Needs Assessment Process and Tools

American College of Surgeons – Committee on Trauma

Trauma Systems Evaluation and Planning Committee

Trauma Center Needs Assessment Process and Tools

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American College of Surgeons
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Trauma System Needs Assessment

Overarching Concept

Individual states ensure optimal care of injured persons in their state by establishing criteria through their executive and legislative branches that define a trauma system within the state's geographic boundaries. The state agency responsible for the trauma system translates the statutes by developing rules or regulations, policies, and procedures which are then implemented by the regional or state trauma system within the constraints of funding.

The American College of Surgeons Committee on Trauma (ACS-COT) represents surgeons with expertise in the optimal care of injured patients, inclusive of trauma system development, prehospital care, trauma center development, direct patient care, research, and injury prevention. The ACS-COT has established the guidelines that define the essential elements that identify a hospital as a trauma center, as well as trauma care within a system. The Trauma System Evaluation and Planning committee and program provide expertise specifically in trauma system development based on an inclusive and integrated model.

The ACS-COT has now proposed a strategy to help states to assess and consider the needed distribution of trauma centers within its boundaries, using an inclusive care model for the trauma system. Such an effort is important because of the need to prevent excessive duplication of Level I and Level II trauma centers that have high costs in which it is important to maintain adequate patient volume to promote optimal quality of care, cost-effectiveness of care, and the training mission. Equally important is ensuring that patients have access to trauma centers that are matched to their level of injury severity. Patients with mild and moderate injuries can have high quality care at a designated lower level trauma center that is closer to their community. Patients with severe injuries may be served by timely access to high level trauma centers, many times by transfer from a lower level trauma center that performs the initial resuscitation and stabilization.

Guidance for Trauma System Needs Assessment

Many factors are important to consider when determining an optimal geographic distribution (the number and location) of trauma centers within a state or region. Important considerations are terrain, the transportation infrastructure, local weather patterns, the mass casualty assessment (terror threat, industrial risk), and population (absolute count, dispersal). Capability (level of trauma care) includes important considerations such as population, the medical infrastructures in a region (trauma surgeons, surgeon subspecialists, availability for the call schedule, intensive care resources), transportation assets for interfacility transfer, and the communication systems.

The attached document provides individual assessment parameters that can be used to help a state or regional trauma system to conduct a needs assessment and estimate the number and location of trauma centers required for its population and visitors. Since this is the first version of the document, it is possible that more assessment parameters will be identified and developed in the future.

These assessment parameters fall into several categories such as patient access, discovery/ dispatch, training mission, education, EMS response, and capacity. The leaders of the regional or

state trauma system should make an effort to use as many of the assessment parameters for which data are available; however, it is unlikely that a trauma system will be able to use all the parameters.

Each of the assessment parameters is a statement about where the system wants to be in the future-the desired outcome. In many cases recommendations for a desirable outcome have been proposed, based either from the literature or common practice in other systems. As there are generally a range of potential values for each parameter, the desired outcomes will likely be different for each trauma system and must be determined by the trauma system's decision makers – choosing targets that are acceptable or desirable based upon local public opinion, policy, and infrastructure. For example, not every trauma system will have the resources to place trauma centers in every location necessary to achieve a goal of transporting 90% of patients to a level 1 trauma center within 1 hour, a goal that may well be achievable in some systems. In this case, the benchmark for system access might be better chosen to establish a threshold for transport to a level I or level II center, or transport to a participating system hospital within 1 hour.

When selecting a desired outcome, the potential gaps in the trauma system should be considered as they could potentially affect ability of the trauma system to meet the desired outcome. Additionally, trade-offs have been identified that should be considered when selecting a desired outcome.

Specific datasets are suggested to perform the assessment for each parameter, along with some strategies or considerations when analyzing the data. Several different datasets may be needed to assess each parameter, and some datasets can be used for several parameters. The list of datasets that have been identified to help perform this assessment includes the following:

- State trauma registry
- Individual trauma center registries
- State EMS registry
- Hospital discharge data (HDD)
- Emergency department data (EDD)
- State NEMSIS data
- State or regional 911 data sets, local 911 data
- Trauma data reported by non-trauma hospitals
- Computer-aided dispatch (CAD) registries
- Trauma system status management data (e.g. time hospitals are on diversion)

The following criteria represent the current state of an ongoing project to quantify metrics that are of potential utility in assessing trauma-related resource needs within a region. Further refinements are expected as the Committee continues its development efforts and various states and regions apply these metrics. Users are encouraged to check back with the Trauma System Evaluation and Planning Program to ensure they have the most recent version of the tools.

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Table 1		
Category - Access	**Desired State**	**xx % of all injured patients meeting step one or two field triage criteria will receive care at a LI or LII trauma center within yy minutes of injury.**
	Parameters	xx - No data available for percentage of injured patients, suggested range 80%-100% yy - No data available for correct time to arrival, suggest 60 min
	Current State	Determine: • Injury time • Field triage step • Arrival time at facility • Destination facility, if other than level I or level II center, then need time to transfer ○ Arrival time at 2nd facility

	Data Sources	• EMS registry
		• Trauma registry at receiving trauma centers
		• Trauma data from intermediate facilities:
		  ○ Trauma specific data
		  ○ HDD or EDD data

	Gaps	• Delay in EMS dispatch • Delay in EMS arrival • Long transport time • No appropriate center
	Strategies	Include both ground and air medical transport time/ distance in calculations (add no-fly days into the calculations)
	Trade-Offs	Over designation likely to improve access but increases cost and volume at individual trauma centers Under-designation will maintain higher volume at individual trauma centers but potentially decreases access and places greater burdens of transport resources, both for field and inter-facility transports.

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Table 2		
Category - Access	**Desired State**	**xx % of patients meeting step three triage criteria will receive care at a a designated trauma center within yy minutes of injury**
	Parameters	xx - No data available, suggested range 80%-100% yy - No data available, suggest 60 min
	Current State	Determine: • Injury time • Field triage step • Arrival time at facility • Destination facility, if other than level I or level II center, then need • Time to transfer • Arrival time and 2nd facility • Destination facility
	Data Sources	• EMS registry • Trauma registry at receiving trauma centers • Trauma data from intermediate facilities: o Trauma specific data o HDD or EDD data
	Gaps	• Delay in EMS dispatch • Delay in EMS arrival • Long transport time • No appropriate center
	Strategies	Determine the number of injured patients without head injury to verify that a Level III trauma center is warranted. Ensure institutional commitment to trauma. Designate enough trauma centers or develop transport mechanisms to get patients to trauma centers within the established parameters.
	Trade-Offs	Level III and IV trauma centers improve access for minor to moderately injured patients. Essential in rural areas for immediate stabilization prior to transfer. Level III centers in urban and suburban areas may adversely affect both system efficiency and cost without significantly improving access to care.

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Table 3		
Category - Access	**Desired State**	**xx % of patients not meeting any field triage criteria initially treated at an appropriate facility**
	Parameters	xx - No data available, suggested range 80%-100%
	Current State	Determine: • Injury time • Field triage step • Arrival time at facility • Disposition

	Data Sources	• EMS registry
		• Trauma registry at receiving trauma centers
		• Injury data from non-trauma centers (community hospitals)
		  o Trauma registry specific data
		  o Hospital discharge or ED discharge data

	Gaps	• Over-utilization of transfer • Failure to transfer • Under-triage
	Strategies	This approach requires injury data from all acute care centers. It must be monitored to ensure minimal under-triage or miss-triage. Outcomes must also be monitored to ensure that patients are getting appropriate care in a timely manner. Consideration of pediatric patients should be included.
	Trade-Offs	In an inclusive and integrated trauma system it is acknowledged that most minor injury is treated appropriately at Level IV-V trauma centers and community acute care hospitals.

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Table 4		
Category - Access	**Desired State**	**xx% of injured patients with ISS > 15 treated without transfer at facilities other than designated Level I, II, and II trauma centers**
	Parameters	xx - no data, suggest < 5%
	Current State	Determine: • % of patients with ISS > 15 treated in designated trauma centers compared with total number of injured patients with ISS >15 in the state
	Data Sources	• State trauma registry • Facility trauma registries • Hospital discharge data • Vital records (death certificates)
	Gaps	Limited enforcement of system guidelines for interfacility transfer
	Strategies	Identify hospitals not appropriately transferring seriously injured patients on a consistent basis (e.g., keep paying patients or neurosurgeon available daytime hours only). Identify as a potential location where trauma center or trauma participating hospital is needed. Monitor and enforce transfer guidelines and policies.
	Trade-Offs	In rural areas access to specialty care, e.g. neurosurgeon, may be occasionally life-saving. However, the resources supporting that sporadic care such as a qualified ICU may be lacking and the lack of their inclusion in the trauma center through a designation/verification process reduces oversight and performance improvement monitoring. Selective triage by ability to pay places a greater burden on higher level centers. Failure to recognize that all acute care facilities treat some level of injury negates the opportunity to collect data from those facilities and to more fully integrate them into an inclusive trauma system designed to meet the needs of the entire spectrum of injured patients.

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Table 5		
Category – Access	**Desired State**	**xx% of injured patients meeting step one or step field triage criteria are appropriately transported to the closest designated or verified trauma center regardless of state or regional boundaries**
	Parameters	xx - no data, suggest transfer to out-of-state trauma center is it is more than 15 minutes closer than a trauma center designated or verified at the same or higher level in-state.
	Current State	Determine: • Number of trauma patients receiving care in surrounding states • Document and analyze transport time differences against in state resources
	Data Sources	• State trauma registry data from neighboring state • Trauma registry data from home state • HDD from neighboring state • EMS registry in home state • Vital records from home and neighboring states (death certificates)
	Gaps	• Need to dual recognition of border facilities as part of the trauma system in both states • Need for contributions to trauma registry data in both states • Reciprocal support for non-paying patients • Structured plan for repatriation to an in-state facility, if appropriate
	Strategies	Identify patients receiving appropriate care at out-of-state trauma centers. May reduce the need for duplication of resources within near proximity.
	Trade-Offs	In the neighboring center is not part of the home state's trauma system, there may be limited opportunities for formal confirmation of capabilities during verification or designation reviews. Likewise there may not be ongoing monitoring through system performance improvement processes. Out-of-state facilities may represent the only logical option for access to timely care if they abut rural areas in the home state.

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Table 6		
Category – Training Mission	**Desired State**	**Each level I center will see a sufficient volume of injured patients to support continued competence of trauma staff and the training mission of the center**
	Parameters	• Limit by admissions: COT 1200 • Limit by severe injuries: COT 250 with ISS > 15
	Current State	Determine: • Required volume for competency mission • Required volume for training mission

	Data Sources	• EMS registry
		• Trauma registry at receiving trauma centers
		• Trauma data from intermediate facilities:
		  ○ Trauma registry specific data
		  ○ Hospital discharge or ED discharge data

	Gaps	• Over-triage to Level I center • Underutilization and commensurate experience at LII-III trauma centers
	Strategies	If the training need cannot be met by standard patient flow, the field triage criteria may need to be adjusted to ensure the agreed upon volume. If patient transport is determined by geographic catchment area, boundary modifications may be necessary. The training mission should be factored into the model for trauma center number, location, and level.
	Trade-Offs	May result in under-designation of supporting facilities that would be necessary for surge or large scale events. This could, potentially, reduce redundancy in the event of a LI facility catastrophe such as a flood, tornado, earthquake, fire or act of terrorism.

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Table 7		
Category – Efficiency	**Desired State**	**Each level I center will serve an appropriately designed geographical area support continued competence of trauma staff, the training mission of the center without unnecessary duplication of resources and subsequent costs**
	Parameters	• Limit by geographical proximity: One Level I per region or catchment area
	Current State	Determine: • Required volume for competency mission • Required volume for training mission

	Data Sources	• EMS registry
		• Trauma registry at receiving trauma centers
		• Trauma data from intermediate facilities:
		  o Trauma registry specific data
		  o Hospital discharge or ED discharge data

	Gaps	• Over-triage to LI center • Underutilization and commensurate experience at LII-III trauma centers
	Strategies	If the training need cannot be met by standard patient flow, the field triage criteria may need to be adjusted to ensure the agreed upon volume. If patient transport is determined by geographic catchment area, boundary modifications may be necessary. The training mission should be factored into the model for trauma center number, location, and level.
	Trade-Offs	May result in under-designation of supporting facilities that would be necessary for surge or large scale events. This could, potentially, reduce redundancy in the event of a Level I facility catastrophe such as a flood, tornado, earthquake, fire or act of terrorism.

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Table 8		
Category – Discovery/ Dispatch	**Desired State**	**xx% of population covered by E911 or Next Generation 911,** **yy% of geographical coverage by E911 or Next Generation 911** **Note: national goal is 100% coverage in the future**
	Parameters	xx - no data available, suggested 95-100% of population yy - no data available, suggested >90% of geography
	Current State	Determine: • % of population covered • % of geography covered
	Data Sources	• State 911 Office • Regional/Local 911 Offices
	Gaps	• Delay in ability to notify dispatch by cell phone • Inability to locate caller results in delayed response
	Strategies	Continued national and statewide efforts to upgrade 911 capacity is ongoing. Trauma stakeholders should be knowledgeable of such efforts in their state or region and should support legislative or grant efforts to secure sufficient funding for such improvements.
	Trade-Offs	While delays in discovery do occasionally occur, delays in notification are far more common and may affect the need for additional trauma centers in order to meet time to definitive care guidelines. Failure to identify caller location (E911 and Next Gen 911) may delay response times and may also suggest the need for additional trauma centers.

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Table 9		
Category – EMS Response	**Desired State**	xx% of population covered by advanced life support personnel • in urban areas within zz (9) minutes; • in rural areas within aa (45-60) minutes; yy% of population covered by basic life support personnel • In urban areas within zz (5) minutes • In rural areas within aa (20) minutes
	Parameters	xx - no data available, zz - in urban systems fractal response time of < 9 minutes >95% yy - no data available aa - in rural systems fractal response time of <20 minutes >90% **Fractal response times** are defined as the ability of the department to respond within a given time with 90% assurance.
	Current State	Determine: • % of urban population covered by ALS within established response times parameters • % of rural population covered by ALS within established response times parameters • % of rural population covered by BLS within established response time parameters
	Data Sources	State EMS Office: • State NEMSIS databases • Computer aided dispatch (CAD) databases
	Gaps	• Limited availability of ALS resources in rural areas o Can be of high value due to extended transport or transfer times. • Local agencies may be reluctant to transport patients to distant trauma centers o Takes limited resources out of primary response area o If volunteer staffed takes people away from primary vocations
	Strategies	Computer aided dispatch may help identify the correct response type/mode. Pre-arrival instructions are essential in areas with extended response times but rural dispatch centers often do not have the resources to provide certification for their dispatchers. Trained emergency medical responders (EMR) such as law enforcement, fire department or freestanding quick response units may be essential to provide immediate medical care prior to the ambulance arrival in rural and remote areas.
	Trade-Offs	Properly positioned EMS agencies reduce response time. It may not be practical to expect high level prehospital resources in every community. Regionalization of EMS systems may help control costs and helps keep local resources within standard response areas. ALS rendezvous and hand-offs may improve system efficiency. Decreasing response times may result in increased costs of EMS care that cannot be supported.

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Table 10		
Category – Air Medical Response	**Desired State**	**Use of air medical resources reduces initial transport time by xx minutes for patients meeting step one or step two field triage criteria beyond a yy time-based transport radius.**
	Parameters	xx - no data available, suggest 15-30 minutes yy - no data available, suggest >30 minutes (assumes full ALS ground capabilities of ground unit)
	Current State	Determine: • Number, location and type of air medical resources in the region or state • Average length of time from dispatch to airborne • Average length of time for patient preparation for flight (scene and inter-hospital) • Average time savings by distance from the nearest appropriate trauma center (may not be the air medical assets home base). ○ Requires assessment and comparison of ground transport times
	Data Sources	• Statewide trauma registry • Individual trauma registry • Acute care facility ED discharge data • NEMSIS statewide database
	Gaps	• Overabundance of resources in some metropolitan areas • Paucity of resources stationed or immediately available in rural/remote areas • May not operate in a manner that best supports the trauma system
	Strategies	Establish clear expectations through rule, regulation or policy concerning the use of air medical resources for the initial transport of trauma patients. Ensure that data are collected and analyzed and that air medical providers are fully engaged in performance improvement activities.
	Trade-Offs	The use of rotor wing aircraft may result in the ability to increase the time/distance radius surrounding high level trauma centers. If “stationed” at the trauma center results in fly out – fly back time considerations that lessen the radius. Rotor wing aircraft affiliated with a hospital may result in over flights of closer appropriate trauma centers resulting in delays to care. Minor/moderate injuries may be transported resulting in increased individual and systems costs and significant risks to providers and patients. Fixed wing aircraft often take significant time from dispatch to launch but may be the only reasonable alternative for remote transfers. Air medical data are often not available for incorporation into other trauma data sets, for system planning, or performance improvement activities.

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Table 11		
Category – Triage/Trauma Activation	**Desired State**	**Use of air medical resources reduces inter-hospital transport time by aa minutes for patients meeting step one or step two field triage criteria beyond a bb ground transport radius.**
	Parameters	aa - no data available, suggest >30 minutes (assumes full ALS ground capabilities) bb - no data available, suggest greater than 50 mile radius (assumes full ALS ground capabilities)
	Current State	Determine: • Number, location and type of air medical resources in the region or state • Average length of time from dispatch to airborne • Average length of time for patient preparation for flight (scene and inter-hospital) • Average time savings by distance from the nearest appropriate trauma center (may not be the air medical assets home base). • Requires assessment and comparison of ground transport times
	Data Sources	• Statewide trauma registry • Individual trauma registry • Acute care facility ED discharge data • NEMSIS statewide database
	Gaps	• Overabundance of resources in some metropolitan areas • Paucity of resources stationed or immediately available in rural/remote areas • May not operate in a manner that best supports the trauma system
	Strategies	Establish clear expectations through rule, regulation or policy concerning the use of air medical resources for the transfer of trauma patients. Ensure that data are collected and analyzed and that air medical providers are fully engaged in performance improvement activities.
	Trade-Offs	The use of rotor wing aircraft may result in the ability to increase the time/distance radius surrounding high level trauma centers. If “stationed” at the trauma center results in fly out – fly back time considerations that lessen the radius. Rotor wing aircraft affiliated with a hospital may result in over flights of closer appropriate trauma centers resulting in delays to care. Minor/moderate injuries may be transported resulting in increased individual and systems costs and significant risks to providers and patients. Fixed wing aircraft often take significant time from dispatch to launch but may be the only reasonable alternative for remote transfers. Air medical data are often not available for incorporation into other trauma data sets, for system planning, or performance improvement activities.

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Table 12		
Category – Triage/Trauma Activation	**Desired State**	**xx% of time when EMS notifies the trauma center that they are transporting a patient meeting the trauma center's criteria for highest level activation prior to arrival and the yy% of time trauma team activation is instituted based on that report.**
	Parameters	xx - no data available yy - no data available ACS Resources for Optimal Care of the Injured Patient suggests • xx <50% over-triage • xx <05% under-triage • yy Trauma surgeon immediately (<15 minutes) available (LI and LII trauma centers, promptly [<30 minutes] for LIII) for the highest level of trauma team activation upon prior notification by EMS.
	Current State	Determine: • % of over-triage • % of under-triage • % of mistriage • Percent of failure to require the highest level of trauma team activation for patients meeting step one or step two trauma triage criteria with appropriate notification by EMS prior to arrival.
	Data Sources	• State trauma registry • Facility trauma registries • State NEMSIS database • Hospital discharge data • Vital records (death certificates) • System (multi-disciplinary) performance improvement minutes
	Gaps	• Establish and enforce field triage guidelines o Adopt or refine CDC/ACS guidelines • Ensure facilities adopt and adhere to trauma team activation policies o Continuously monitored through PIPS processes
	Strategies	Develop "Cribari grid" for each facility to determine rates of over- and under-triage. Develop model criteria for trauma team activation at the regional or state level. Monitor compliance of both triage and activation.
	Trade-Offs	Over-triage ensures injured patients do not have occult injuries, however it increases system costs. Under-triage/mistriage contributes to poorer outcomes. Failure to initiate trauma team activations delays access to care.

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Table 13		
Category - Capacity	**Desired State**	**xx% of time trauma centers are on diversion.**
	Parameters	xx - no data available - suggest <5% total time on diversion
	Current State	Determine: • % of time on diversion
	Data Sources	• Individual trauma registries • Statewide or regional system/bed status management data
	Gaps	• Limited trauma centers may result in excess diversion and subsequent delays in care. • Persistent overcapacity issues may result in inability meet unexpected demands during catastrophic events.
	Strategies	Establish and monitor diversion and capacity benchmarks as part of verification/designation process. Monitor system/bed status management data (such as EMsystem installed for use during catastrophic events) on an ongoing basis.
	Trade-Offs	Excessive diversion or over-capacity issues impact the system's ability to flex for surges and large scale events. It may indicate a need for additional trauma centers in an region or state. This could include lower level centers to relieve some burden for minor and moderate injuries.