MASS CASUALTY TRAUMA TRIAGE

PARADIGMS AND PITFALLS

JULY 2019

EXECUTIVE SUMMARY

Emergency medical services (EMS) providers arrive on the scene of a mass casualty incident (MCI) and implement triage, moving green patients to a single area and grouping red and yellow patients using triage tape or tags. Patients are then transported to local hospitals according to their priority group. Tagged patients arrive at the hospital and are assessed and treated according to their priority.

Though this triage process may not exactly describe your agency's system, this traditional approach to MCIs is the model that has been used to train American EMS providers for decades. Unfortunately—especially in mass violence incidents involving patients with time-critical injuries and ongoing threats to responders and patients—this model may not be feasible and may result in mis-triage and avoidable, outcome-altering delays in care. Further, many hospitals have not trained or exercised triage or re-triage of exceedingly large numbers of patients, nor practiced a formalized secondary triage process that prioritizes patients for operative intervention or transfer to other facilities.

> " As a nation, we've got a lot of trailers with backboards and colored tape out there and that's not what the focus of mass casualty response is about anymore. "
>
> **Dr. Edward Racht**
> American Medical Response

The focus of this paper is to alert EMS medical directors and EMS systems planners and hospital emergency planners to key differences between "conventional" MCIs and mass violence events when:

- the scene is dynamic,

- the number of patients far exceeds usual resources; and

- usual triage and treatment paradigms may fail.

This paper provides a framework for those stakeholders above and provides the following factors to consider when planning a response to MCIs:

- **Common approaches and equipment for area law enforcement officials (LEOs), fire department, and EMS agencies.** Law enforcement actions in recent incidents have saved many lives. However, to ensure continued success, law enforcement actions must be aligned with those of other first responder partners and involve advance planning and training, with the right equipment, with all partners.

- **Triage is an inherent part of mass casualty response that prioritizes patients and the care they should receive based on the number and type of casualties and resources available.** Triage is dynamic and ongoing, and not a discrete activity. The thoroughness of the patient assessment will vary based on scene safety, number of patients, personnel available to participate in the triage process, and other factors. Having scalable and flexible triage protocols allows providers to respond to any kind of incident.

T R A C I E

- **Integration between the pre-hospital and hospital response.** Joint planning and exercising can ensure that EMS and hospitals will be prepared to rapidly assess and provide appropriate care and disposition for patients at the scene and at the hospital after a mass violence incident.

- **Response objectives and basic strategies are the same for every incident; however, the tactics will vary depending on the available resources and the individual situation.** Developing a response plan for one type of MCI may not address the needs of all incidents. In particular, recent mass shootings have challenged historical paradigms for both EMS and hospital triage, treatment, and transport/transfer.

- **Provider safety is paramount.** When scene safety is in question, EMS should establish unified command with law enforcement, obtain situational awareness, institute rescue task force activities (with those trained and equipped to participate in such task forces), identify zones of relative safety, and move patients to those areas as rapidly as possible with lifesaving interventions, such as hemorrhage control, performed while patients are being moved to relative safety.

> **A _RESCUE TASK FORCE_ consists of EMS and law enforcement personnel who work together to provide immediate basic medical care to victims in the warm zone – an area cleared by law enforcement, but not completely secure.**

- **Initial triage and patient assessment includes a rapid evaluation for life-threats.** This includes early assessment for truncal penetrating wounds, which can be life-threatening regardless of the patient's current condition.

- **Patients triaged to the yellow/delayed category are monitored and reassessed.** Significant life-threatening injuries can be missed during triage and patients who were previously stable can quickly decompensate. It is important to ensure that healthcare professionals continually monitor and reassess those patients that were initially triaged in the yellow category.

- **Rapid EMS transport should be favored over formal on-scene triage/sorting activities.** EMS command staff should determine if on-scene patient collection/treatment activities are useful based on the nature and size of the incident, number of trained EMS providers, available ambulances and other transport vehicles, scene safety concerns, capacity of nearby hospitals, environmental conditions, and the number of remaining injured patients.

- **Transport capacity should be maximized by prior agreements and early resource requests.** In certain circumstances, law enforcement vehicles, buses, or privately owned vehicles may be options to consider when there is an increased need to rapidly transfer patients to a hospital and traditional ambulance resources are not sufficient.

- **Patient distribution to appropriate hospitals should be considered a component of triage and can have significant impact on survival.** Getting critical patients to trauma centers while not burdening these centers with too many non-critical patients is a difficult balance and may require adjustments based on the scope of the incident. In incidents with overwhelming patient numbers, community hospitals should be prepared to receive critically injured victims via self-referral or EMS. Specialty hospitals' (e.g. children's hospitals) roles should be defined prior to an event.

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- **EMS should be able to monitor the capacity and needs of local hospitals and provide support to hospital triage and secondary transport operations.** Hospitals should be prepared to accept pre-designated numbers of patients from EMS based on their trauma status and ability to manage special populations (e.g. pediatric). However, polling hospitals for initial patient capacity during an incident is time consuming and often inaccurate. EMS personnel must have consistent and timely communications with the hospitals throughout the incident to ensure that pre-event capacity assumptions remain accurate. In addition, pre-event planning and having established processes in place with healthcare coalition partners is critical to successful information sharing and resource requests.

- **Every hospital must be prepared for large numbers of privately transported and walk-in casualties, particularly from nearby MCIs that involve violence**. Hospitals must ensure they have a system in place to implement access controls and rapidly triage, track, and place patients. There are no accepted criteria or processes for trauma secondary and tertiary triage. These are concepts that require additional planning and exercises at every facility.

> *HEALTHCARE COALITIONS* (HCCs) integrate healthcare and response organizations (e.g., hospitals, EMS, emergency management organizations, public health agencies, etc.) in a defined geographic location. HCCs play a critical role in developing healthcare delivery preparedness and response capabilities. HCCs serve as multiagency coordinating groups that support and integrate with Emergency Support Function (ESF)-8 activities at the jurisdictional level.

It is important for EMS medical directors and EMS systems planners and hospital emergency planners to be familiar with the lessons learned from recent bombing and mass shooting events in order to stay informed, update their emergency operations plans as appropriate, and test any new processes required. They must also work with their community partners to review triage and disaster treatment processes and ensure these processes account for dynamic and unsafe situations, exceedingly large numbers of victims, multiple unidentified victims, and a high incidence of life-threatening injuries. Failure to plan, train, and exercise for these situations may risk the lives of both provider and patient.

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Mass Casualty Trauma Triage - Paradigms and Pitfalls

MASS CASUALTY TRAUMA TRIAGE
PARADIGMS AND PITFALLS

July 2019

PROJECT

The U.S. Department of Health and Human Services (HHS), Office of the Assistant Secretary for Preparedness and Response, (ASPR) Technical Resources, Assistance Center, and Information Exchange (TRACIE) received a technical assistance request asking whether current EMS triage approaches needed to be modified in the era of mass violence/mass shooting incidents with extremely large numbers of patients. The ASPR TRACIE team searched peer-reviewed literature, as well as recent gray literature and after-action reports with a particular focus on mass shootings.

After completing a thorough literature search, the ASPR TRACIE team developed and circulated a draft white paper to EMS subject matter experts (SMEs) for review and feedback. Given the breadth of the comments and issues raised by these EMS SMEs, ASPR TRACIE later convened a roundtable with 42 SMEs (refer to Appendix D) in the subject areas of both EMS and hospital trauma care who represented key organizations/agencies and had particular experience in disaster response. Prior to the roundtable, the ASPR TRACIE team developed 25 recommendation statements (refer to Appendix C) so that attendees could review them in advance, decide whether they agreed or disagreed with each statement, and come to the meeting prepared to discuss their thoughts. Following the roundtable, ASPR TRACIE staff edited the white paper to capture the comments solicited from attendees.

INTENDED AUDIENCE

The intended audience for this paper are EMS medical directors and EMS systems planners and hospital emergency planners, and any others that have a lead role in healthcare emergency response planning. Other providers and disciplines may also find the materials useful in their planning and training.

The focus of this paper is to inform the intended audience of key differences between "conventional" MCIs and mass violence events when:

- the scene is dynamic,

- the number of patients far exceeds usual resources; and

- usual triage and treatment paradigms may fail.

INTENDED SCOPE AND ACTION

Although this document reflects the opinions of many EMS and hospital trauma care SMEs, it is not intended as official guidance or direction from HHS or ASPR. This document contains planning considerations that EMS medical directors and EMS systems planners and hospital emergency planners should review when developing MCI plans and training programs.

The focus of this paper is specifically designed to educate emergency planners on the key distinctions of no-notice, dynamic incident scenes with exceedingly large numbers of patients. This will require review of current plans and making necessary modifications to those plans and corresponding training and exercises to ensure preparedness for these types of events. Each community has a unique set of resources and needs and may therefore require different solutions than other jurisdictions. It is important to note that this is a discussion document, and not a consensus document. Therefore, the authors have tried to represent the diversity of opinions where they were significant. This document is also focused on triage and does not account for the broad range of supporting disaster planning required for successful response.

BACKGROUND AND RECENT LESSONS

> *Triage is not the same as patient assessment – it is an assignment of resources based on the initial patient assessment and consideration of available resources.*

Both of these variables may change over time, thus changing the triage priority. Healthcare providers make triage decisions every day. For example, EMS providers decide when to transport a patient to a trauma or stroke center, and triage nurses assign priority for patients to be seen in the emergency department (ED). If the patient deteriorates, they receive higher priority for care.

While triage systems used under daily conditions (particularly for time-sensitive emergencies, such as stroke and traumatic injury) may have a significant amount of supporting evidence, most mass casualty triage systems have little evidence other than expert consensus to support their use.

Though triage will occur in every MCI, questions related to where, when, and how this occurs may vary depending on the specifics of the incident, location, and the resources available. The processes used for triage require flexibility to adapt to a range of incidents.

Experience from multiple past incidents provides specific examples of the limitations of traditional triage processes[1]:

> **This white paper uses the term "mass casualty" to reflect a situation in which medical resources are overwhelmed, at least temporarily, and will concentrate specifically on events with extremely large numbers of patients.**

- In real-world incidents, EMS personnel often do not follow triage protocols outlined in agency mass casualty plans.

- EMS may not be able to establish structured triage, casualty collection points, or treatment areas due to the large number of patients, the scope/size of the scene, and scene safety issues.

- Commonly used EMS mass casualty triage criteria do not include a rapid assessment for presence of truncal penetrating trauma.

- Immediate responders (bystanders) or self-care may be the primary means of initial medical care and/or transport and may need supplies to effectively control bleeding.

- Hospitals must be prepared to triage large volumes of both walk-in/drop-off patients and those that arrive by ambulance - as seen with the 2017 shooting at the Route 91 Harvest music festival in Las Vegas, Nevada. EMS may not realize hospitals are overwhelmed, as without a liaison or other direct communication with the hospital, they may only be aware of ambulance transports.

> **This white paper supports a re-examination of local disaster mass casualty triage planning based on prior lessons learned.**

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[1]*Based on interviews and discussions conducted by ASPR and ASPR TRACIE staff with pre-hospital and hospital staff involved in response to the following recent events: Pulse Nightclub, Century 16 Theatre, First Baptist Church of Sutherland, Route 91 Harvest music festival, Stoneman Douglas High School, Inland Regional Center, Boston Marathon, Red Lake Reservation, and reflected in peer-reviewed articles (e.g. Boston, 35W bridge collapse).*

T R A C I E

- Destination hospitals recommended by online sources (e.g., Google Maps, Waze) or known to ride-hailing services, taxis, and law enforcement may not be the closest or most appropriate hospital for the patient's injuries and do not currently factor in wait times or current volume.

- Patients may present to nearby outpatient clinics and urgent care centers requiring assessment, initial care, and EMS transfer.

- EMS support of hospital "parking lot" triage and secondary transfer operations can provide critical support to an overwhelmed hospital and help move patients to appropriate levels of trauma care. However, this is rarely planned for or exercised.

> **An MCI may be declared with fewer than 10 patients if the system is overwhelmed by that number. In other jurisdictions 20 or more patients might be an MCI. This report concentrates on MCIs with several hundred or more patients.**

- Serial re-triage is necessary as patients who initially seem stable can deteriorate and critical patients can stabilize (e.g., after tourniquet application). This is particularly true in penetrating trauma. Also, as additional resources become available, prioritization or treatment may change.

- Secondary and tertiary triage (i.e., occurring after initial interventions and diagnostics – usually at the hospital unless scene times are severely prolonged) should be emphasized and exercised in hospitals. In particular priority for the operating room (OR) or Intensive Care Unit (ICU) should be addressed. In mass shooting incidents, the number of patients requiring emergent surgery may exceed available resources.

FOCUS AND USE OF THE DOCUMENT

This white paper highlights some of the challenges of mass casualty response and triage process considerations for EMS agencies and hospitals to help improve outcomes in the face of overwhelmed systems. The focus of this paper is EMS and hospital response to incidents of mass violence—particularly mass shootings—but also vehicular or bomb attacks on crowds where the scene is dynamic, the number of patients exceeds available resources, and the mechanism of injury is life-threatening and time sensitive.

Each section of this paper offers points for consideration and local agency/facility discussion based on lessons learned from past incident responses and from the perspective of SMEs with experience in disaster response, EMS, and trauma care. Ideally, the considerations can support hospital and EMS planning and result in a joint community mass casualty plan for the HCC/region that outlines key principles, roles/responsibilities, processes, communications mechanisms, and a summary of key resources. This paper is not a definitive review of triage, nor is it a consensus or policy document like the Model Uniform Core Criteria for Mass Casualty Triage.

Underlying these associated recommendations are the following concepts:

- Disaster policies should mirror, or build off of, daily practices whenever possible. Those policies/procedures unique to disasters require the most education.

- Protocols should allow for situational flexibility.

- Providers must understand overall response principles and apply tactics that fit the incident.

- Triage systems should be designed around the needs, resources, and potential threats in the region.

- Training and exercises should emphasize provider decision-making in a variety of situations.

- Lessons learned from MCIs should be reviewed and, when appropriate, result in plan revision and additional education.

As previously noted in this document, the ASPR TRACIE team conducted a roundtable with multiple EMS and hospital SMEs. Multiple participants and SME reviewers of the document felt that a primary issue specific to EMS was that agencies often focused on a single *process* for conducting triage, which may not be appropriate in all situations. The focus should be the *principles* of triage which include:

- Doing the greatest good for the greatest number of patients with the resources available.

- Gaining rapid access to living casualties and evacuating them from the hazard area.

- Providing basic life-saving interventions as soon as it is safe to do so[2].

- Transporting the injured to an **appropriate** hospital as rapidly as possible.

- When necessary, prioritizing resources to those who are most in need and are salvageable with current resources.

- Re-triaging patients as the resource situation changes over time.

For hospitals, decisions and actions at the scene by EMS and immediate responders (bystanders) can have cascading effects on healthcare facilities that are unprepared for large numbers of patients arriving by private vehicles, a lack of expected triage tags/categories, and life-threatening injuries exceeding usual resuscitation and operative resources.

These principles and issues are relevant regardless of the type of event or population affected. Appendix A describes specialty incident situations that require additional consideration by emergency planners. Planners and medical directors should review the considerations included in each section of the paper (summarized in Appendix B) and may wish to reference the recommendation statements and discussion summary from the roundtable provided in Appendix C. For further information, reference documents based on the literature review conducted by ASPR TRACIE staff and input from SMEs are included in Appendix E.

OVERVIEW OF TRIAGE AND SCARCE RESOURCES

The medical response to any MCI where triage processes are implemented likely involves at least temporary crisis care conditions in which decisions need to be made that may increase the chance of a poor outcome for individual patients (due to delays in transport or lack of medications, for example). These incidents may not be prolonged enough to require formal *crisis standards of care* (CSC) processes, declarations, or other proactive legal, regulatory, and policy support. However, because they are expected for at least a short period of time, both at the scene and at the hospital, all providers should have a basic understanding of the goals and foundations of triage. Most of these crisis care situations are resolved within hours as additional resources arrive. The faster these resources are requested, the better systems are at sourcing and filling requests (e.g., through HCCs, mutual aid agreements, and/or notification/alerting systems). In addition, the more resources that are available, the faster the system can get back to contingency (i.e., providing appropriate care to all patients with some adaptations) and eventually conventional (normal) operations. Patients with special considerations (such as individuals with pre-existing health conditions, children, the elderly, and those with limited to no English proficiency), may require additional planning.

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[2]*This could include 'Stop the Bleed', basic airway interventions, chest decompression/chest seal, or administration of nerve agent or other antidotes that can quickly reverse immediate life threats.*

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Triage depends on a provider's assessment and an interpretation of the patient's prognosis based on that assessment (i.e., what care the patient needs and their estimated likelihood of survival), and what is required to deliver that care in terms of:

- **Time** – How much time is required to provide the interventions and how quickly does the intervention need to be initiated to be effective?

- **Treater** – How much healthcare provider expertise is required?

- **Treatment** – How many resources are required to achieve the desired outcome?

From a **Time/Treater/Treatment (TTT**) standpoint, based on military analysis of medical care, the most efficient interventions for penetrating trauma are those that offer high benefit for minimal resource commitment. Tourniquets, basic airway positioning and interventions, chest seals, and chest decompression are among the interventions that form the core of Tactical Combat Casualty Care (TCCC)/Tactical Emergency Casualty Care (TECC). The least efficient interventions are ones that require numerous or specialty staff, significant time, and/or a very high resource-to-benefit ratio. As the number of patients increases, focusing on the moderately injured rather than the most critically injured patients may save the most lives. Also, preventing deterioration through simpler interventions may be more efficient than committing major resources to questionably salvageable patients. This is an extremely difficult hypothesis to research, but should be considered, particularly for trauma surgeons and emergency medicine providers.

Generally, there are three types of triage[3]:

- **Primary triage** – Performed at the first encounter with the patient and establishes initial priority for life-saving interventions and/or transport. This may be done by EMS, first responders, or hospital personnel and may be accomplished in multiple stages or all at once depending on the need to:

  » Prioritize moving living patients away from an unsafe area,

  » Assess for life threats and provide immediate treatment in an area of relative safety, and

  » Identify the appropriate destination hospital based on the injuries and administer initial/additional treatment.

- **Secondary triage** – Re-evaluation of the primary triage category performed after additional assessment and/or interventions. It may be performed in the pre-hospital setting when scene or transport times are prolonged. It is more often used at the hospital to prioritize patients for operative care or advanced studies after further assessment and initial resuscitation in the ED.

- **Tertiary triage** – Performed during ongoing definitive care. This evaluates whether ongoing resource commitments are sustainable or new commitments are necessary, given the patient's condition and the resources available.

Secondary triage has received less attention and there are fewer validated models, though emergency care providers make secondary triage decisions every day based on prognosis (e.g., the decision to provide supportive care to a patient with a catastrophic head injury or a major burn patient with a negligible chance of survival) or resources available (e.g., which

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[3]A roundtable participant noted that the use of the term 'triage' itself lacks a precise definition for EMS and is often conflated with a variety of processes performed during mass casualty response.

patient will go to the CT scanner next). Note that for the purposes of this document, re-triage of EMS patients on arrival to the hospital is considered primary triage, not secondary. Hospital-based secondary triage occurs after additional diagnostics or stabilizing interventions are performed.

Even "objective" triage systems are subject to provider bias. Both pediatric and adult minority patients have been shown in studies to be categorized differently than white patients with similar ED presentations (Puumala, 2016 and Vigil, 2016). Provider education should focus on prognosis and resource use as key determinants and raise awareness of inherent age and other bias to help ensure fairness.

CONSIDERATIONS

- Do EMS, nursing, and clinicians involved in trauma and critical care understand the types of triage as well as the variables (e.g., TTT) that should be considered?

- As the number of patients becomes overwhelming, should providers shift their focus to prioritize assessment of victims with potential life threats rather than focusing on definitive care for the most critically injured?

PRE-HOSPITAL TRIAGE

EMS uses triage systems on a daily basis. EMS personnel use trauma triage criteria to help determine the appropriate hospital that a patient should be transferred to, and is based on patient injury and condition (according to the Centers for Disease Control and Prevention's [CDC] Guidelines for Field Triage of Injured Patients). State and regional systems may have triage criteria for conditions such as, stroke, ST-elevation myocardial infarction, and cardiac arrest. The goal of condition-specific triage systems is to choose a destination hospital most appropriate for an *individual* patient and not to determine priorities for transport or access to services for multiple patients; therefore, the focus of triage systems should change in MCIs. Ideally, triage systems should be standardized across a HCC/region to facilitate mutual aid integration.

Disaster field triage systems are designed to be used by those with minimal medical training to efficiently sort casualties. The goal is to assign patients to categories[4] (Frykberg, 2005):

- Immediate (red)

- Delayed (yellow)

- Minimal (green)

- Expectant (variable color - if included on tag)

- Dead (black or black/white stripes)

During the roundtable meeting previously mentioned in this document, participants felt strongly that this sorting was a critical element regardless of the process used to make the determination, but noted that "red and dead" were the two most critical determinations during primary triage.

> **The goal of initial triage is to recognize and prioritize the critically injured for care, avoiding under-triage (inappropriately assigning a critically injured patient to a delayed category) and over-triage (inappropriately assigning a patient with non-critical injuries to immediate care).**

There has been much debate among EMS and trauma professionals around the nation related to the importance of distinguishing between red and yellow casualties prior to patient movement, particularly in a mass shooting or blast event where the majority of triage may be self-evident. To paraphrase one Las Vegas responder, "People were either gone, dead, or alive." Making a distinction between red and yellow casualties with penetrating torso trauma— particularly on the basis of field triage tools that may lack precision—may not be a worthwhile investment of time depending on the number of casualties and the safety of the scene.

Under- and over-triage are both dangerous and can affect mortality. Under-triage (placing a patient in a lower category than their actual injuries require), means critical injuries were not recognized. Over-triage (placing a patient in a higher category than their actual injuries require), diverts assessment and treatment resources from those who needed it more. Frykberg and others have demonstrated that reductions in over-triage reduce mortality during bombing incidents. Due to the graphic nature of blast injuries and pre-existing trauma triage criteria that emphasize transport to a trauma center for nearly all penetrating injuries, over-triage is a distinct possibility in mass violence incidents and can rapidly result in trauma center saturation. Over-triage may also occur for pediatric patients due both to child and provider reaction to the situation and injuries. Under-triage can be a risk when a patient is stable with an isolated, externally unimpressive penetrating torso injury that masks major internal injuries.

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[4]*Some systems use 2 or more categories that combine these categories.*

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When possible, daily triage practices should be replicated in response to an MCI. Standardized triage systems can provide common structure and a clinical basis for decisions, particularly for providers with limited training and experience. However, cognitive limitations from incident stress may cause responders to default to usual ("muscle memory") practices unless substantial training and job aids support an alternate practice. Despite training and practice on disaster triage, EMS providers in multiple real-world incidents often failed to use their triage systems (DiCarlo, Maher, Hick, and Hanfling, 2011) and instead relied on their clinical judgment. Notably, in the case of the 35W bridge collapse in Minneapolis, Minnesota, triage based on provider judgment was highly effective; though the providers were experienced urban paramedics (Hick, 2008).

In some cases, triage categorization by an experienced provider has been shown to be superior to standardized systems (Kierstead, 2015). This common experience has led Israeli healthcare policy makers to recommend an experienced clinician perform initial triage at the hospital. However, when resources are constrained, a physician may not be able to perform hospital triage and an experienced nurse may handle this critical task.

The roundtable participants emphasized the need for a process to assign priority and stated that adoption of a common strategy that can be used by a broad range of providers (since some triage systems are regional or even statewide) is helpful – with an understanding of the limitations of such systems. In general, EMS field triage constructs are most likely to be helpful for the providers with the least clinical training and experience (for example, some law enforcement personnel). Providers should incorporate other variables based on their clinical experience when appropriate.

Frequently used EMS disaster triage systems include:

- START (Simple Triage And Rapid Treatment),

- JumpSTART (pediatrics), and

- SALT (Sort, Assess, Life-saving interventions, Treatment/transport)

SALT arose after a 2006 consensus review group convened by the National Association of EMS Physicians and the CDC found that there was insufficient evidence to support any one existing system and created the Model Uniform Core Criteria for Mass Casualty Triage (MUCC) with 24 core criteria for mass casualty triage systems. SALT was the consensus-based triage method developed by that working group for pre-hospital MCI triage. SALT, in contrast to other systems, deliberately includes administration of life-saving antidotes and actions. It also includes a "gray" category for expectant patients.

However, expectant triage decisions are seldom made in the field during an MCI because systematic transport prioritization is rarely required, and providers usually lack the diagnostic information or experience to be comfortable triaging patients as expectant. In several cases known to our roundtable participants, patients categorized in the hospital environment as "expectant" actually had positive outcomes after re-triage as the resource situation improved. Therefore, absent compelling evidence for non-survivability, transport of patients with vital signs to the hospital is encouraged.

All of these systems noted categorize ambulatory patients as green; those with respiratory compromise (START > 40 breaths/minute, SALT respiratory distress), without radial pulse, or unable to follow commands as red; and the remaining patients as yellow.

Despite widespread use of these systems and evidence that providers can assign patients effectively to groups based on the system, there is very little clinical evidence or comparison to routine provider clinical assessment to validate them. Concern exists about both the rate-based (rather than effort-based) respiratory criterion in START

and the reliance on radial pulse presence as a shock threshold. Roundtable participant opinions of the systems were highly variable ranging from "not valuable" to "very valuable." Those participants that felt that the systems had value generally concurred that some system was better than none, that these systems were common and accepted, and absent alternatives still offered value (particularly to providers with lesser clinical experience and training).

A common theme among the roundtable participants was the concern about the need to recognize early shock and potential deterioration in the "yellow" group (and even some "green" casualties that are highly motivated to move to safety, even in the face of life-threatening wounds). This is of particular concern with penetrating injuries to the torso.

These concerns are supported by findings in an abstract by Bultmann and Hick, which describes 228 patients assessed upon arrival at an urban Level 1 trauma center, noting that 26% of "yellow" patients required emergency interventions within minutes of ED arrival. Overall, there was a 24% under-triage rate in the "yellow" group and a 6% over-triage rate in the "red" group based on physician assessment and the need for emergency interventions, suggesting the "yellow" group may contain many critically injured patients.

Heffernan, et al studied 115 pediatric patients arriving at a Level 1 pediatric trauma center that were assessed by a trained paramedic and categorized under four commonly used pre-hospital triage schemes. In comparing medical records, SALT was the most accurate scheme overall at 59%, but all schemes exhibited under-triage rates of at least 33%.

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> In our experience, you can pretty much trust START Minor, you can pretty much trust START Immediate, but you can't trust START Delayed. There can be higher acuity patients among the Yellow/Delayed category of patients.
>
> **Dr. Ken Miller**
> Santa Clara County EMS
> "

The CDC Guidelines for Field Triage of Injured Patients are intended for all trauma patients. The guidelines, or a variation of them, are used by most major EMS systems and therefore could offer familiarity to providers during a disaster. These guidelines were not intended as a mass casualty triage tool, but rather were created to help pre-hospital providers triage individual patients who are most likely to benefit from specialized trauma care resources. One of the advantages of the guidelines is that truncal penetrating trauma is a criteria for high priority transport to a trauma center, a key variable that is not present in most mass casualty EMS triage systems. However, the criteria also may result in over-triage to trauma centers during mass violence incidents and risk overwhelming those centers. Awareness of current resources is important to try to balance these competing priorities.

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CONSIDERATIONS

- Are providers aware of how clinical experience can affect the performance of triage?

- Does the MCI plan clearly identify roles and responsibilities?

- Do providers understand the risks of over- and under-triage, and situations where this may be more likely to occur?

- Does the current triage system used emphasize assessment for: sources of uncontrolled hemorrhage (external and suspected internal), compromised airway/breathing, signs of shock (prior to decompensation), altered mental status, and a search for truncal penetrating injury?

- Is the current triage system adequate and working? Does it require modifications or re-training?

- Does the current triage system account for presentation differences among special populations, such as children and those with pre-existing communication challenges?

EMS MASS CASUALTY PRACTICES

Historical EMS mass casualty practices include: conducting a quick reconnaissance of the scene for hazards; asking all ambulatory patients to move to a safe collecting area; assessing non-ambulatory patients; tagging them with colored tape or triage tags (or both) to assign a red/yellow/green/black color priority for movement to a collection point; and moving patients to a collection point for transport according to priority. Some incident scenes are more conducive to this system than others and in this paper are delineated as static and dynamic scenes.

Static incidents are single scene or single area incidents, often with no immediate safety threat and little potential for non-EMS transport of patients. The scope and source of the incident is generally understood and apparent. Examples include a transportation crash or rural incident. There is little desire and/or ability for patients to flee or seek care on their own, as EMS resources are generally adequate to provide direction and services.	**Dynamic** incidents may have multiple locations, and/or involve a large number of casualties who cannot be managed by available resources, have a high potential to require cover/concealment during rescue operations, have a high potential for victims and bystanders to flee and seek medical care on their own, and result in disorganized evacuation. Immediate or secondary safety threats to the public and providers are likely. The scope and source of the incident may not be apparent on arrival. Examples include the Route 91 Harvest Music Festival mass shooting, the Pulse nightclub shooting, and the New York City 9/11 terror attack.

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General EMS MCI strategies, as reflected in Figure 3 below, include:

- Safety/size up and resource request.

- Incident/unified command established as soon as practical.

- Patient access (use rescue task force if required).

- Stop the Bleed and other emergency interventions.

- Triage/treatment/transport.

- Evaluate appropriate destination for patients and hospital capacity.

- Re-evaluate resources and patients; release extra resources to support community and hospital needs.
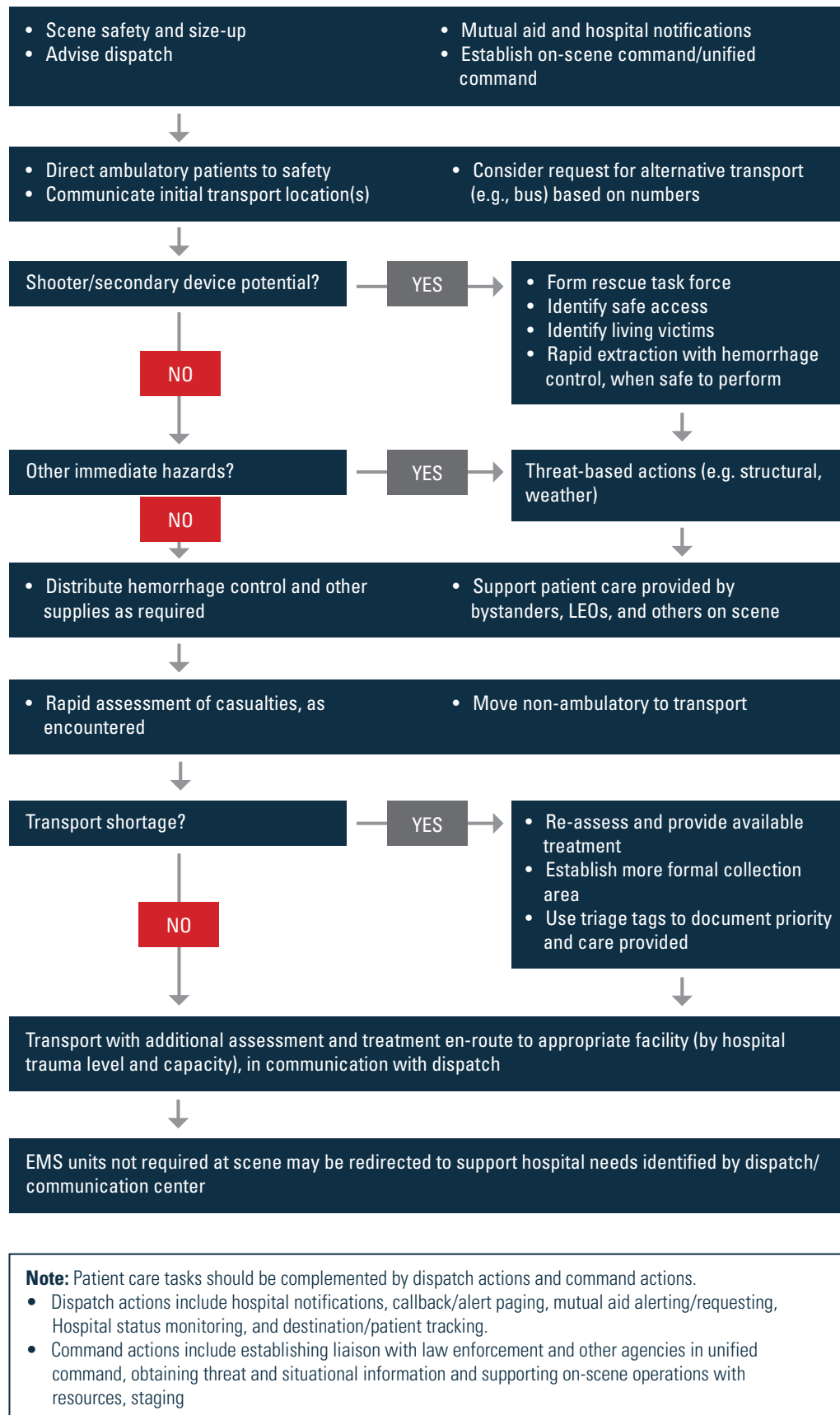
- Scene safety and size-up
- Advise dispatch

- Mutual aid and hospital notifications
- Establish on-scene command/unified command

- Direct ambulatory patients to safety
- Communicate initial transport location(s)

- Consider request for alternative transport (e.g., bus) based on numbers

Shooter/secondary device potential? — **YES** →
- Form rescue task force
- Identify safe access
- Identify living victims
- Rapid extraction with hemorrhage control, when safe to perform

NO

Other immediate hazards? — **YES** → Threat-based actions (e.g. structural, weather)

NO

- Distribute hemorrhage control and other supplies as required

- Support patient care provided by bystanders, LEOs, and others on scene

- Rapid assessment of casualties, as encountered

- Move non-ambulatory to transport

Transport shortage? — **YES** →
- Re-assess and provide available treatment
- Establish more formal collection area
- Use triage tags to document priority and care provided

NO

Transport with additional assessment and treatment en-route to appropriate facility (by hospital trauma level and capacity), in communication with dispatch

EMS units not required at scene may be redirected to support hospital needs identified by dispatch/communication center

Note: Patient care tasks should be complemented by dispatch actions and command actions.
- Dispatch actions include hospital notifications, callback/alert paging, mutual aid alerting/requesting, Hospital status monitoring, and destination/patient tracking.
- Command actions include establishing liaison with law enforcement and other agencies in unified command, obtaining threat and situational information and supporting on-scene operations with resources, staging

Figure 3. Overall Mass Casualty Process for EMS

TRACIE

Mass Casualty Trauma Triage - Paradigms and Pitfalls

Basic job aids/prompts on a card attached to identification badges may be a reasonable reference for responders to review while en route to the scene to refresh initial actions and assignments of command, transport, and staging officers, and general principles tailored to local protocols. ***Perhaps even more simply, initial responders should concentrate on safety, patient access with law enforcement, and triage, treatment, and rapid transport tailored to the needs of the incident. Command staff can assist with more formal incident command, staging, communications, patient distribution, and hospital support issues***.

In order to effectively manage on-scene operations, an incident command system (ICS) or unified command with law enforcement, EMS, and fire **must** be rapidly established to evaluate scene safety/security, make resource requests, direct rescues/patient movement, and coordinate staging and transport. On-scene command should coordinate with local emergency operations centers, HCCs, and hospitals to determine appropriate patient distribution and evaluate hospital saturation.

STATIC INCIDENTS

During static incident operations, traditional triage strategies can be used, though portions may have to be modified depending on scene safety. An assessment for ongoing threats is still important (e.g., looking for downed wires, traffic hazards, and gas leaks), but when the primary impact is over there is no major threat of incident expansion. First responders must ensure patients are in a safe place while awaiting transport. There is a risk of unnecessary delay if patients are moved to a collection area for reassessment. If there are adequate transportation resources, then transport should be prioritized for "red" followed by "yellow" patients rather than moving them to a collection area first and reassessing them on site. This is consistent with daily expectations, which means that trauma patients should receive expedited transport to a trauma center, keeping on-scene time to a minimum. Ambulance capacity should be maximized by transporting sitting, "green" patients in the passenger or available bench seat when possible (based on available seat belts) while simultaneously transporting supine "red" and "yellow" patients.

When transportation resources are inadequate, such as the bus crash incident in remote Mexican Hat, Utah in 2008 (NTSB, 2009), on-scene assessment, triaging for care/transport priority, and ongoing treatment in a collection area is appropriate if the delay to transport patients will be significant. Alternative transportation resources should be considered. "Green" patients may be sent by non-medical transport, with medical providers on board if possible. When the patient's injuries and other environmental factors pose time-sensitive risks, those with severe injuries also may be best served by immediate movement via non-EMS transport. For example, shooting victims at the Aurora, CO Century 16 movie theatre were transported by law enforcement personnel due to lack of immediately available ambulances. What constitutes a significant delay should be determined by the local medical director, medical control, or system protocols, optimally prior to an incident. Air ambulances may be a helpful adjunct for the more critically injured, though air ambulance capacity is limited, and landing zone operations require assets that may not be available.

When scene evacuation will be prolonged or the local hospital overwhelmed for a significant time, obtaining resources (e.g., trauma/emergency physicians, or supplies such as medications and blood products) from a referral center to the site may be warranted. However, it is generally a poor idea to send hospital providers to a disaster scene as they often lack the experience, protective equipment, and understanding of pre-hospital medicine necessary to provide effective care. When hospital providers are sent to a disaster scene, the hospital's capacity and capability to provide care is diminished. These situations should be anticipated and planned for whenever possible.

DYNAMIC INCIDENTS

Many mass casualty situations challenge responders because they have a poorly defined and dynamic scene. Situations may involve widespread structural damage (e.g., the 35W bridge collapse in Minnesota, and the tornado in Joplin, Missouri); a large site with multiple egress locations (e.g., the Route 91 Harvest Festival shooting); or multi-location terrorist attacks (e.g., Paris and London Bridge attacks) that impede situational awareness, rapid patient access and assessment, and the establishment of on-site triage and treatment locations.

Dynamic incidents pose the following four challenges that prevent EMS personnel from undertaking traditional, more structured triage operations:

- Ensuring the safety of EMS providers dictates that on-scene operations be as simple and brief as possible. However, dynamic incidents are rarely simple or easy to manage.

- During dynamic incidents, the public will bypass EMS and flee the area in direct proportion to any perceived ongoing threat, often relying on private transport or law enforcement vehicles to access hospitals. In addition, efforts to search on the Internet for the nearest hospital or ED often do not direct patients to an appropriate trauma center.

- Patients who seek out EMS providers often have minor injuries and may unnecessarily occupy providers and prevent them from implementing a systematic process. This may also prevent EMS providers from reaching the scene to access the more severely injured.

- The geography or safety of the incident may not lend itself to the setup of a formal staging/collection area, and it may be difficult to quickly access and assess the non-ambulatory patients, thereby limiting awareness of the number of patients.

The magnitude of self-referral or private transport to hospitals depends on patient access to vehicles and their motivation to leave the area. For example, an active shooter incident at a rural elementary school would be expected to result in far less private transport/self-referral than one in a downtown area. In the Route 91 Harvest music festival shooting, 80% of the patients self-referred to hospitals, including patients with both minor and critical wounds. The tendency to flee may also be related to the confidence the victims have in EMS to rapidly provide safety, treatment, and transport. Plans must also account for the impact of these patients on receiving hospitals.

EMS personnel responding to dynamic scenes should be prepared to:

- Ensure their own immediate safety and establish unified command with law enforcement.

- Provide situational awareness so dispatch can send additional units, request appropriate mutual aid, and provide information to area hospitals about the location and scope of the incident.

- Support "buddy" or immediate responder (bystander) care by providing treatment materials and just-in-time instruction to immediate responder (bystanders), to the extent feasible.

- Integrate with law enforcement on rescue task forces/evacuation teams per local protocols.

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[5]*Note that the closest hospital may not be the most appropriate destination for individual patients depending on the extent of their injuries and that particular hospital's assets and capabilities. Many patients may not need trauma center care. However, if provider assessment is incomplete, the driver of a private vehicle should generally be directed to the closest trauma hospital.*

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- Direct patients to relative safety. Secondary attacks should be anticipated.

- Direct patients to an appropriate hospital, if transport is inadequate/unavailable and patients cannot or will not wait for EMS transport[5].

- Plan to transport patients to both trauma centers and non-trauma hospitals, using all appropriate facilities in relation to the scope of the incident.

- Determine the closest, safe ambulance loading points, and direct incoming EMS resources to that location.

- Focus on rapid transport of the casualties tagged as "red" or "yellow" to trauma centers rather than areas where collection or categorization of patients is occurring.

- Determine the role (if any) for ongoing casualty collection/treatment points at or near the scene.

- Determine the need for EMS to support hospitals as on-scene operations conclude if nearby hospitals or trauma centers are overwhelmed.

The initial focus in all mass casualty incidents should be an assessment of scene safety. On the scene of a dynamic mass violence incident with potential additional threats, triage of patients will be incremental. Initially, living patients should be rapidly moved to safety and further assessment may not occur until the patient is in an ambulance (or other transportation means) or at the hospital. Clearing the unsecured scene of patients via rapid transport can also help minimize provider and patient exposure to hazards. Once the scene is safe, the remaining patients may be cared for with the usual processes.

Rendering the scene "safe enough" to conduct lifesaving operations is the goal in an active violence event, and law enforcement should rapidly engage, neutralize, or contain active threats so that access to patients can be secured. EMS personnel must always consider safety to be a risk/benefit calculus, and if the staff do not feel sufficiently safe to conduct their duties they should retreat or shelter in place and re-engage law enforcement to discuss further threat mitigation. Rescue Task Force activity or EMS response involving insertion with police assets prior to complete scene safety confirmation must be coordinated and practiced prior to the incident.

THE ROLE OF DISPATCH

The first role of dispatch is to gather incident information and assign initial resources. Roundtable participants felt that dispatch personnel had an effect on triage that has been under-estimated.

At the dispatch level, triggers should be identified for automatic assignment of resources to a potential mass casualty incident as well as notifications of agency staff, partner agencies, and hospitals (e.g., for any incident involving X number of patients, an initial assignment of Y ambulances, supervisor/battalion chief, MCI assets, and mobile command assets will be deployed). Different threshold levels for MCIs were used by the roundtable participants' agencies. In general, any multiple-person shooting or incident involving about 10 patients was the threshold for sending an initial response usually involving

> **Tremendous resources may be wasted on responding to active shooter calls that are not secondary incidents, but result when patients call from a location of safety after fleeing the scene. The dispatcher must clarify:**
>
> - **Where were you when you were shot/injured?**
> - **Are you safe right now?**

at least five EMS units and a supervisor, with additional responders assigned based on subsequent information about the incident. Some systems had graduated resource assignments for incidents involving up to 100 patients.

Particularly during mass violence incidents, 911 calls may come from multiple locations near the incident site where victims have sought refuge. These "echo calls" have created problems in several recent incidents where dispatchers have entered them as individual/new active shooter calls, creating confusion and requiring resource commitments to address possible secondary incidents. Dispatchers should ask callers where they were when they were injured and if they are safe at their current location. Clarifying whether there are multiple incidents or incident locations can save valuable time and prevent law enforcement officials from repeatedly assessing and clearing areas that are already safe.

Dispatchers can also provide life support advice to callers, helping them apply Stop the Bleed techniques. Dispatch personnel may need permission to deviate from the script when necessary. For example, if the system is out of resources, private transport may be a preferred option versus waiting for EMS, particularly in the setting of penetrating torso trauma. Dispatchers also need policies to follow when the system is unable to meet the needs of community 911 during a disaster. Further, dispatchers should collaborate with the on-scene commander to request mutual aid or direct additional resources to the scene or to an overwhelmed hospital based on information they are receiving and their awareness of system resources; or at least be empowered to prompt the EMS command staff for decisions and information.

The role of coordinating communications, mutual aid, patient tracking, and hospital monitoring often falls to dispatch centers. However, these functions must be practiced, and adequate resources must be available to manage these functions in addition to the demands of the 911 system and incident communications. Regardless of which agency is responsible, these functions require policy and practice to ensure success during an MCI.

TRIAGE TAGS AND PATIENT TRACKING

EMS triage tags in their simplest form are paper tags with an elastic cord that include tear-offs for the colored category, but may include SALT or other criteria, bar codes, and other tracking or treatment information. These tags can be a pragmatic means of documenting care and findings during an MCI. Initial triage with red, yellow, and green colored tape that is applied to patients may save time in a dynamic environment compared to using tags.

Some agencies use a combination of tape and tags; the tape color is rapidly affixed during initial triage, and then a triage tag is applied when a more thorough assessment has been completed. Other agencies use simple orange tape to indicate living, non-ambulatory casualties. Black, striped, or reflective tape may be used to identify the deceased. Failure to identify the dead has led, in some cases, to reassessments of the same victim by multiple providers. Black tape has posed problems with visibility, particularly in low light conditions; "zebra" or black and white reflective tape may be helpful. Some experts recommend the use of light sticks to distinguish casualties for evacuation in darker environments.

All responding units should have an abundant supply of appropriate tapes and tags that are used by the agency or at the regional level. The expectations for the use of tags and tape should be identified community-wide through written and tested/exercised protocols. The use of tape or tags may prove to be useless if a rescue task force simply moves non-ambulatory patients whenever they encounter them. Additionally, if transport is immediately available, there is likely no benefit to a tape or tag. Triage tags may have their greatest benefit in situations where transportation is delayed, in which case the ability to record vital signs, medications, interventions, and assessments may be valuable. It is important to note that some triage tags have space for this documentation, while others do not.

If tags are used for tracking purposes (e.g., bar-coding or numbering), they should integrate with a community process that is consistently followed, ideally in daily practice. Bar code and other systems used only for disasters are likely to fail and have the potential to delay transport. Roundtable participants were in agreement that use of tags for patient tracking was likely to fail in extreme MCI incidents. Not all patients will be tagged or tracked regardless of the policy given that some, and perhaps the majority of, transports will occur by private or law enforcement vehicles. Radio reports and hospital arrival tracking mechanisms may represent a more accurate means of obtaining patient data. There may be other benefits of applying tags (including denoting those transported by EMS once arrived at the hospital), and the advantages and disadvantages should be assessed by each jurisdiction.

> " I don't think it does much to inspire confidence in EMS if we are seen focusing on opening and applying packages of triage tags when people need immediate care.
>
> **Dr. Ed Racht**
> American Medical Response "

Family reunification, especially of children with adult caregivers, is another important factor to consider and should be built into any MCI plans. The call load by family members seeking information on their loved ones can place a severe burden on dispatch and hospital operators if there is no alternative central resource for information that can be publicized.

A specific challenge that should be noted is that providers often do not use standard triage tags and processes regardless of the agreed upon plan or the training they have received. This does not mean that triage is not occurring. It does mean there is a lack of access to triage supplies; a lack of education/exercising; time/priority constraints; or the perception that it does not offer benefit. The transporting provider should be able to provide some information about the patient to receiving hospital personnel regardless of whether tags or tapes were used. Triage tags may give a false sense of security to the receiving hospital if the patient is tagged green or yellow but has deteriorated. This may not be recognized immediately and further patient hand off information may not be provided. EMS agency leadership should understand that use of triage tags and tape during a large incident is an exception rather than a rule in most urban services based on accounts from roundtable participants and other SME reviewers.

In conclusion, there is no clear evidence base that supports the use of triage tags and consensus from the roundtable participants supports the idea of not using tags when it would delay treatment or transport, particularly in dynamic incidents. However, taping systems may offer benefit identifying live (but not alert) and deceased patients prior to their arrival at a collection/transport point. EMS and hospital services should select a triage system that is adaptive, easily recognizable, and standardized within the jurisdiction or response area.

TREATMENT

Because treatment in mass violence events is so closely linked with triage (and successful interventions such as the use of tourniquets may help alter the patient's triage category), the roundtable participants felt that such key considerations should be addressed in the meeting and in this document.

One pre-incident priority would be to provide the public with training on the Stop the Bleed program so community members would know how to perform self/immediate responder (bystander) care. This may be particularly important for those providing public transport via bus, taxi, and app-based ride-hailing services (e.g., Lyft and Uber).

However, access to treatment materials may be a challenge. It has been recommended that all congregate public venues (e.g., arenas, and conference facilities) have at least 20 Stop the Bleed kits available for use (Goolsby, 2019). Co-location with Automated External Defibrillators (AED) is recommended. The number of kits stocked on ambulances and with fire services varies widely. For example, the Las Vegas community is fielding 1,000 kits divided among all responder vehicles. As experienced during the 2017 shooting at the Route 91 Harvest music festival, they found that supplies were needed in multiple locations and often within the first minutes of the incident. While most services carry multiple tourniquets, there is significant variation in numbers. Most roundtable participants agreed that EMS will likely need to provide just-in-time training and provide supplies for hemorrhage control or other interventions to immediate responders (bystanders) in these extreme MCI incidents, although there was no consensus on how much material should be stocked on each ambulance for this purpose. However, there was agreement that this equipment belongs on every ambulance rather than on mass casualty response vehicles, that may be delayed arriving on scene.

Denver Health ambulances carry:

- **At least one personal tourniquet per paramedic or law enforcement officer.**

- **Ballistic vests for each paramedic on each truck.**

- **5 kits with 2 tourniquets, 2 chest seals, and 2 chest decompression needles per pack attached by hook-and-loop to the vest.**

- **Backpack with hook-and-loop pouches for 20 patients and two foldable drag litters.**

   - Dr. Peter Pons, Denver Health

Multiple SMEs emphasized the role of law enforcement in initial triage (alive/dead) for movement and life-saving interventions. In the 2018 school shooting in Parkland, Florida, officers and Special Weapons and Tactics (SWAT) medics applied all the tourniquets (5) and chest seals (7) used in the incident prior to EMS/fire entry, which ultimately saved multiple lives according to the EMS medical director. Law enforcement, in many situations, will perform life-saving interventions and may even move the victims to safety prior to the assembly of any rescue task forces. It has been estimated that rapid movement of patients to safety by law enforcement in the Parkland shooting may have saved 17 additional lives, as EMS was able to rapidly transport those victims for emergency care.

All roundtable participants emphasized the need to adopt and practice "Rescue Task Force" models (as described by the Hartford consensus and other sources) of combined teams consisting of law enforcement and fire/EMS providers to rapidly access and evacuate patients through secured areas once the threat has been neutralized or contained. Based on the incident scope, multiple teams and transport locations may be necessary. The role of EMS in these events will vary by community depending on the resources available to law enforcement and EMS agencies. Training together and providing consistent education between disciplines were also key factors emphasized by many SMEs.

TRANSPORT

Destination hospital choice is a key component of triage. Choice of an appropriate trauma center for a critically injured patient can be lifesaving. In all situations, the focus should be on getting critical trauma patients to trauma centers as quickly as possible. EMS personnel and dispatch may have to make judgment calls based on the size of the incident, bed reports from hospitals, and status reports from other EMS personnel who have already

transported patients to specific facilities. This will help to inform EMS personnel on when and if they will need to start "off-loading" trauma centers by taking less critical trauma patients to non-trauma hospitals.

It is also important to ensure that EMS protocols build in caveats for MCI's. For example, patients with extremity penetrating injury, non-torso shrapnel injury, orthopedic injuries, and amputations may be good candidates for diversion to more distant or non-trauma hospitals even if, based on standard protocols, they would normally go to the closest trauma center.

All community (non-trauma) hospitals should be prepared to receive large numbers of casualties either because of their proximity to the incident or deliberate diversion of less-injured patients from the trauma centers when they are saturated. Trauma centers may have "overload" protocols, which diverts less serious trauma patients to community hospitals when they are taxed. These protocols may greatly facilitate further decision-making processes during a disaster. Jurisdictions may even consider establishing protocols to divert most patients transported via EMS to a facility other than the closest hospital to prevent overload as significant self-transport often overburdens the closest hospital. In smaller communities the options are more limited. EMS and hospitals should plan for their unique resource challenges and processes for managing multiple secondary transfers to other hospitals.

Transport and destination decisions should be as simple as possible, but revolve around the following questions:

- What is the patient's condition?

- What is the treatment capacity of the closest center?

- What transport resources are available?

An understanding of the trauma system and its resources can benefit all stakeholders. This should include an understanding of pediatric trauma resources, as well as educating community partners about when transferring patients to an adult or pediatric center might be most appropriate. For example, a hemodynamically unstable teenager with a gunshot wound to the torso should always go to the closest major trauma center. A child less than 8 years old who is stable is best served at a pediatric trauma center. ***Children and parents should generally be kept together. This may mean that a children's hospital takes care of parents and a non-pediatric center takes care of children. The family member with the most critical injuries should generally guide determination of the destination hospital.***

Roundtable attendees emphasized the point that law enforcement transport of patients was becoming more commonplace. They also noted that law enforcement officials, other public safety and public servants, and the general public at large, should have a better understanding of the trauma centers in their area, as well as the priorities for care so that victims are not transported without addressing correctable life threats.

EMS should have a process through a dispatch center or local/regional coordination center to contact hospitals

> " In Illinois we have the Private Providers Emergency Response System (PPERS) where private EMS, during a disaster and upon request, automatically sends a certain number of ambulances to a staging area where they can be dispatched to hospitals to perform secondary transfers of trauma patients.
>
> **Leslee Stein Spencer**
> National Association of State EMS Officials "

and determine the status and needs of that facility as well as notify the hospitals of the incident and provide important updates. If EMS cannot communicate with the receiving hospital, an EMS/hospital liaison should be at the hospital, in-person, to relay incoming patient information and communicate hospital bed capacity, needs, or other issues. There should also be a process for basic patient tracking (e.g., numbers of patients a hospital has received from EMS) and for redirecting EMS units so that they can transport patients to appropriate facilities if a specific hospital is overwhelmed or experiencing access issues due to traffic or safety.

> **In one Las Vegas hospital, the pediatric ED was used to care for all "green" patients, regardless of age, to decompress the adult ED. Additional orthopedic and surgical staff supported the pediatric providers in this area.**

Roundtable participants and reviewers strongly concurred that "polling" hospitals during an MCI for available bed capacity was ineffective and did not actually represent critical trauma resources. They also noted that hospitals should understand that potentially large volumes of patients might arrive via private transport, which precludes "tailoring" the initial casualty volumes.

The participants also agreed that better metrics/triggers are needed for when a center is at or over capacity. Suggested ideas on such metrics/triggers included the inability to handle additional resuscitations, or delays in taking emergency cases to the OR due to lack of resources. These triggers would prompt hospitals to notify EMS of the need to defer additional critical patients temporarily. This information must be accurate and timely. The EMS/hospital coordination function can be a critical factor in the success of a mass casualty response as it facilitates patient distribution and maximizes use of available resources.

In some situations, the on-scene role for EMS may conclude rapidly due to a majority of victims self-transporting. While not currently written in most disaster plans or exercises, EMS can provide valuable support for hospital triage and transport needs during or after on-scene response and initial transports.

When hospitals are overwhelmed by walk-in casualties, the usual screening mandated by the Emergency Medical Treatment and Labor Act (EMTALA) will need to be modified. Hospitals must have plans in place for triage of large numbers of patients (e.g., during the shooting in Las Vegas, more than 250 patients arrived at Sunrise Hospital in Las Vegas). In mass casualty disaster situations, the Centers for Medicare & Medicaid Services (CMS) supports actions by EMS to assist hospital staff with triaging and transporting appropriate patients to other hospitals with adequate resources in order to conduct a medical screening exam (MSE) and determine the most appropriate definitive care location for patients. More information can be found in the ASPR TRACIE fact sheet EMTALA and Disasters. EMS can be a key force-multiplier for hospitals that are overwhelmed, as they could take responsibility for "parking lot" triage, lifesaving interventions, and/or transport patients with minor injuries to other facilities.

During the 2017 Las Vegas shooting incident, a non-trauma hospital that received 93 patients used EMS, including a multi-patient bus, to move patients to trauma centers and other hospitals. EMS can also assist with redistribution of patients with critical injuries to facilities that offer a higher level of care after initial assessment and stabilization. Finally, EMS may, in some situations, be able to transport patients to non-hospital destinations (e.g., urgent care centers or health centers) to decrease patient loads on the hospital. Alternate transport protocols must be established in advance of a disaster.

These potential contingency measures depend on understanding the needs and capacities at hospitals through communication and coordination mechanisms agreed upon and practiced in advance of an incident. The needs of the hospital must be balanced with the emergency response (i.e., 911 calls) in the community and any ongoing

incident response needs (for example, a patient already in a hospital may be lower priority than a patient with chest pain in the community).

Roundtable participants were supportive of EMS assistance to hospitals. However, they felt that this needed to be carefully planned for, and noted that any regulatory or legal issues of concern must be explored and addressed. In some cases, hospital bylaws may be able to specify the role of EMS during disasters, providing them a recognized role in the response.

A multi-agency coordination mechanism can provide critical situational awareness of emergency healthcare needs across the community, help EMS and hospitals recognize where resources and patient transfers may be required, and balance those needs against the community need for EMS services. The importance of having physicians (or "remote clinical command" as used by one roundtable participant's agency) involved in these prioritization decisions was endorsed by multiple roundtable participants.

> "
> In Northern Virginia, we developed the role of 'regional triage officer' that helped coordinate secondary transfers. Also, we instituted an automatic activation of our mass casualty plan when 10 patients or more go to three or more hospitals. We highlighted the use of telephone and telemedicine support for trauma care and transfer decision-making.
>
> **Dr. Dan Hanfling**
> In-Q-Tel
> "

The roles for EMS in disaster response need to be planned with agency leadership, the State EMS office, and system medical directors. They should also be incorporated into written plans prior to an emergency to ensure that factors such as scope of practice, credentialing, and operational protocols are addressed. Education, training, and exercising these protocols in an integrated fashion must also follow policy development.

TRACIE

CONSIDERATIONS

- Do dispatch center personnel have specific protocols in place to include questions for 911 callers during a mass violence/shooting event? Example questions should include: Were you injured at the location where you are now? Are you safe where you currently are located?

- Does the EMS MCI plan clearly state that in dynamic events, rapid victim access, extraction, and transport are prioritized instead of a systematic assessment of all victims?

- Have the specific needs and uses for triage tags or tapes been incorporated into response plans? Is there an option for alternate, simpler processes?

- How do hospitals and EMS coordinate patient distribution and communication about incident needs and available capacity?

- Is there a patient tracking system in place for both hospitals and EMS?

- Do emergency plans include a mechanism to recognize overwhelmed hospitals and provide EMS support for those hospitals when the situation allows (e.g., secondary transfers and assistance with "parking lot" triage at overwhelmed hospitals)?

- Does EMS have policies or procedures in place that accommodate the use of immediate responders (bystanders) at an MCI?

- Does every responding unit carry a sufficient supply of hemorrhage control and other patient care materials (including packaged Stop the Bleed supplies, which contain tourniquets, chest seals, etc.) to treat multiple patients? Will responders have adequate supplies to provide to immediate responders (bystanders), law enforcement, and others who are attempting hemorrhage control? Do these supplies address the pediatric population?

- Are law enforcement, EMS, and fire department roles integrated into MCI plans both as rescue task force members as well as their potential roles in triage and transport?

- Do all public safety and EMS providers understand the trauma system and resources? Are they prepared and empowered to adjust trauma center criteria when trauma centers are overwhelmed?

- Is there a good understanding of the specialty (e.g., burn, pediatric) resources and capabilities in the area by EMS?

- Have alternate sources of patient transportation been considered (both to the hospital and between hospitals)?

HOSPITAL AND EMERGENCY DEPARTMENT TRIAGE CRITERIA

In the ED, the five-level Emergency Severity Index (ESI) is the most commonly used method for routine triage. This triage method is based both on acuity and resource needs, and could theoretically be used in MCI situations to prioritize patients for placement in the department. However, the ESI does not distinguish well between patients in the highest acuity group, which may limit its applicability with large numbers of patients. Interestingly, in a study published by Iversen et al., the ESI was shown to be inferior to an informal assessment by a triage nurse, and a standardized ESI assessment performed by a nurse was inferior to an "eyeball" assessment of acuity by a phlebotomist (Iversen et al., 2018). Much remains unknown about the sensitivity and specificity of triage methods.

Some EDs use and train their personnel on the same triage system used by EMS in their jurisdiction. This can provide continuity and improve the interface between providers as well as offer structure when primary triage occurs at the hospital. However, START and SALT are simple models that limit provider incorporation of other prognostic variables. The training level and experience of ED providers should allow them to consider other signs of shock, general appearance, abdominal or chest exam findings, and other assessments that can take seconds, but result in significant changes in triage category.

> **Emergency Severity Index**
>
> The Emergency Severity Index (ESI) is a five-level emergency department (ED) triage algorithm that provides clinically relevant stratification of patients into five groups from 1 (most urgent) to 5 (least urgent) on the basis of acuity and resource needs.
>
> **Agency for Healthcare Research and Quality**

HOSPITAL PRIMARY TRIAGE

It is common for experienced hospital providers to feel they are best suited to treatment roles and therefore, they may appoint newer or less trained personnel to the role of triage officer. However, the research and review of recent incidents indicate that experienced providers should perform triage, and hospitals should develop MCI plans that assign other appropriate personnel to triage and treatment roles while appropriately training them on those roles. Triage providers must understand that their role is to rapidly assess and determine placement, *not* to make a thorough assessment or start treatment. Providers with military or other field experience may be optimally suited to triage roles.

Although not intended as a triage tool, the "Airway, Breathing, Circulation (including signs of shock), Disability (altered mental status), and Exposure (looking for penetrating trauma) (ABCDE)," or alternate CAB[6], developed by Advanced Trauma Life Support is designed to identify immediate life threats and may be the most familiar (and therefore useable) assessment framework for hospital providers in particular. With minimal additional education, ABCDE can be used for daily routine and disaster patient assessment. This approach is much more likely to be recalled by providers under significant cognitive loads during an incident. The use of an ABCDE framework allows

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[6]*Note that some providers now prefer 'CAB' versus "ABCDE" to control life-threatening external hemorrhage before airway control.*

additional variables to be included, based on provider training and available diagnostics. Patients with signs or symptoms identified in the ABCDE primary survey are categorized "red" for immediate interventions, the walking wounded are categorized "green," and others "yellow," with an emphasis on rapid additional diagnostics and evaluation for the "yellow" patients since that group has a broad spectrum of injury severity. However, ABCDE is geared towards individual patient assessment and has never been tested in a disaster setting.

The arrival of an influx of patients may be the initial notification a hospital receives that an MCI has occurred. Hospitals must be prepared to perform primary triage, including reassessment of patients transported by EMS. In this document, all initial triage at the hospital is referred to as primary triage, regardless of what triage and interventions were performed on patients arriving by EMS.

> **ED personnel should be aware of the triage criteria used in the community, but use of a pre-hospital triage system at the hospital is unlikely to be beneficial. Experienced nurses and physicians should perform triage at the hospital. Providers with military or field experience are optimally suited for these roles.**

The number of patients requiring primary triage will vary, but can be expected to increase when:

- The facility is within walking distance of the MCI (e.g., St. Vincent's Hospital in New York City on 9/11).

- Scene safety issues encourage self-referral (e.g., Las Vegas Route 91 festival shooting).

- EMS transportation resources are limited and/or law enforcement transports victims (e.g., Las Vegas, Pulse nightclub in Orlando, FL, and Aurora, CO mass shootings, and the Philadelphia Amtrak derailment).

- EMS resources are unable to rapidly access or leave the scene as a result of road closures/congestion.

The hospital's ICS and command center should be activated as early as possible in the MCI and should:

- Activate callbacks and notification procedures for key personnel.

- Establish communications with EMS and other external partners (e.g., community EOC).

- Support the ED and all involved areas and departments with needed supplies and staff.

- Act proactively to help open inpatient beds, provide staff, and obtain resources as needed.

- Ensure that incident patients are registered and tracked, and that the Medical Care Branch of the ICS is coordinating the reassessment of admitted patients.

- Ensure the hospital secures its campus, staff, and patients.

- Support coordination and communication efforts, including the activation of any staff or supply sharing between facilities.

Hospitals must implement access controls for the entire facility and direct victims to the ED or designated entrances. Each patient entry point should have a triage provider assigned.

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Mass Casualty Trauma Triage - Paradigms and Pitfalls

Mass casualty surge plans should be immediately implemented in order to: open beds in the ED for "red" or "yellow" patients by moving existing patients rapidly to inpatient units, chairs, or to the waiting room as appropriate; obtain available crash or disaster carts, stretchers, and wheelchairs; and open additional patient care areas (particularly to provide overflow for "green" or ambulatory casualty care and inpatient units, like intensive care and post-anesthesia care). These plans are beyond the scope of this paper; however, the ASPR TRACIE Hospital Surge Capacity and Immediate Bed Availability Topic Collection provides additional information and resources.

A rapid patient identifier and tagging system should be used. Electronic health records (EHR) should not be relied upon to be functional as the sole identification and tracking system in the early phase of an MCI. Many incidents have demonstrated that EHRs may not accurately reflect the names and location of casualties until several hours into the incident. However, the sooner the patient data can be entered into the EHR in the response, the better as, it will allow for appropriate tracking and reporting of test results and orders for radiology, laboratory, and other patient documentation purposes. It is important to note that every effort should be made to utilize the EHR as soon as possible in MCI conditions, even if initial patient documentation is conducted at the patient's bedside on paper charts or using EHR "downtime" procedures.

> **Electronic health record (EHR) systems have limitations in the early phase of an MCI; too many victims can arrive too fast to get registered, and the EHR may not be accurate until several hours into the event.**

Related ASPR TRACIE resources:

- **Family Reunification and Support Topic Collection**
- **Tips for Healthcare Facilities: Assisting Families and Loved Ones after a Mass Casualty Incident**
- **No-Notice Incidents: Family Assistance**

Within several minutes, an influx of unidentified patients can arrive at the hospital for care. The hospital's system should be capable of registering large numbers of patients without identification, using protocols that do not cause overlap, cause confusion, or lead to multiple patients being assigned the same temporary name or number or create conflict. Depending on the size and role of the hospital, a reasonable goal might be to establish a system that can rapidly register 200 unidentified patients at a rate of several patients arriving per minute for a single incident depending on the size and role of the hospital. Following daily processes for unidentified patients is always preferable to having a separate process for MCIs.

Once a patient is brought to the hospital for admission, EMS triage tags are often poorly suited for hospital use. EMS tags can provide continuity for tracking, but can also create problems when a patient's condition/triage category changes. It is advisable for hospitals to use a dedicated hospital tag in which both primary and secondary triage can be documented, as well as the patient's condition/destination in the facility, and space to note injuries, vital signs, and administered medications. Using the hospital tags during EHR downtime may offer additional opportunities for staff use and familiarity.

Surgical and emergency medical providers should designate a leader for the critical care area to track and prioritize the patients and their interventions, and to prioritize patients for the OR or additional diagnostics. Life-saving interventions such as intubation, chest thoracostomy, and hemorrhage control should be performed and additional information rapidly obtained that can assist with secondary triage (e.g., vital signs and bedside ultrasound).

Mass Casualty Trauma Triage - Paradigms and Pitfalls

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Adequate supplies must be available in the ED to support the needs of mass violence patients (e.g., tourniquets, chest tubes/thoracostomy supplies, intubation supplies, and intubation medications,) including appropriate supplies for pediatric patients.

CONSIDERATIONS

- Does the hospital have a process to perform initial (primary) triage, direct patients, and rapidly apply temporary tracking mechanisms (e.g., band or tag), including those for unidentified patients?

- Is there a plan for how/where to place patients in the ED or other designated areas by acuity (and account for how pediatric patients are handled)?

- Does the hospital have adequate supplies for life-saving initial and ongoing interventions for very large numbers of critical patients?

- Does the hospital have a plan for patient tracking and reunification including unaccompanied children (and arrangements for Pediatric Safe Areas), use of Family Support Centers at the hospital, and a private location to notify families when their loved ones are deceased?

- Have these plans been exercised/drilled sufficiently?

HOSPITAL SECONDARY TRIAGE

Secondary triage prioritizes the patient for further diagnostics, operative intervention, or care location (e.g., floor vs. ICU). Secondary triage occurs *after* initial stabilizing interventions and further assessment (sometimes including basic diagnostic results such as ultrasound) are obtained. If the hospital does not provide surgical services, secondary triage establishes priority for transfer to a trauma center. The discussion that follows is based upon the assumption that the hospital provides some trauma surgery services. It is likely the criteria discussed below for operative intervention could be adapted to sort patients for transport to a higher level of care, although the ability of the patient to survive the transfer should be considered.

Most hospitals rely on a surgeon or emergency physician to oversee secondary triage and direct patients to the correct next location of care. This secondary triage provider role is important for overall situational awareness to include, the types of patients and their conditions, patient needs, and the associated demands on resources. However, it can be challenging to coordinate triage decisions between the resuscitation room, CT scanner(s), and pre-operative areas, particularly in a major trauma center, due to the distance and lack of easy communication between those disparate areas. A plan for secondary triage coordination is important.

Some facilities have a triage point in pre-induction for all patients being referred to the OR.

> **Surgical priority is given to patients who are at high risk of death and can rapidly be saved with surgical intervention. General priorities should be agreed upon before MCIs occur.**

Patients arriving in the pre-operative area may have limited information with them, such as existing medical conditions or current medications, making it difficult to determine which cases require immediate care and those that can be delayed, especially when there is no tag or other visual indicating their status. Hospital staff should decide if a designated area on the triage tag, disaster encounter note to indicate a secondary destination location (e.g., inpatient units, CT, OR-immediate, OR-delayed), or a tape/other visual system is appropriate and should be used to flag immediate OR priority patients. This step could be as simple as indicating the OR priority in writing on tape placed on the patient's forehead or chest. Alternatively, immediate OR patients may be sent to one pre-induction/pre-operative area and delayed OR patients to another. Finally, in some hospitals there may not be adequate surgical staff available to fulfill the secondary triage role in which case another provider with understanding of operative priority should be designated. There may be competing demands from trauma, neurologic, thoracic, and orthopedic surgery to take cases to the OR. Interventional radiology services may also require prioritization depending on case load. A prioritization system and a single provider who determines operative triage is preferred, but this takes advance planning and agreement between the surgical specialties. These triage efforts should be organized under the hospital's ICS Surgical Services Unit Leader (Medical Care Branch).

Surgical decision-making and secondary triage is based on the TTT considerations previously outlined in this document. In general, surgical priority is given to patients at high risk of death who can rapidly be saved with surgical intervention. The classic example is a damage control laparotomy on a patient in shock from an isolated penetrating abdominal wound. Figure 4 was modified from a published figure (Hick, 2012) by multiple trauma surgeons in the Minneapolis/St. Paul area and was reviewed for this paper by SMEs, including roundtable participants. It provides a possible framework for prioritization of surgical patients during an MCI that may be helpful to facilitate discussion and planning at the hospital level.

General strategies MAY reflect (but should be based on the resources and preferences of the facility):

- **Priority 1**
  - » Hemodynamically unstable, salvageable patient with isolated abdominal or junctional (axillary or femoral) hemorrhage source.

- **Priority 2**
  - » Hemodynamically stable abdominal injury with positive abdominal ultrasound or CT requiring exploration.
  - » Critical chest injuries not responding to chest tube placement.
  - » Salvageable limb with neurovascular compromise.
  - » Salvageable neurotrauma with worsening exam.

- **Priority 3**
  - » Time-critical but less salvageable conditions (penetrating neurotrauma; combined injuries; complex anatomy; pelvic; etc.).

- **Priority 4**
  - » General orthopedic (open reduction and internal fixation, washouts, etc.).
  - » Temporized hemorrhage/complex wound exploration without distal neurovascular compromise.
  - » Other less time-sensitive conditions.

Figure 4. Example Strategies for Prioritization of Surgical Cases During a Mass Casualty Incident

Surgical priority should be agreed upon prior to MCIs, and the categories and system must be understood by emergency medicine, anesthesia, and all surgery personnel. The secondary triage provider in the emergent care area should make initial decisions with reassessment by surgeons in the OR or those interpreting CT scans (Korner et al., 2009). The decision to take a patient to the OR should be made with awareness of available surgical resources, ideally by an experienced trauma surgeon unless all surgeons are occupied with life-saving surgeries.

Until adequate resources are available, CT scans should be reserved for cases in which an immediate decision is needed (e.g., a head CT for prognosis; or an abdominal/pelvic CT to determine whether operative, interventional radiology, or no intervention is needed for stable blunt trauma with hemoperitoneum or a pelvic fracture). Ideally, hospitals should encourage one-way patient flow out of the ED. That is, when a patient leaves the ED for a CT or other tests, they do not come back. For example, after testing is conducting at the radiology department, patients are sent to inpatient units, the OR, or other appropriate areas until it is clear that no additional ED space is needed.

Resource prioritization is generally based on TTT principles in conjunction with patient prognosis. It is possible that several patients with equivalent prognoses and similar TTT needs may arrive simultaneously or in close time proximity. In that case, it is appropriate to take a first come, first served approach, understanding that priorities may change as additional patients arrive that may have greater need for (or benefit from) the available resources. Good communication with the ORs is critical so that the surgeons can adjust their procedures according to the demand (e.g., damage control procedures when other patients are waiting or likely to arrive).

In some cases, during the hospital primary or secondary triage process, it may be clear that the patient is either expectant or that the prognosis is so poor that resources cannot be expended on the patient due to competing demands. These patients must continue to receive palliative care as well as any additional supportive care that can be provided (e.g., if a patient with head injury cannot go to the OR immediately and has a poor prognosis, the individual should still receive airway interventions, seizure prophylaxis, and hypertonic fluids as indicated, if possible). These patients must be reassessed as resources become available. Anecdotal experiences during several recent incidents describe patients initially labeled expectant that were subsequently re-triaged and survived with good outcomes. Secondary triage may also reveal the patient to be more or less injured than originally suspected and the patient should be reprioritized accordingly.

CONSIDERATIONS

- Who is the designated leader in the emergent care area that is responsible for secondary triage?

- What types of trauma surgery will be performed? What process and priorities for secondary triage to the operating room are in place?

- Does the system emphasize "one-way" patient flow whenever possible so that patients do not return to the ED from CT or other locations?

- How does the hospital obtain support to either bring in more resources or move patients to other facilities?

- Do providers understand that available care, including at minimum palliative care, should be provided to those categorized as "expectant" and that these patients must be reassessed as more resources become available, as some may potentially have a good outcome?

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HOSPITAL TERTIARY TRIAGE

As the response to the incident continues, additional resources often become available, which may change the clinical decisions. Tertiary triage is performed during ongoing definitive care and involves reassessing the patient's condition to determine if a change in care is warranted based on:

- The patient's response to treatment/how the individual is doing clinically over time.

- The status of resources at the hospital.

The hospital command center should move as rapidly as possible from *reacting* to the incident demands to *proactively* addressing operational needs. This includes conducting ongoing communications, obtaining situational information, and planning for continuing or anticipated resource or other needs. This should also include implementing a plan to conserve, substitute, adapt, reuse, or reallocate resources in shortage in conjunction with HCCs and partners. This can reduce the need for restrictions on care and involve the command center in triage issues and decision-making.

In the early stages of an MCI, the scope of the situation will be unclear, and resources will be limited. As the impact becomes more obvious and more resources arrive, additional diagnostics and interventions are often possible, and some expectant casualties might be able to receive aggressive treatment. On the other hand, the resource situation may not have improved and if the patient's condition is deteriorating or their resource consumption is not sustainable, restrictions on care may be required. This restriction may apply to a single resource or involve a global determination that withdrawal of care is warranted based on prognosis.

For example, if a surgeon is in the OR with a patient who remains in shock, restrictions on care might be needed if:

- The blood bank was unable to keep up with plasma needed to maintain usual packed cell to plasma ratios, and the surgeon decided to change the ratio to 1:4 instead of 1:2.

- No blood resupply was possible in the near future, and the patient was requiring so much blood that it was consuming resources needed for other more salvageable patients, so the surgeon decided to stop or limit blood given (while continuing other interventions).

- The surgeon found complex vascular or other injuries in the OR that made survival so unlikely that it was decided to stop the procedure and move to the next emergency case.

Whenever possible, consultation with another provider of similar training and involvement of the hospital command center should be sought prior to implementing restrictions on care due to resource constraints. These discussions and decisions must be reflected in the medical record. Tertiary triage decisions in trauma are rarely practiced or performed outside the battlefield environment and are therefore not as familiar or comfortable for the involved providers, but may become necessary in certain situations. Providers with prior military experience may be valuable resources when making these decisions.

Ongoing proactive triage decisions such as those made about continuing ventilator support, triage of mass burn victims, or other more systematic applications of crisis standards of care in disasters are beyond the scope of this document. However, a process should be in place for these situations[7]. The overarching goal in the community

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[7]*For further information on crisis care triage decision-making see the Institute of Medicine/National Academies of Medicine 2012 Crisis Standards of Care report – hospital section. For information on clinical decision-making see the Minnesota Department of Health Patient Care Strategies for Scarce Resource Situations.*

should be to load-balance between hospitals to lessen demand on resources and to provide as much consistency and transparency to the decision-making processes as possible across the community and region. In many cases, resources will be available at other facilities that can accept transfers and therefore reduce the burden on the initial receiving facility.

CONSIDERATIONS

- Does the hospital's plan ensure that every patient is reassessed regularly after an MCI? Whose responsibility is it to coordinate this effort?

- Do the providers (especially surgical and critical care) understand the considerations that go into tertiary triage, and that sometimes this results in more aggressive interventions (as resources become available) or less aggressive care (as when a patient improves or the patient's prognosis is significantly worse based on new information or requires unsustainable resource commitments)?

- How does the hospital command center obtain information or assistance from other hospitals in the area to prevent unnecessary restrictions on care by bringing in resources or transferring patients to other facilities for care?

- Do providers understand that tertiary triage decisions to restrict care should be made in consultation with another provider of equal training (whenever possible), and discussion and decision-making should be conveyed to the hospital command center and clearly documented in the patient's medical record?

CONCLUSION

MCIs from violent attacks, that generate an overwhelming number of victims, are unfortunately becoming more common. These incidents highlight the need for a renewed focus on community, agency, and facility processes to determine if plans optimize provider safety and patient care. Disaster situations are dynamic, and one triage process will not work in all situations.

EMS providers should be trained and encouraged to apply principles, both standard and other times nonconventional processes, to the situation they are facing. Information gathering and cooperative decision-making with law enforcement and other partners should be emphasized, along with patient access and rapid transport whenever possible, assuring that the critically injured are taken to the closest trauma center with available resources. Re-triage is important across the spectrum of care as patients may do worse or better than assumed and the resource situation will fluctuate over time.

> " Now that we are aware of these issues, we have a conscious obligation to address them in our agencies to ensure that we are doing the best we can for our providers and our patients.
>
> **Ray Swienton**
> University of Texas
> Southwestern Medical Center "

Hospitals have often assumed that patients from disasters will be evaluated and triaged by EMS. This is not the case, and hospitals need to be prepared for hundreds of victims, many self-transported or unidentified, and a large percentage with critical injuries. Primary, secondary, and tertiary triage should be understood and practiced in hospitals. Systems and tools (e.g., tags, OR whiteboard) for these assessments and decisions must be familiar to all involved staff.

The ASPR TRACIE team and SMEs involved in the roundtable and our review process hope that this document will promote engagement, dialogue, and changes in practice in EMS agencies and hospitals. This document can also foster additional activities, research, and policy to improve our understanding of what works and what does not during disaster patient care. It can also sharpen our focus on the fact that the two priorities during disaster patient care are the same as our daily priorities: keep our providers as safe as possible, and get critical trauma patients to appropriate trauma centers as rapidly as possible.

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APPENDIX A: SPECIAL CONSIDERATIONS

Although this document concentrates on the triage of trauma patients, with special considerations for those resulting from mass violence incidents, other types of mass casualty incidents (MCIs) require triage. This appendix includes "capsule summaries" of considerations for other types of incidents.

Biologic/Epidemic/Pandemic

Biological terrorist incidents, such as the widespread dissemination of anthrax could place crippling burdens on the healthcare system. EMS can apply triage criteria with the understanding that altered mental status, respiratory distress, and signs of shock are all relevant to their transport and destination priority. In the hospital, diagnostic criteria (both clinical and laboratory) should be circulated as well as thresholds for specific treatments based on the resources available (e.g., which patients get antitoxin, and how many and which antibiotics are administered). The CDC's Clinical Framework and Medical Countermeasure Use During an Anthrax Mass-Casualty Incident includes information on allocation of resources in mass anthrax incidents. Pediatric-specific information is also available[8].

"White powder" incidents and certain other biologics (such as ricin) may require decontamination and consultation with poison control/public health officials. Many biological incidents, including pandemics, evolve on a timeframe that allows for proactive, system/coalition-wide crisis standards of care frameworks to be implemented for allocation and restriction of resources. HCCs, EMS providers, and healthcare facilities should have plans to recognize, coordinate, and provide as consistent a level of care across the community as is possible during these incidents by balancing patient loads and resources. Close coordination with both state and local public health and emergency management is required to ensure appropriate specialized resources (e.g., ventilators, vaccines, antibiotics, antitoxins, personal protective equipment [PPE]) are requested in a timely manner and distributed appropriately. For more information, download ASPR TRACIE's Bioterrorism and High Consequence Biological Threats and Epidemic/Pandemic Influenza Topic Collections.

Tiered, regional approaches to infectious disease emergencies support EMS use of case definitions and other criteria, which allows for the triaging of suspected viral hemorrhagic fever and other special pathogen cases to specific assessment or regional treatment centers.

Chemical Injuries

EMS mass casualty triage systems are generally based on traumatic injuries and outcomes, although SALT does incorporate auto-injector treatment. While there are no pre-hospital triage systems specific to chemical events, respiratory distress and altered mental status are expected symptoms and are included variables in SALT. Degree of salivation/secretions or seizures in cholinergic/nerve agent poisoning could also be considered when making triage decisions. Large-scale exposures from toxic industrial chemicals and transportation accidents can generate hundreds of patients with severe respiratory and other symptoms. Many patients may require airway management as seen in large chlorine spills. Airway swelling can progress rapidly and may be delayed by hours with some chemicals. Chemical burns can be severe and, in some cases, small burns can be lethal (e.g., hydrofluoric acid). Children may have more severe effects as they are closer to the ground.

Contaminated patients can present additional challenges for both EMS and hospital providers. All EMS agencies should understand their role in a contaminated casualty situation and be familiar with the PPE required for their mission as well as the available community and regional resources (e.g., Chempack, other countermeasures, and decontamination assets). EMS personnel should also have enough training in hazardous materials (HAZMAT) response to understand basic principles

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such as off-gassing. Pre-designated SME contacts (e.g., HAZMAT team members or poison control centers) can also provide assistance in near real-time. Moving patients out of the contaminated area and simply removing patients' clothing is a recommended initial intervention and can reduce contaminant by over 90% depending on the clothing worn (access Primary Response Incident Scene Management [PRISM] Guidance for Chemical Incidents). EMS may triage contaminated patients to specific hospitals depending on the local capabilities.

The following are key points specific to chemical incidents:

- EMS providers must understand their roles at a HAZMAT scene and know where they can safely operate with the PPE available to them.

- The agent will not be immediately known in most mass casualty chemical scenes; providers should be familiar with basic toxidromes.

- Providers are seldom significantly poisoned by chemical contaminants on patients, but the potential is significant for many toxic agents. Several published cases describe provider intoxication after patient exposure with organophosphate compounds, which can include symptoms such as cholinergic syndrome with miosis, hypersecretory state, respiratory difficulty, altered mental status, and seizures (e.g., Byers, 2014 and Okumura, 2008).

- Triage specific to decontamination may be required. Non-ambulatory patients should receive decontamination priority over the walking wounded.

- Though performing decontamination prior to treatment is ideal, treatment may have to be started prior to decontamination. This may include injection of countermeasures (e.g., atropine) or airway management. Providers should be able to perform these in PPE when necessary and practical; however, doing so greatly increases the degree of difficulty and the risk of the procedures. Though easier to place while in PPE, supraglottic airways may be less effective than endotracheal intubation due to high airway pressures and high risk of vomiting.

- "Dry" decontamination involving simple clothing control and redress garments/coverings/coveralls may be the most efficient and effective means of providing mass decontamination to ambulatory casualties. Contaminated clothing and porous items (e.g., leather) should be sealed in plastic bags. Jewelry, credit cards, etc. that are non-porous may be washed with soap and water and kept with/returned to the patient. All contaminated items should be handled by trained HAZMAT personnel.

- Hospitals must be prepared to provide decontamination to those self-referring for care, recognized in transport as contaminated, or incompletely decontaminated on scene.

- Pediatric patients require special assistance during the decontamination process.

Access ASPR TRACIE's Topic Collections on Chemical Hazards, Pre-Hospital Patient Decontamination, and Hospital Patient Decontamination for more information.

Burn Injuries

Communities across the U.S., regardless of size or location, are at risk for a mass burn event (e.g., the Lac-Mégantic train derailment in Quebec and the Station nightclub fire in Warwick, RI). Mass burn injuries present great challenges to providers. The patient's suffering and the graphic nature of these injuries can result in over-triage. Taylor and others have developed a table that can assist with triage of burn patients by estimating survival based on age and percent of body surface area burned (Taylor, 2014, and Minnesota Department of Health cardset). However, these tables should be used by those experienced in burn care as burn extent is often overestimated by providers with less experience or

underestimated when performed too early in the patient's course. When in doubt, aggressive resuscitation should continue until a burn surgeon can evaluate the patient. Early shock or concomitant traumatic injuries are poor prognostic signs. Early airway management for large numbers of burn patients can be logistically challenging, but contributes substantially to survival (Dacey, 2003). The intravenous fluid and analgesia demands of large numbers of burn patients can present substantial planning challenges. Access ASPR TRACIE's 2016 Mass Burn Event Overview and Burns Topic Collection for related information.

Blast Injuries

EMS agencies responding to blast scenes should immediately consider the potential for secondary devices and take appropriate precautions. One of the challenges that can complicate assessment of mental status and cooperation with care is that many people in close proximity to the blast may have eardrum damage and not be able to hear. In general, the more limbs and body areas involved in blast trauma, the worse the prognosis. Altered mental status after blast injury is a poor prognostic sign, and a Glasgow Coma Scale (GCS) score of 3 after blast trauma predicts a near-universal fatal outcome. Penetrating wounds from shrapnel can be subtle. Extremity wounds can be graphic and life-threatening, but rapid availability and application of tourniquets can stabilize critical patients. Healthcare providers should not let extremity wounds distract from the primary survey and examination for truncal injuries. All persons in the blast area are at risk for concussion regardless of initial symptoms and should be encouraged to seek evaluation even if they decline initial care.

Every blast scene should also be checked for the presence of radiation as a protocol once immediate life safety issues have been addressed. The ASPR TRACIE Topic Collections Explosives and Mass Shooting and On-Scene Mass Casualty Trauma Care and Triage contain links to related information.

Radiation Injuries

In radiation incidents, treatment of traumatic injuries and life threats takes precedence over decontamination activities. Decontamination and screening algorithms are available from Radiation Emergency Assistance Center/Training Site (REAC/TS) and Radiation Emergency Medical Management (REMM). These tools should be included in job aids, as many providers are likely to prioritize decontamination over immediate patient care. Such job aids should include a reminder of the low risk of significant provider exposure during a radiological incident.

Acute radiation illness is not expected with most radiation incidents (e.g., dirty bombs, power plant incidents), therefore aggressive management of traumatic injuries should be the focus. However, on-scene providers may be at risk depending on the amount and type of isotope involved. The role of EMS at these scenes and the dosimetry and PPE available should be known and practiced. Guidance exists for assessment and management of patients with radiation exposure (REMM) whether from external or internal contamination or via irradiation (i.e., gamma waves passing through and leaving no contaminant). Combined injuries involving significant trauma or burns and radiation exposure have a higher mortality than either injury alone.

Vomiting should not be used as a triage criterion in the hours immediately following a radiation incident. There are many causes of vomiting including anxiety or trauma. Timing the onset of exposure to radiation, the dose, and other factors can make it very difficult to use the onset of vomiting prognostically. Health physicists and hematologists should be consulted and an absolute lymphocyte count (ALC) done as soon as resources permit to more accurately assess bone marrow damage. As other causes of vomiting are ruled out and information is obtained about the location of the patient relative to the radiation source, additional and evolving symptoms, and results of laboratory testing, a better evaluation of the radiation effects is possible (REMM and Exposure and Symptom Triage [EAST]). The ASPR TRACIE Radiological and Nuclear Topic Collection includes links to helpful resources.

T R A C I E

Pediatric Issues

Children are different from adults, and they require different triage approaches. Over-triage of children can easily occur due to patient (e.g., excessive crying, tachycardia due to anxiety) and provider (e.g., care instinct) factors. There is also a potential for under-triage as children compensate for shock better than adults until the point of cardiovascular collapse (e.g., tachycardia may be the only indication of significant shock and by the time hypotension occurs, death may follow rapidly). Upon arrival to the ED, it is critical that children receive the same interventions (e.g., IV access, diagnostics) as all trauma patients when indicated. It is probable that during MCIs a decision of omission (e.g., not to place a second IV in a child or to observe rather than perform a CT scan) may be made that can have significant consequences, especially with pediatric propensity for compensation until the late phases of hemorrhagic shock. With the competing priorities of the MCI, serial triage and assessments may be less predictable and subtle signs of deterioration missed until complications occur. In some cases, the best intentions to perform serial exams instead of imaging may not be achievable, and more liberal imaging and interventions may be warranted.

In an MCI involving a large number of young patients and when a pediatric trauma center has bed availability, it should receive the most critically injured patients with a particular emphasis on referring children younger than eight years of age, as this is the age range that benefits most from pediatric specialist care. However, EMS providers should balance the advantages of a pediatric trauma center with other considerations such as, transport time, age/size of the patient, injury severity, and the needs of accompanying family members.

Triage tags can be particularly useful for pediatric patients as a means of tracking and accountability since more of them may be non-verbal and/or unable to provide demographic information. A pediatric safe area should be designated for unaccompanied minors who have no medical needs identified during primary triage and any additional evaluation has been conducted. The pediatric safe area will serve as a place where the child's non-medical needs can be met while awaiting parent/caregiver reunification. A patient tracking system should be used in the community that allows hospitals to pool their patient information and allow queries (via phone, internet, and/or in person at a Family Assistance Center) to find loved ones. A process for unidentified patients should be in place (including children too young to give their names) and a mechanism/threshold for demonstrating that the child indeed belongs to a parent/caregiver prior to release to them.

Pediatric departments and pediatric care providers at all levels should anticipate that they may be needed to respond to care for adult patients in response to an overwhelming mass casualty disaster resulting in only adult patients.

The ASPR TRACIE Pediatric Topic Collection includes additional resources.

Legal Issues

Providers may express concerns about triage from a liability standpoint. EMS medical directors can play a key role in approving disaster practices for their agency that can be invoked when required. Legal protections during disasters vary by state and providers should be aware of their state-specific obligations and protections. Federally deployed providers (e.g., Disaster Medical Assistance Team members) have broad liability protections. Most volunteer providers (including "Good Samaritans") and most providers acting on behalf of a jurisdiction or state have significant protections during a disaster. Protection for medical providers in the hospital environment is variable. However, a common underlying principle in all medical liability cases is the "reasonable provider" standard, which holds that the choices made by the provider should be consistent with those another reasonable provider would make in the same circumstances. These circumstances shift under crisis standards of care situations. In all cases, having basic plans in place, making decisions with other providers, and having the incident commander informed of the situation provide additional protection compared to ad hoc individual provider decisions. Access the ASPR TRACIE Healthcare-Related Disaster Legal/Regulatory/Federal Policy and Volunteer Management Topic Collections for more information.

- Are the providers appropriately trained, and do they have appropriate PPE to assess and give initial treatment to contaminated casualties?

- Are providers prepared to coordinate sub-specialty or incident-specific prognostic information with consultants (including those at outside specialty centers, such as pediatric or burn centers)?

- Is there a community plan for specialty MCI response including those with large numbers of pediatric patients?

- Are the state and local legal and regulatory protections that may be invoked during disasters clearly defined? Is there a need for further documentation, education, or planning? Is there a need to advocate for changes to local ordinances or state law?

APPENDIX B: SUMMARY LIST OF CONSIDERATIONS FROM THE WHITE PAPER

This appendix contains the considerations listed in the body of the white paper for each section.

Overview of Triage and Scarce Resources

- Do EMS, nursing, and clinicians involved in trauma and critical care understand the types of triage as well as the variables (e.g., TTT) that should be considered?

- As the number of patients becomes overwhelming, should providers shift their focus to prioritize assessment of victims with *potential* life threats rather than focusing on definitive care for the most critically injured?

Pre-Hospital Triage

- Are providers aware of how clinical experience can affect the performance of triage?

- Does the MCI plan clearly identify the roles and responsibilities?

- Do providers understand the risks of over- and under-triage, and situations where this may be more likely to occur?

- Does the current triage system used emphasize assessment for: sources of uncontrolled hemorrhage (external and suspected internal), compromised airway/breathing, signs of shock (prior to decompensation), altered mental status, and a search for truncal penetrating injury?

- Is the current triage system adequate and working? Does it require modifications or re-training?

- Does the current triage system account for presentation differences among special populations, such as children and those with pre-existing communication challenges?

EMS Mass Casualty Practices

- Do dispatch center personnel have specific protocols in place to include questions for 911 callers during a mass violence/shooting event? Example questions should include: Were you injured at the location where you are now? Are you safe where you currently are located?

- Does the EMS MCI plan clearly state that in dynamic events, rapid victim access, extraction, and transport are prioritized instead of a systematic assessment of all victims?

- Have the specific needs and uses for triage tags or tapes been incorporated into response plans? Is there an option for alternate, simpler processes?

- How do hospitals and EMS coordinate patient distribution and communication about incident needs and available capacity?

- Is there a patient tracking system in place for both hospitals and EMS?

- Do emergency plans include a mechanism to recognize overwhelmed hospitals and provide EMS support for those hospitals when the situation allows (e.g., secondary transfers and assistance with "parking lot" triage at overwhelmed hospitals)?

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- Does EMS have policies or procedures in place that accommodate the use of immediate responders (bystanders) at an MCI?

- Does every responding unit carry a sufficient supply of hemorrhage control and other patient care materials (including packaged Stop the Bleed supplies, which contain tourniquets, chest seals, etc.) to treat multiple patients? Will responders have adequate supplies to provide to immediate responders (bystanders), law enforcement, and others who are attempting hemorrhage control? Do these supplies address the pediatric population?

- Are law enforcement, EMS, and fire department roles integrated into MCI plans both as rescue task force members as well as their potential roles in triage and transport?

- Do all public safety and EMS providers understand the trauma system and resources? Are they prepared and empowered to adjust trauma center criteria when trauma centers are overwhelmed?

- Is there a good understanding of the specialty (e.g., burn, pediatric) resources and capabilities in the area by EMS?

- Have alternate sources of patient transportation been considered (both to the hospital and between hospitals)?

Hospital Primary Triage

- Does the hospital have a process to perform initial (primary) triage, direct patients, and rapidly apply temporary tracking mechanisms (e.g., band or tag), including those for unidentified patients?

- Is there a plan for how/where to place patients in the ED or other designated areas by acuity (and account for how pediatric patients are handled)?

- Does the hospital have adequate supplies for life-saving initial and ongoing interventions for very large numbers of critical patients?

- Does the hospital have a plan for patient tracking and reunification including unaccompanied children (and arrangements for Pediatric Safe Areas), use of Family Support Centers at the hospital, and a private location to notify families when their loved ones are deceased?

- Have these plans been exercised/drilled sufficiently?

Hospital Secondary Triage

- Who is the designated leader in the emergent care area that is responsible for secondary triage?

- What types of trauma surgery will be performed? What process and priorities for secondary triage to the operating room are in place?

- Does the system emphasize "one-way" patient flow whenever possible so that patients do not return to the ED from CT or other locations?

- How does the hospital obtain support to either bring in more resources or move patients to other facilities?

- Do providers understand that available care, including at minimum palliative care, should be provided to those categorized as "expectant" and that these patients must be reassessed as more resources become available, as some may potentially have a good outcome?

T R A C I E

Hospital Tertiary Triage

- Does the hospital's plan ensure that every patient is reassessed regularly after an MCI? Whose responsibility is it to coordinate this effort?

- Do the providers (especially surgical and critical care) understand the considerations that go into tertiary triage, and that sometimes this results in more aggressive interventions (as resources become available) or less aggressive care (as when a patient improves or the patient's prognosis is significantly worse based on new information or requires unsustainable resource commitments)?

- How does the hospital command center obtain information or assistance from other hospitals in the area to prevent unnecessary restrictions on care by bringing in resources or transferring patients to other facilities for care?

- Do providers understand that tertiary triage decisions to restrict care should be made in consultation with another provider of equal training (whenever possible), and discussion and decision-making should be conveyed to the hospital command center and clearly documented in the patient's medical record?

Special Considerations

- Are the providers appropriately trained, and do they have appropriate PPE to assess and give initial treatment to contaminated casualties?

- Are providers prepared to coordinate sub-specialty or incident-specific prognostic information with consultants (including those at outside specialty centers, such as pediatric or burn centers)?

- Is there a community plan for specialty MCI response including those with large numbers of pediatric patients?

- Are the state and local legal and regulatory protections that may be invoked during disasters clearly defined? Is there a need for further documentation, education, or planning? Is there a need to advocate for changes to local ordinances or state law?

APPENDIX C: ROUNDTABLE DISCUSSION ON MASS CASUALTY TRIAGE RECOMMENDATION STATEMENTS

ASPR TRACIE began work on this initiative as a result of a technical assistance request received about revisiting triage processes and mass casualty protocols in the wake of recent mass violence and mass casualty incidents and the lessons learned from meeting with those providers.

After drafting the white paper and consulting with numerous EMS experts across the country, it was apparent that an in-person meeting to discuss key recommendations for EMS system administrators, educators, planners, and medical directors was necessary. ASPR TRACIE convened, in person, a group of 42 experts in January 2019 to discuss the 25 recommendations presented in this section. The information in this appendix is a compilation of key comments provided to the authors from the roundtable participants prior to, during, and following the roundtable. Appendix D provides the participant list for the Roundtable.

Note that for purposes of reporting, the following gradations are used based on the moderator and authors' assessment of the agreement level of attendees by electronic means prior to the meeting or assent at the meeting:

- Strong Agreement – 90% or greater agreement among attendees.

- Some Agreement – 60-89% agreement among attendees.

- Neutral or no agreement - less than 60% agreement among attendees (there were no recommendation statements that fell into this category).

All attendees were given the opportunity to review and comment on this document and these discussion points.

1. EMS and hospital disaster processes should reflect daily practices whenever possible. (Strong Agreement)

There was strong agreement from all attendees that this is a best practice. Several attendees noted that all healthcare facilities and EMS agencies should have a plan in place for incidents that exceed the boundaries of daily practices, but replicates them as closely as possible. Attendees also emphasized the need to exercise and test those daily practices and procedures to stress them to the breaking point. Doing so will demonstrate which processes cannot be used in disasters and are/are not scalable. Practicing also allows plans to account for additional resources needed to scale daily practices to disaster levels.

2. Triage is the "sorting" of patients based on acuity and is a part of, but not the same as, the MCI protocol used in the community. Triage occurs in the response process whenever sorting becomes necessary. This may occur at the scene or at the hospital. (Strong Agreement)

There was strong agreement from all attendees on this statement. Some attendees emphasized that triage can take place in multiple locations and be done numerous times during the response phase, whenever the number of patients exceeds the available resources and sorting or prioritization of resources needs to take place. Triage should occur at the hospital regardless of whether it was done in the field. If patient transport is delayed, secondary triage should be conducted while still in the field.

3. EMS MCI protocols should allow for situational flexibility depending on scene characteristics such as access, containment, and scene safety. (Strong Agreement)

Attendees strongly agreed with this statement. They acknowledged that the risk/benefit equation of EMS providers

entering a dynamic scene is a recent paradigm shift from past protocols where EMS providers staged away from active law enforcement operations and unsafe scenes until all threats were eliminated. EMS system administrators and planners need to consider these threat scenarios and work with law enforcement on how to best approach joint law enforcement/fire/EMS operations.

4. Principles of EMS MCI response operations include the core features of rapid: 1) scene size up and request for resources; 2) safe access to victims; 3) patient evaluation; 4) intervention to correct immediate life threats; 5) movement to transport; 6) (notification of and) transport to an appropriate healthcare facility; and 7) re-evaluation and secondary transfer of patients to more appropriate healthcare facilities when necessary. (Strong Agreement)

There was strong agreement on this statement among attendees. Many participants wanted further emphasis on notification of transport to receiving facilities; therefore, the authors modified the recommendation in point 6. Some attendees argued that in a mass casualty situation, other than initial notification of the mass casualty and noting how many patients are coming, prior notification on specific/individual patient conditions will not really affect any action on the part of the ED and is largely unnecessary. Attendees also discussed the importance of ongoing assessment and secondary or re-triage of patients. In determining receiving facilities, on-scene providers should consider patient distribution, most appropriate facility for patient status/injuries, and load balancing the affected healthcare system across the region. Ensuring patients are initially transported to the correct facility can reduce secondary transfers. Some of these interfacility transfers may be unavoidable in situations where patients have self-transported or were transported by someone other than an EMS provider. Regional MCI plans should anticipate this possibility. Attendees also discussed the need to continuously assess for hazards and secondary risks beyond the initial scene size up. There was also discussion that this recommendation addresses more than just "principles of EMS." It addresses the whole healthcare community response and these actions do not stop with EMS providers. Some attendees recommended alignment with the DISASTER Paradigm discussed in the Basic Disaster Life Support course. Several attendees also emphasized the need to let hospitals know when patient transports are complete and the on-scene response phase concludes.

5. MCI response protocols should be designed around the needs, resources, and likely threats in the community and should identify roles and responsibilities of providers and staff. (Strong Agreement)

Attendees strongly agreed with this statement; however, they noted that "potential" may be a more appropriate word rather than "likely." Attendees also stated that the roles and responsibilities of providers and staff should not be person-dependent, as disasters happen when individuals may be unavailable. In addition, roles/responsibilities can change throughout the course of an incident based on availability of staff and response needs.

6. Provider safety should be the first priority during MCI operations; rescue task forces, appropriate equipment, and minimizing on-scene operations can help reduce vulnerability of EMS personnel. (Some Agreement)

There was some agreement among attendees on this statement. Attendees recommended a number of changes to this statement to make it reflect the reality, and oftentimes necessity, of operating in unsafe environments. Attendees recommended changing "first priority" to "primary focus" as there is risk in all scenes, some scenes can never be made "safe," and risk to providers must be managed from a risk/benefit perspective. EMS system administrators must now consider a "managed risk scene entry" as opposed to the traditional "no risk entry." As rescue task forces—with law enforcement partnering with EMS— become more common, EMS system administrators and planners need to develop entry protocols that address safe operation and emphasize pre-event training for both EMS and law enforcement members of these task forces. Most attendees underscored the need for proper training of all personnel to operate in "warm zone" environments and those personnel must have access to proper equipment to mitigate the threat and perform properly in the hazardous environment.

7. Triage tagging or taping may be of limited value if EMS transportation is immediately available. (Some Agreement)

There was some agreement among attendees on this statement. Initial disagreement surrounded the distinction between tagging and taping. Tagging is the process of filling out and applying a triage tag with, presumably, some amount of patient data for each patient triaged. Taping is simply applying some color indication (tape, markers). Attendees generally agreed that tagging is not an efficient use of time in primary on-scene triage, but taping had some value. Attendees indicated taping deceased or expectant patients, especially those who were left in place, was especially helpful in that it provided a quick visual indication to subsequent responders that the patient had already been checked and prevented multiple assessments. Some attendees also commented that black tape is sometimes difficult to see and therefore black/white or other striped tape is sometimes preferred for expectant or deceased patients.

Most attendees agreed that application of triage tags could be accomplished in a staging area if transportation is not immediately available as part of a secondary triage process. Several attendees indicated that tagging and taping during MCIs is often not done well because it is simply not used in everyday practice. Several EMS medical directors and providers in attendance at the meeting whose services utilize the "triage tag Tuesday" approach to practicing tagging (e.g., in which all patients encountered by EMS on a particular day of the month are assessed and tagged) have not used it well during real life incidents. In systems where tagging is the method for patient tracking, plans need to accommodate the fact that in uncontained and unsafe scenes, many patients will bypass EMS transport and arrive at the hospital without tags or tracking. Attendees also commented that hospital first receivers need to re-triage for the different resource constraints in the hospital and not rely on field triage as an absolute indicator of acuity status at the hospital. Several attendees indicated that, for their systems, initial triage is ambulatory and non-ambulatory, then sorting occurs further from those two distinct groups.

8. There is no superior system of tagging or taping for victim identification – local jurisdictions should adopt simple systems that will be flexible and work for them. (Some Agreement)

There was some agreement on this statement from attendees. There was general agreement with this statement if reference to taping was removed and the statement only applied to systems of tagging. Attendees emphasized that tagging and taping are NOT the same action and recommended separating those actions within this statement. Generally, taping was favored over tagging by attendees unless significant delays in transport from a scene would occur, and then tagging could be utilized if providers would be available for that task. Attendees agreed that if a tagging system is to be utilized, the system of tagging most appropriate to an EMS agency is one that meets their operational needs and preferably one that is used throughout a common geographic, or likely mutual aid, region.

9. The triage process in mass violence situations should include a rapid evaluation for penetrating torso trauma. (Some Agreement)

There was some agreement on this statement among the attendees. Looking for penetrating trauma was an obvious positive addition to some attendees, and viewed as a potentially unnecessary and time-consuming step to others. Some attendees felt it could be added as a caveat to a reassessment conducted during secondary triage, while others felt that it was potentially too late to make immediate transport decisions that would positively impact outcomes. Some attendees felt that low light, clothing, and patients being covered in blood would make the process too time-consuming in an initial triage pass through. Several attendees representing tactical EMS operations felt it could be accomplished with little difficulty. It is sometimes difficult to differentiate between superficial and deep injury, particularly after a blast or with shrapnel. The attendees generally agreed that patients with penetrating trauma are the ones that ideally should have expedited transport. External hemorrhage can be controlled in the field, not so for truncal penetrating injury. Non-compressible suspected intracavitary bleeding (chest, abdomen, pelvis) should have priority for transport over compressible extremity bleeding. The attendees also discussed that this is likely an issue for stable "yellow" or "green" patients whose injuries are not obvious and that "red" patients should go first regardless of location of injury. Some attendees preferred to simply rely on the MUCC

criteria and how the patient presents at the time of triage and not speculate about the effect of mechanism of injury on the triage process. All attendees agreed that active and aggressive re-triage of patients with delayed transport and once in the ED is critical.

One attendee felt so strongly that this statement should not be removed or altered that he sent a follow up email to ASPR TRACIE. Highlights of his statement include the following: "Firstly, a rapid evaluation for penetrating injury of the torso can be accomplished in less than 10 seconds. Second, the notion that the stable patient with penetrating torso trauma should be categorized as delayed unless or until they manifest signs of vascular instability seems to me to be quite dangerous. If transport of that "stable" patient is delayed until they do, in fact, shown signs of hemorrhage, that patient is already behind the resuscitation curve (and that is assuming that the early signs of hypovolemia are recognized shortly after they develop, which I would not be hopeful will occur in a mass casualty situation). These patients are best served by rapid identification of the injury and expeditious transport while 'stable'."

10. [Experienced or expert] providers should rely on their clinical skills when performing triage rather than adhering strictly to triage algorithms/systems. (Some agreement)

There was initial hesitation and disagreement on this statement, but some agreement emerged through discussion that more experienced providers could use their clinical skills as part of their assessment. Therefore, the authors recommend adding the word "experienced" to this statement as reflected above. Participants agreed that clinical skills positively augment triage algorithms, but that those skills are highly variable. The lesser trained the provider, the more adherence to a triage system may be necessary. Also, participants wanted to ensure the statement clearly specifies that clinical skills are meant to be applied to assessment during triage and not interventions, and that the focus should be on assessment and intervention on airway problems and hemorrhage control only, not broader clinical skill application. The experience of the provider also includes their ability to conduct a good situational assessment and knowledge of available resources and capabilities of their system. Triage decisions are made based on clinical need and available resources, so the triaging provider needs to be aware of both. This statement is also not intended to be used as permission for providers to abandon established protocols, but is a recognition that clinical judgement is appropriate to use in assessing MCI patients as an adjunct to your jurisdictional triage protocol. One participant likened an optimal triage protocol to "system one thinking" – it's automatic. The closer you align triage decision making to natural system one provider thinking the more the action will occur as reflex.

11. When EMS transport is available, rapid transport should take precedence over structured on-scene grouping or sorting of patients by priority, particularly in mass violence situations. (Strong Agreement)

Attendees initially hesitated, but eventually agreed on this statement. The initial hesitation surrounded the concern that valuable transport resources could be wasted moving "green" patients if some level of triage had not been accomplished. During the discussion the participants agreed that if there is enough room to transport ALL patients rapidly, then patients should be moved quickly. If there needs to be any delay or if any decisions need to be made on load balancing receiving facilities, then a triage process or assessment of patient priority needs to occur to ensure prioritization of limited resources for "red" **or** "yellow" patients over "green" patients. Rapid transport is preferred, but must still be to the correct facility for the patient's needs. Sufficient assessment should be conducted to ensure the patient is being transported to the correct facility. Finally, ambulances should be used efficiently, and this could include the transport of multiple patients with varying acuity levels in the same unit.

12. Taxis and ride-hailing drivers should know the trauma centers in the community and/or there should be a means to communicate this to them during an incident. (Some Agreement)

There was some agreement on this statement among attendees. Discussion surrounded whether this was an appropriate

ask of ride-hailing services drivers and how to best communicate with and engage them. Uncoordinated use of ride-hailing services could result in an over-triage of ambulatory patients to trauma centers, which could result in delays in treatment. Artificial intelligence, machine learning, and other technology innovations may be able to address these issues in the future, including potential coordination of distribution of private transport patients.

13. Taxi and ride-hailing drivers should all be trained in "Stop the Bleed" techniques. (Some Agreement)

There was some agreement on this statement among attendees. Largely the discussion carried over from statement 12 about whether these ride-hailing service drivers should be engaged at all, but there were passionate opinions by some attendees that absolutely everyone should be trained on Stop the Bleed techniques, so ride-hailing service drivers are an obvious first audience to target. EMS system administrators working with local ride-hailing services or taxi licensing entities should discuss the legal implications and duty to act requirements, the process for providing training, and the process for providing and exchanging supplies. Several attendees mentioned that ride-hailing services are already engaging in medical transport, so this seems like a logical use. If people are going to use ride-hailing to get to a hospital following an MCI, then those services should be prepared. One attendee recommended including public transit employees and this suggestion was well received.

14. EMS providers should be prepared to provide hemorrhage control supplies to immediate responders (bystanders) that have been trained in "Stop the Bleed" techniques during mass violence incidents. (Some Agreement)

There was some agreement on this statement among attendees. Discussion centered on concerns about the competency of the person applying the bleeding control measures and protocols for EMS providers to check their work. Attendees also discussed whether it is appropriate to require public venues to stock hemorrhage control supplies and other equipment as part of a local permitting process or other regulations. Additional discussion occurred around the feasibility of EMS agencies carrying enough supplies to hand them to immediate responders (bystanders). Lessons learned from the Route 91 Harvest music festival shooting incident included that there were many trained responders in the audience attending the concert and not enough supplies. Some attendees discussed how an organized throw-down of supplies for immediate responders (bystanders) might limit raiding of ambulances. Attendees also discussed how best to provide just-in-time training to immediate responders (bystanders) or check their technique. Pictograms on the hemorrhage control packaging and other instructional techniques and target audiences were discussed.

15. EMS provides a critical service to hospitals during disasters by providing secondary transfers of patients to appropriate levels of care when the initial hospital cannot provide the services required by the patient's condition. (Some Agreement)

There was some agreement on this statement among attendees. This is a complex issue and the affected system has to balance hospital needs with incident needs, as well as community 911 calls. Attendees discussed who the most appropriate agency to conduct these interfacility transfers is — the municipal 911 agency or private ambulances or mutual aid units. Attendees felt it was an important decision, but one that is best left to the local agencies to address, both in plans and at the time of the incident. The system should be able to rapidly accommodate the use of all three types of transportation. Several attendees indicated that they have pre-written contracts with scheduled or private providers to surge in the event of an MCI and report to a staging area. Local EMS then decides the best use of those units. There was agreement among the participants that during and post-incident patient load balancing is best completed when there is a medical control or regional medical command involved in some of these resource allocation decisions while looking at the bigger, regional picture. Other attendees emphasized that EMS can also support other hospital needs after their on-scene role has terminated and not just be used for post-incident interfacility transports. There was also discussion about ensuring there is a physician involved when determining whether interfacility transfers or pending 911 calls get priority.

16. EMS personnel not needed at the MCI scene or to answer other 911 calls could provide critical support to hospital triage and treatment at an overwhelmed healthcare facility and this potential role should be discussed in each community with identification of barriers and issues prior to an event. (Some Agreement)

There was some agreement on this statement among attendees. The disagreement among the attendees was not centered on whether or not this was a good idea, but rather some attendees felt their current EMS provider protocols, scope of practice, and plans already addressed this idea. Some attendees felt they did not, others felt there would be potential EMTALA implications, and others felt EMS would be too overwhelmed to provide this support. All attendees agreed that this use of EMS must be planned for ahead of time and regulatory, legal, and procedural issues addressed and exercised in advance. Everyone agreed that this was not something that could likely be successful if attempted just-in-time. Credentialing, liability, and verification of licenses if using EMS providers under mutual aid agreements may be issues that need to be addressed in advance. Some hospitals have explored adding EMS providers to their disaster credentialing/disaster responsibilities emergency operations planning language to provide some protection. There was discussion that in addition to using EMS providers to help surge, hospitals can successfully use non-clinical hospital staff to support clinical needs. For example, in hospitals following the Route 91 harvest music festival shooting, environmental services staff held pressure on wounds of arriving self-transport patients. EMS providers could be used to support "parking lot triage" or to augment clinical staff in the hospital.

17. Hospitals must be prepared to provide rapid triage and treatment to large numbers of EMS and self-referred patients after disasters, particularly those involving mass violence. (Strong Agreement)

There was general agreement on this statement among all attendees. Attendees discussed the need for hospitals to rethink the traditional threshold and planning numbers for MCIs and need to think about their plans for extreme MCIs with many hundreds of patients. Attendees also emphasized the need to plan for very large numbers of unidentified patients and ensure a plan is in place to temporarily track them without names or other identifying information (e.g., a "Doe" or other temporary naming convention).

18. Experienced providers should perform triage whenever possible. (Strong Agreement)

There was general agreement on this statement among attendees with a few caveats. Some attendees felt an experienced basic level first responder or Emergency Medical Technician-Basic is not preferred over an emergency physician just out of training. Attendees also shared that sometimes the most experienced providers are the only ones of their type (emergency physicians) and have to provide the clinical care so it's not the "most" experienced provider, but it is somebody who is available to do triage and also has triage experience.

19. Hospitals must have a process to rapidly register and track patients including many unidentified patients during mass casualty events. (Strong Agreement)

Discussion by multiple attendees underscored that this is a major issue and not easily solved with some of the current EHR systems. In some situations, EMS patient care records may never be completed by EMS providers, especially when large numbers of patients are transported at once, such as the use of a bus to transport "green" patients to a hospital. Hospital plans for registering MCI patients and unidentified patients should be tested and stressed during a full-scale exercise and should mirror daily practices of registering unidentified patients as much as possible.

20. Hospitals must have a process in place to provide secondary triage when casualty loads exceed available resources (e.g., defining priority for the OR for trauma centers, or defining priority for transport to a trauma center for non-trauma centers). (Strong Agreement)

There was complete agreement on this statement from attendees and no additional discussion or points of clarification.

21. Re-triage of patients over time should be a concept emphasized with both pre-hospital and hospital providers. (Strong Agreement)

There was complete agreement on this statement from attendees. Discussion emphasized that clinical status changes over time and must be continually assessed until the patient is clearly stable, and the need for constant re-triage and continual reassessment should be emphasized in initial and ongoing training of pre-hospital and hospital providers at all clinical levels.

22. Physicians should be familiar with hospital-based tertiary triage concepts. (Strong Agreement)

There was complete agreement on this statement among attendees. Discussion focused on the need to determine which physicians/providers need to be trained and to what level. Attendees also discussed how EMS system and hospital administrators can ensure the providers are trained and refreshed so they remember AND apply the concepts when needed.

23. Communities must have real-time systems in place to vet and coordinate information between hospitals and EMS during a disaster. (Strong Agreement)

There was general agreement on this statement from attendees. These systems should be in place and used daily so that the chaos of the disaster is less impactful on communication/information sharing. Attendees expressed that effective means of patient tracking remains the "Holy Grail" of MCI planning and execution.

24. Hospitals and EMS should critically examine their supply preparedness for mass penetrating trauma including hemorrhage control, airway management, medications, chest tubes, and operative supplies and ensure adequate resources for likely scenarios in the community. (Strong Agreement)

There was general agreement on this statement among attendees. Discussion focused on the need to ensure adequate supplies for extreme mass casualties, especially hemorrhage control kits if local plans include engaging bystanders in emergency medical treatment, so they can become immediate responders. Attendees did discuss the cost of purchasing and stockpiling these supplies, understanding that there is a lot of cost and a potential for no return on the investment. Hospitals and EMS systems relying on just-in-time ordering from the same or a limited number of suppliers remains a point of failure in many jurisdictions. Attendees also discussed that the term "likely" should be replaced by the term "potential" as in statement 5 above.

25. Hospitals and EMS should exercise mass violence scenarios in an integrated fashion with public health and emergency management, determining what community resources are available, how they can be used, and how they will be requested and coordinated during an event. (Strong Agreement)

There was general agreement on this statement among attendees with the caveat that law enforcement must be added to the list of necessary planning, training, and exercise partners. Most attendees felt that current drills – and even full-scale exercises – were not stressing systems and protocols enough to be a realistic test for MCIs. Attendees discussed whether ride-hailing services should be included in community-based exercises.

APPENDIX D: MASS CASUALTY TRIAGE ROUNDTABLE PARTICIPANTS LIST

January 24, 2019

Attendees-Table

(Alphabetical Order)

Dr. Peter Antevy
Coral Springs Fire Department/Davie Fire Rescue/Palm Beach County Fire Rescue

Susan Bailey
National Association of Emergency Medical Technicians (NAEMT)

Dr. Paul Biddinger
Massachusetts General Hospital

Dr. Jonathan Burstein
Beth Israel Deaconess Medical Center

Dr. Brendan Carr
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR)

Dr. Richard Catherina
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), National Disaster Medical System (NDMS), Chief Medical Officer

Dr. Alexander Eastman
US Department of Homeland Security (DHS), Countering Weapons of Mass Destruction Office (CWMD)

Dr. Jeffrey Elder
LSU Health Sciences Center, Emergency Medicine

Dr. James Ficke
American College of Surgeons (ACS)

Dr. Denis FitzGerald
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), Office of Emergency Management and Medical Operations (EMMO)

John Gill
Boston EMS

Dr. E. Brooke Lerner
National Association of EMS Physicians (NAEMSP)

Dr. Anthony Macintyre (Invited, Unable to Attend)
US Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA)

Dr. Ken Miller
Santa Clara County EMS (CA)

Dr. Paul Pepe
UT Southwestern Medical Center & Dallas County

Dr. James Phillips
American College of Emergency Physicians (ACEP)

Dr. Peter Pons
Denver Health

Dr. Dan Hanfling
In-Q-Tel

Melissa Harvey
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), National Healthcare Preparedness Program (NHPP)

Jack Herrmann
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), Division of External Stakeholder Engagement

Dr. John Hick
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR) & Hennepin County Medical Center (MN)

Dr. Richard Hunt
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), National Healthcare Preparedness Programs (NHPP)

Dr. Alexander Isakov
Emory University, Office of Critical Event Preparedness and Response

Dr. Thomas Kirsch
National Center for Disaster Medicine & Public Health (NCDMPH)

Dr. Jon Krohmer
National Highway Traffic Safety Administration (NHTSA), Office of Emergency Medical Services (OEMS)

Dr. Julio Lairet
American College of Emergency Physicians (ACEP)

Joseph Lamana (Invited – Unable to Attend)
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), Office of Emergency Management and Medical Operations (EMMO)

Dr. Edward Racht
American Medical Response

Dr. E. Reed Smith (Invited, Unable to Attend)
Committee for Tactical Emergency Casualty Care

Leslee Stein-Spencer
National Association of State EMS Officials (NASEMSO)

Dr. Ray Swienton
University of Texas Southwestern Medical Center

Jennifer Ward
Trauma Center Association of America

Dr. Kevin Yeskey
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), Principal Deputy Assistant Secretary

Attendees- Observers

(Alphabetical Order)

Sean Andrews
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR)

Shayne Brannman
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), Technical Resources, Assistance Center, and Information Exchange (TRACIE)

Alysia Durant
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), Division of Critical Infrastructure Protection (CIP)

Dr. Katharyn Kryda
ASPPH/NHTSA Public Health Fellow at Association of Schools and Programs of Public Health

Lisa Maddry
HHS Office of the Assistant Secretary for Preparedness and Response (ASPR)

LCDR Ross Mullinax
National Center for Disaster Medicine & Public Health (NCDMPH)

CAPT Jessica Reeves
National Center for Disaster Medicine & Public Health (NCDMPH)

Dr. Helga Scharf-Bell
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Gamunu "Gam" Wijetunge
National Highway Traffic Safety Administration (NHTSA), Office of Emergency Medical Services (OEMS)

Dr. David Yue
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APPENDIX E: RESOURCES

ASPR TRACIE Resources (listed alphabetically)

Active Shooter and Explosives Topic Collection

Bioterrorism and High Consequence Biological Threats Topic Collection

Crisis Standards of Care Topic Collection

EMTALA and Disasters

Epidemic/Pan Flu Topic Collection

Hospital Surge Capacity and Immediate Bed Availability Topic Collection

Mass Burn Event Overview

No-Notice Incidents: Hospital Triage, Intake, and Throughput

On-Scene Mass Casualty Triage and Trauma Care Topic Collection

Additional Resources/References

American College of Emergency Physicians. (2013). Joint Committee to Create a National Policy to Enhance Survivability from Mass Casualty Shooting Events: The Hartford Consensus II.

> The Hartford Consensus committee recommends strategies and tactics for ensuring seamless, integrated hemorrhage control interventions to improve survival of victims of active shooter and intentional mass casualty incidents. For those with suspected internal hemorrhage, the committee emphasizes the importance of rapid transportation and access to a trauma center, and prompt access to the operating room.

Arshad, F.H., Williams, A., Asaeda, G., et al. (2015). A Modified Simple Triage and Rapid Treatment Algorithm from the New York City (USA) Fire Department. Prehospital and Disaster Medicine. 30(2):199-204.

> This article explores whether modification to the START system by the addition of an "orange" category would reduce over- and under-triage rates in an MCI exercise. The results showed that there was a higher rate of correct triages using the modified system.

Atiyeh, B., Gunn, S.W., and Dibo, S. (2013). Primary Triage of Mass Burn Casualties with Associated Severe Traumatic Injuries. Annals of Burns and Fire Disasters. 26(1): 48–52.

> This article reviews existing pre-hospital triage systems to try to correctly categorize burn patients who simultaneously have trauma injuries. The authors contend that additional research is necessary to develop a standardized, evidence-based triage system for these patients.

Aylwin, C.J., König, T.C., Brennan, N.W. et al. (2017). Reduction in Critical Mortality in Urban Mass Casualty Incidents: Analysis of Triage, Surge, and Resource Use After the London Bombings on July 7, 2005. (Abstract only.) Lancet. 368(9554):2219-25.

> The authors retrospectively analyzed the pre-hospital and hospital response to the 2005 London bombings. They found that over-triage rates were reduced where advanced prehospital teams did initial scene triage, and that critical mortality did not seem to be related to over-triage.

Badiali, S., Giugni, A., and Marcis, L. (2017). Testing the START Triage Protocol: Can It Improve the Ability of Nonmedical

Personnel to Better Triage Patients During Disasters and Mass Casualties Incidents? (Abstract only.) Disaster Medicine and Public Health Preparedness. 11(3):305-309.

The authors evaluated whether "last-minute" START training of nonmedical ambulance personnel in Italy during a disaster or MCI (using data from a train system victim database as proxy) would result in more effective triage of patients. There was significant improvement in accuracy, and less over- and under-triage for evaluations performed by the group that received just-in-time training on the START protocol. (Note that validation was against the tool itself, making it unclear whether it improved victim triage.)

Barnett, A., Wang, N., Sahni, R., et al. (2013). Variation in Prehospital Use and Uptake of the National Field Triage Decision Scheme. Official Journal of the National Association of EMS Physicians and the National Association of State EMS Directors. 17(2):135-148.

The objective of this study was to compare the use of field triage criteria EMS personnel in six regions. The researchers ultimately found a large variation between the frequency and type of field triage criteria used and suggested opportunities for incorporating updated guidelines.

Beam, B. (2011). START (Simple Triage and Rapid Treatment) Triage Basics. University of Nebraska Medical Center (UNMC).

This seven-and-a-half-minute video demonstrates the START Triage system for use during mass casualty incidents.

Bhalla, M.C., Frey, J., Rider, C., et al. (2015). Simple Triage Algorithm and Rapid Treatment and Sort, Assess, Lifesaving, Interventions, Treatment, and Transportation Mass Casualty Triage Methods for Sensitivity, Specificity, and Predictive Values. (Abstract only.) The American Journal of Emergency Medicine. 33(11):1687-91.

The authors performed a retrospective chart review of 100 trauma patients seen in their EDs. They concluded that, overall, neither SALT nor START was sensitive or specific for predicting clinical outcome.

Blessing Health System (Quincy, IL). (2013). Mass Casualty, START Triage and the SMART Tag System.

This presentation includes information on START triage and the SMART patient tagging system. It includes Illinois-approved triage tags and assessment forms, and a link to an online test that individuals can take after reviewing the presentation.

Bulger, E., Snyder, D., Schoelles, K., et al. (2014). An Evidence-Based Prehospital Guideline for External Hemorrhage Control: American College of Surgeons Committee on Trauma. Prehospital Emergency Care. 18(2):163-173.

This guideline is a culmination of an extensive literature review on the use of tourniquets and hemostatic agents for managing life-threatening extremity and junctional hemorrhage. An expert panel examined the results of the literature review, and provided recommendations for EMS care.

Bultman L.L. and Hick, J.L. (2005). Does START Triage Correspond to Emergency Department Acuity? (Abstract only on p. 167.) Academic Emergency Medicine. 12:S167.

The authors applied START triage to 228 patients arriving to their stabilization room at a Level 1 trauma center and found 26% of "yellow" patients needed lifesaving interventions within the first few minutes of care, and patients categorized "red" by absent radial pulse had 70% mortality. The authors found that START may result in significant under-triage within the "yellow" category.

Canberra Hospital, University of Canberra. (2006). Putting Triage Theory into Practice at the Scene of Multiple Casualty Vehicular Accidents: The Reality of Multiple Casualty Triage.

This Australian document examines the use of triage by EMS providers on patients after multiple casualty motor vehicle accidents. The authors discuss EMS providers performing triage, but adapting to circumstances and not using structured schemes.

Cannon, W. and Heightman, A.J. (2015). A Scientific Look at START and Our Ability to Do It. Journal of Emergency Medical Services.

The authors analyzed START triage application in several MCIs to determine how efficient, effective, and consistently it was performed. In the article they also discuss when it may be appropriate for EMS personnel to use other parameters (such as resources available and hospital capabilities) to perform triage and patient distribution in an optimal manner.

Centers for Disease Control and Prevention. (2012). Decision Scheme: 2011 Guidelines for Field Triage of Injured Patients. Morbidity and Mortality Weekly Report, Recommendations and Reports, 61(1).

This guidance can help EMS providers recognize when patients would benefit from specialized trauma care resources. The report includes a list of tools that can be used to assess vital signs; anatomy of injury; mechanism of injury and evidence of high-energy impact; and special considerations (e.g., age, bleeding disorders, burns, and pregnancy).

Christian, M, et al. (2014). Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement. CHEST Journal. 146(4):e61S–e74S.

The authors describe the results of a comprehensive literature search conducted on "critical care triage" – the practice of prioritizing patients for care and rationing scarce resources.

Critical Illness and Trauma Foundation. (2001). START Triage-Flowchart.

This resource provides a graphic of the START triage system. Detailed and simplified flowcharts are included.

Cone, D., Serra, J., and Kurland, L. (2011). Comparison of the SALT and SMART Triage Systems Using a Virtual Reality Simulator with Paramedic Students. European Journal of Emergency Medicine. 18(6):314-321.

Paramedic students (N=22) were trained on SALT and then applied it to triage a bus crash scene; this was repeated 3 months later with SMART. The authors concluded that virtual reality seems to be a viable research tool for examining mass casualty triage, and participants triaged simulated patients faster and with greater accuracy with SMART triage vs. SALT triage.

Cuttance, G., Dansie, K., and Rayner, T. (2017). Paramedic Application of a Triage Sieve: A Paper-Based Exercise. (Abstract only.) Prehospital and Disaster Medicine. 32(1):3-13.

The authors split 292 paramedics into 4 groups to assess how accurately they applied the triage sieve/algorithm: no training or job aid provided; just-in-time (JIT) training only provided; job aid only provided, and JIT training plus a job aid provided. They found that both JIT training and use of a job aid significantly improved triage accuracy and recommend that paramedics be provided with job aids for field triage because JIT training is impractical when a mass casualty incident occurs. This study also provides some guidance on triage sieve accuracy rate measures.

Dacey, M. (2003). Tragedy and Response: The Rhode Island Nightclub Fire. New England Journal of Medicine. 349:1990-1992.

This article provides a graphic account with excellent learning points from the vantage of an ED physician caring for multiple victims in the aftermath of the Station Nightclub fire in Rhode Island.

DiCarlo, A.L., Maher, C., Hick, J.L. et al. (2011). Radiation Injury After a Nuclear Detonation: Medical Consequences and the

Need for Scarce Resources Allocation. Disaster Medicine and Public Health Preparedness. 5(1).

This literature review focuses on radiation injuries from human exposures and animal models, and is accompanied by various triage and management approaches (covered in the rest of this special issue).

Duckworth, R. (2017). How to Use SALT to Triage MCI Patients. EMS1.

The author discusses the implementation of SALT (Sort, Assess, Lifesaving interventions, Treatment and/or Transport) during a mass casualty incident, and the importance of utilizing the triage system to keep patients moving away from the hazard and toward a casualty collection point for further triage.

Federal Interagency Committee on Emergency Medical Services. (2014). National Implementation of the Model Uniform Core Criteria for Mass Casualty Incident Triage: A Report of the FICEMS.

The Model Uniform Core Criteria (MUCC) for Mass Casualty Triage is a science and consensus-based national guideline that recommends 24 core criteria for all mass casualty triage systems. These criteria were developed to support interoperability among multiple existing triage tools across the country.

Frykberg, E. (2005). Triage: Principles and Practice. Scandinavian Journal of Surgery. 94:272-278.

The author discusses the foundations of triage, lists challenges associated with triaging after a mass casualty incident, shares data on under- and over-triage, and lists factors that should be taken into account when making triage decisions.

Glatter, R. and Carrison, D. (2017). Triaging and Treating After the Las Vegas Shooting: A Firsthand Account. (Abstract only) Medscape Emergency Medicine.

In this interview with Dale Carrison, DO, Chief of Staff at University Medical Center in Nevada, Dr. Carrison describes how patients were triaged and treated following the mass shooting incident in Las Vegas on October 1, 2017.

Hanfling, D., Altevogt, B.M., Viswanathan, K., and Gostin, L.O (eds.). (2012). Crisis Standards of Care: A Systems Framework for Catastrophic Disaster Response. Institute of Medicine, Washington, DC: National Academies Press.

This report was designed to help authorities operationalize the concepts first developed in the 2009 Institute of Medicine Report titled, "Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations: A Letter Report." It provides practical templates and toolkits for the emergency response disciplines and emphasizes the importance of a systems framework. This report also includes a "public engagement" template specifically to guide communities in hosting meetings and encourages the inclusion of citizens in their policy process.

Hong, R., Sexton, R., Sweet, B., et al. (2015). Comparison of START Triage Categories to Emergency Department Triage Levels to Determine Need for Urgent Care and to Predict Hospitalization. American Journal of Disaster Medicine. 10(1):13-21

Researchers compared EMS use of START with hospital use of the ESI during a statewide triage tag exercise in 2011. After assessing pre-hospital and hospital triage of the same 233 patients, ESI better identified patients with abnormal vital signs, those needing emergent interventions, and those admitted to the hospital than START.

Iserson, K., and Moskop, J. (2007). Triage in Medicine, Part I: Concept, History, and Types. Annals of Emergency Medicine. 49(3).

This article provides information on the history and evolution of the practice of triage. It includes a chart detailing the "continuum of triage" from "most resources, most social order, to fewest resources, chaos." (See also the Part II article by Moskop and Iserson.)

TRACIE

Keating, Brad. (2017). Development of New Triage and Scene Management Techniques to Provide a More Effective Response to Active Shooter Situations. Prehospital and Disaster Medicine. (Abstract Only). 32(S1):S12-S13.

This article describes a new proposed triage method for managing mass shooting assessments on scene, which limits assessment to whether the patient has a radial pulse and can follow simple commands.

Kierstead, R. (2015). Recommendation for a National Standard for Tactical Emergency Casualty Care and Israeli Hospital Trauma Protocols in the US. Calhoun Institutional Archive of the Naval Postgraduate School.

This paper recommends the implementation of a national standard for tactical emergency medical services to ensure that programs using the Israeli hospital paradigm are instituted in jurisdictions across the US.

Korner, M, Krotz, MM, et al. (2009). Evaluation of a CT Triage Protocol for Mass Casualty Incidents: Results from Two Large-scale Exercises. European Radiology. 19(8): 1867-74.

This paper provides the results of a study conducted to evaluate the feasibility, stability, and reproducibility of a dedicated CT protocol for the triage of patients in two separate large-scale exercises that simulated a MCI.

Kragh, J.F., O Neill, M.L., Beebe, D.F., et al. (2011). Survey of the Indications for Use of Emergency Tourniquets. Journal of Special Operations Medicine. 11(1):30-8.

The authors analyzed data on emergency tourniquet use from a large clinical study to define emergency tourniquet use indications to stop limb bleeding. They concluded that tourniquets should be used on any compressible limb wounds having possibly lethal hemorrhages. They call for additional research to address the gaps in knowledge that exist regarding tourniquet use.

Lerner, E.B., Schwartz, R.B., Coule, P.L., et al. (2010). Use of SALT Triage in a Simulated Mass-Casualty Incident. Pre-hospital Emergency Care. 14(1): 21-25.

This study evaluated the accuracy of SALT triage during a simulated mass-casualty incident; the average time it took to make triage designations; and providers' opinions of SALT triage. The authors concluded that the accuracy rate was higher than those published for other triage systems, and of similar speed.

Menes, K. (2018). ED Triage Systems Fail in MCIs. Emergency Physicians Monthly.

This article is the first in a series of three articles where the author outlines recommendations for a new triage system that can better handle the 12-hour surge of a large scale penetrating MCI. This article describes the existing pre-hospital and ED triage systems and shortcomings.

National Transportation Safety Board. (2009). Highway Accident Report: Motorcoach Run-off-the-road and Rollover, US Route 163, Mexican Hat, UT.

The results of this incident investigation led to recommendations regarding safety for EMS, Federal Highway Administration, American Association of State Highway and Transportation Officials, National Association of State Emergency Medical Services Officials, and others.

National Fire Protection Agency. (n.d.). The Station Nightclub Fire. (Accessed 8/13/2018.)

This webpage includes links to resources related to the 2003 fire that claimed 100 lives and contributed to the enactment of stringent code provisions requiring fire sprinklers and crowd management in entertainment venues.

Oullette, D., Patel, S., Girard, T., et al. (2017). Liberation from Mechanical Ventilation in Critically Ill Adults: An Official

American College of Chest Physicians/American Thoracic Society Clinical Practice Guideline. CHEST Journal. 151(1): 166-180.

The authors conducted a thorough review of the literature using the Grading of Recommendations, Assessment, Development, and Evaluation approach. This document highlights the recommendations for inspiratory pressure augmentation, protocols minimizing sedation, and preventative noninvasive ventilation developed by the panel.

Ovens, H. (2016). Is Triage Obsolete? Emergency Medicine Cases.

This article focuses on the use of triage in the ED. Its conclusion is that a quicker triage process should be used and should be coupled with protocols for rapid intervention based on findings during triage. Questions about when triage is indicated and how complicated it should be are relevant to the pre-hospital environment as well.

No author. SALT Mass Casualty Triage: Concept Endorsed by the American College of Emergency Physicians, American College of Surgeons Committee on Trauma, American Trauma Society, National Association of EMS Physicians, National Disaster Life Support Education Consortium, and State and Territorial Injury Prevention Directors Association. (2008). Disaster Medicine and Public Health Preparedness, 2(4), 245-246.

This paper provides an overview of the SALT method as a national standard for mass casualty triage.

Schenk, T. (2008). Triage Report: A Brief Assessment of Florida's Pre-hospital Triage Strategy.

This paper, assessing the status of Florida's pre-hospital triage strategy, found that EMS providers were using standardized systems such as START and Start 2 Finish consistently. Triage procedures were included in Field Operations Guides and agencies had been equipped with triage tools, such as tape and tags.

Smith, R., Shapiro, G., and Sarani, B. (2016). The Profile of Wounding in Civilian Public Mass Shooting Fatalities. (Abstract only.) Journal of Trauma and Acute Care Surgery. 81(1): 86-92.

Under the hypothesis that the wounding pattern of civilian mass shootings differs from that of military combat patterns, the authors examined 371 wounds incurred by 139 fatalities. They found a significantly higher case fatality rate and that no deaths were due to extremity hemorrhage, leading them to propose a treatment strategy that surpasses the use of a tourniquet. The authors did identify several considerations and recurring elements including that most victims of an MCI will have minor injuries, many will self-transport, and triage will need to be completed multiple times and at multiple venues throughout an incident.

Transportation Safety Board of Canada. (2014). Lac-Mégantic Runaway Train and Derailment Investigation Summary.

This report includes a description of the incident, an overview of the analysis, a summary of safety action taken, recommendations, and suggestions for future work to prevent similar accidents.

Turner, C., Lockey, D., and Rehn, M. (2016). Pre-hospital Management of Mass Casualty Civilian Shootings: A Systemic Literature Review. Critical Care. 20(362).

The authors conducted a literature review of articles discussing pre-hospital management of civilian mass shootings. 494 manuscripts were identified and 73 were selected. The article highlights the key themes identified through the manuscript review: tactical emergency medical support may harmonize inter cordon interventions, a need for inter-service education on effective hemorrhage control, the value of senior triage operators and the need for regular mass casualty incident simulation.