AMERICAN COLLEGE OF SURGEONS COMMITTEE ON TRAUMA
Trauma Systems Evaluation and Planning Committee

Trauma System Consultation Report

Santa Clara County

San Jose, CA

November 15 – 18, 2016

AMERICAN COLLEGE OF SURGEONS
Inspiring Quality: Highest Standards, Better Outcomes

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An interdisciplinary working group prepared this document based on the consultation visit that took place November 15 – 18, 2016, in the San Jose, CA, and included the following members:

ACS Review Team Leader

Robert J. Winchell, MD, FACS
Surgeon
Chair, Trauma Systems Evaluation and Planning Committee,
American College of Surgeons Committee on Trauma
Chief, Division of Trauma, Burns, Acute and Critical Care,
Weill Cornell Medical College
Director, Trauma Center,
New York-Presbyterian Weill Cornell Medical Center
New York, NY

ACS Review Team

Michael H. Thomason, MD, FACS
Surgeon
Professor and Vice Chair, Department of Surgery
Carolinas Medical Center
Specialty Medical Director, Surgery Care Division
Medical Director, Carolinas Trauma Network
Carolinas Healthcare System
Clinical Professor, Department of Surgery
UNC School of Medicine
Charlotte, NC

Peter E. Fischer, MD, MS, FACS
Surgeon (Observer)
Associate Professor, Department of General Surgery, University of Tennessee Health Science Center
Trauma Surgery, University of Tennessee Health Science Center
Memphis, TN

James D. Upchurch, MD, MA, FAAFP, FACEP
ED Physician
EMS Medical Director, Big Horn County EMS, MT
Hardin, MT

Fergus Laughridge, Captain, CPM
State EMS Director
Professional Services and Compliance Officer
Community Outreach
Humboldt General Hospital EMS Rescue
Winnemucca, NV

Jolene R. Whitney, MPA
Trauma Program Manager
Specialty Care Systems and Performance Improvement
Bureau of Emergency Medical Services and Preparedness
Utah Department of Health
Midvale, UT

Jane Ball, RN, DrPH
Technical Advisor TSC
Consultant, Trauma Systems Programs, American College of Surgeons
Director (Retired), National Resource Center (EMSC & Trauma)
Gaithersburg, MD

ACS Program Staff

Melanie Neal, MS
Trauma Quality Programs Staff (Observer)
Senior Manager, Trauma Quality Programs, American College of Surgeons
Chicago, IL

Jimm Dodd, MS, MA
Trauma Systems Programs Staff
Manager, Trauma Systems Programs, American College of Surgeons
Chicago, IL

Holly Michaels, MPH
Trauma Systems, Program Staff
Program Manager, Trauma Systems, American College of Surgeons
Chicago, IL

Maria Alvi, MHA
Trauma Systems, Program Staff
Program Manager, Trauma Systems, American College of Surgeons
Chicago, IL

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EXECUTIVE SUMMARY

Current Status

Santa Clara County encompasses 1,132 square miles, one-third is very urban and two-thirds are considered rural. The county contains recreational areas, national forests and monuments, lakes and rugged mountain ranges. The resident population is 1.8 million, which increases during the day to 2.2 million with commuter activity. Most of this population is concentrated in the urban areas; however, the rural part of the county is experiencing a significant increase in residential development. In addition, estimated regional populations of approximately 1 million residents in adjoining counties (Alameda, San Mateo, Santa Cruz, San Benito and Monterey) are part of the effective catchment area of the trauma system.

The trauma system in the State of California is structured as a federal system, in which the primary responsibility for system structure and operation is at the level of the Local EMS Agency (LEMSA), with limited centralized authority and oversight at the level of the California EMS Authority. The system has enabling legislation that provides broad trauma system authority to the Local EMS Agencies (LEMSA's) under the direction of the California EMS Authority. The SCC EMS Agency is the designated LEMSA for Santa Clara County. The SCC EMS Agency is charged with implementation and oversight of comprehensive emergency care delivery services including the trauma system, as well as emergency medical services, and systems for the care of stroke, and STEMI. There is a trauma system plan in place and it is updated annually.

The Santa Clara County trauma system was designed and conceived in the late 1980's, following an exclusive trauma system philosophy. This trauma system model concentrates on the management of the severely injured patient, characterized as the major trauma victim, with less severely injured patients being cared for outside of the organized trauma system. The SCC trauma system has been functioning at a high level for more than 20 years; however, the underlying structure of the trauma system has not been updated to reflect the more current public health-based, inclusive model intended to address the broader spectrum of injury. As a result, organized injury care is isolated to the three designated trauma centers with minimal participation from the eight non-designated acute care facilities. Limited system-level outreach and education is provided to these non-designated acute care facilities, and trauma data are not collected from these facilities.

The EMS system and trauma system provide good county coverage with rational use of air medical services. The coverage area is relatively small, with good transportation resources, and does not face major geographical challenges. The County has strong destination guidelines for patients brought in from the field and well-established transfer guidelines. Excellent resources for the care of special populations (pediatrics, burns, rehabilitation for brain injury and spinal cord injury) exist. Additionally, the ability of the SCC trauma system to provide trauma services to adjoining counties has been successful due to the regional trauma system planning approach and the collaboration of all LEMSAs involved.

The trauma system has a well-established advisory structure, in which most participants come from the designated trauma centers. These stakeholders are engaged, collaborate well, and have a long history of volunteerism. However, the stakeholder base is narrow, and does not formally include a broader representation from other important components of the trauma system (e.g., injury prevention, emergency nursing, air medical services, fire, EMS, and rehabilitation). An active process for medical care and trauma system performance is well-

established, with a history of strong cooperative work among the designated centers. This medical audit process involves only the designated trauma centers and does not encompass data from the other acute care facilities. It is, therefore, unable to assess care provided at these facilities, either in terms of volume or quality outcomes.

The SCC EMS Agency has a fragmented approach to data management. Limited staffing impedes progress in developing robust systems. Challenges are becoming more acute as the prehospital, stroke, and STEMI programs require more resources for data management. The epidemiologist provides registrar and information technology support for all datasets rather than enhancing data analysis opportunities.

The SCC EMS Agency has an opportunity to make some strategic choices, embrace a broader vision of system design and make incremental improvements to the current system. The recent administrative relocation to the Health and Hospital Committee and ability to report directly to the SCC Board of Supervisors helps raise the visibility of the trauma system. The SCC EMS Agency should raise public awareness and educate elected officials about the services and value of the trauma system and other time-sensitive condition programs to foster support for needed resources to further develop these systems of care.

Advantages and Assets

- Long-standing, high-functioning system
- Stable, minimal changes in system structure
- Good governance model with broad authority
- Good working relationships
- Long history of dedicated volunteerism
- Engaged and active lead agency
    - Full time medical director
    - Well-positioned in county government
    - Funding mechanisms in place
- Engaged and energetic stakeholders
- Strong historical trauma centers
- Good coverage of the region
- Trauma plan in place, updated yearly
- Active assessment of system function by The Trauma Care System Quality Improvement Committee (TCSQIC)
    - Medical review
    - System review
- Good EMS system
    - Coverage, rational use of air medical service
    - Strong destination and transfer processes
- Involvement in region coordination and planning
- County registry evolving
    - Field mapping issues solved
    - Data validation processes in place
- Prehospital data collection evolving
- Already have overlap with stroke/STEMI
- Have an epidemiologist, knows trauma data
- Using outside data resources for reporting

- Wide range of injury prevention activities
- Good coverage of special populations
- Good rehabilitation resources

Challenges and Vulnerabilities

- System has been static for many years
- Rooted in 1980's exclusive model
    - Minimal involvement of non-designated centers
    - Does not optimize use of county resources
- Focus is on operations, less on strategic planning
- Tendency to be reactive rather than proactive
- Lack of specific policy in key areas of governance
- Changes at state level difficult and slow
- Relatively narrow stakeholder base
- Limited public awareness/support
- Limited Agency staffing impedes progress
    - Epidemiologist functions as registrar/ IT, upon occasion
    - No resources to facilitate broader data collection
    - Limited ability to pursue integrative functions
    - Increased demands related to stroke/STEMI
- Currently, a fragmented approach to data systems
- No data from non-designated acute care facilities
- Limited coordination of prevention activities
- Limited system-level education and outreach

Themes

- It's time for some strategic choices
    - Embrace a broader vision of system design
    - Make incremental improvements to the current system
- Networks are better than funnels
    - Even if you have a really good funnel…
    - It still won't fully optimize the county's capacity
- Build a bigger tent
    - Very well positioned to integrate stroke/STEMI
    - Significant opportunities to improve efficiency
- Remember you are building from strength
- You have the authority and leadership, use it
- There is a skeleton crew at the EMS Agency
- Sometimes you have to re-allocate resources
    - Think catalyst - a small investment will reap large benefits
- Your engagement with data is going to grow
    - It won't work without the infrastructure
    - It's of no value if you can't use it
- Starting is the hardest part
    - Especially when things already work pretty well
- Do not be held back by *perceived* barriers

PRIORITY RECOMMENDATIONS

Statutory Authority and Administrative Rules

- Revise the hospital contracting language for 9-1-1 receiving centers:
    - Outline detailed specifications for participation in the trauma system, including submission of a minimal dataset.
    - Outline penalties for failure to comply with contract specifications.

System Leadership

- Establish an updated vision for the trauma system that embraces an inclusive model.

- Develop policy and procedure for ongoing assessment of the trauma system effectiveness, specifically addressing:
    - Number and level of trauma centers,
    - Trauma catchment areas,
    - Role of non-designated acute care facilities, and
    - Cooperation and interaction with neighboring counties.

Lead Agency

- Provide an additional two or three full-time equivalent positions for more support and technical assistance of the trauma system and time-sensitive conditions, such as:
    - Registrar/data analyst,
    - Information technology support, and
    - Specialty Programs Nurse Coordinator.

Trauma System Plan

- Develop a specific process and policy with metrics for needs-based assessment of possible changes to the trauma system.
    - Consider including elements such as current and projected changes in population growth and density, trauma patient volume, patients with an injury severity score greater than 15, distribution for existing trauma centers, transport times to trauma centers, diversion times, and plans of other counties to designate new trauma centers.

- Streamline, update, and consolidate the current trauma system plan.

System Integration

- Utilize the reorganized Emergency Medical Care Committee (EMCC) as the forum for coordinated interdepartmental planning for all time-sensitive conditions, including trauma, stroke, and ST-elevation myocardial infarction.

Financing

- Secure a stable and sustainable funding source to support additional trauma system program personnel in the Santa Clara County Emergency Medical Services Agency to perform coalition building, outreach and injury prevention, data system management, and performance improvement functions.

Prevention and Outreach

- Plan a coordinated outreach program to non-designated acute care facilities to offer education and support regarding their roles in an inclusive trauma system as well as topics in the care of the injured patient.

Definitive Care Facilities

- Apply the needs assessment process developed within the trauma system plan prior to the designation of additional trauma centers.

- Require all acute care facilities to submit a minimum trauma patient dataset to form a comprehensive profile of injury care in the county.
    - Request stakeholders in the Bay Area Regional Trauma Care Committee to consider a similar recommendation to facilitate future regional trauma care planning.

System Coordination and Patient Flow

- Assess the compliance of non-designated acute care facilities with trauma transfer guidelines.
- Communicate compliance rates with trauma transfer guidelines to stakeholders, and determine a strategy to improve compliance, if necessary.

System-Wide Evaluation and Quality Assurance

- Develop a Santa Clara County Emergency Medical Services Agency performance improvement and patient safety (PIPS) plan that is distinct from the state trauma plan.
    - Ensure alignment of the PIPS Plan with the process and indicators identified in the California EMS Authority trauma system PIPS plan.
    - Engage stakeholders in the process of developing the PIPS plan.
    - Modify the Trauma System Quality Improvement policy to reflect the PIPS plan.

Trauma Management Information Systems (MIS)

- Create a unit within the Santa Clara County Emergency Medical Services Agency responsible for pre-hospital, trauma, stroke, and STEMI data systems, which includes:
    - Full-time registrar, and
    - Full-time IT support

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TRAUMA SYSTEM ASSESSMENT

Injury Epidemiology

Purpose and Rationale

Injury epidemiology is concerned with the evaluation of the frequency, rates, and pattern of injury events in a population. Injury pattern refers to the occurrence of injury-related events by time, place, and personal characteristics (for example, demographic factors such as age, race, and sex) and behavior and environmental exposures, and, thus, it provides a relatively simple form of risk- factor assessment.

The descriptive epidemiology of injury among the whole jurisdictional population (geographic area served) within a trauma system should be studied and reported. Injury epidemiology provides the data for public health action and becomes an important link between injury prevention and control and trauma system design and development. Within the trauma system, injury epidemiology has an integral role in describing the root causes of injury and identifying patterns of injury so that public health policy and programs can be implemented. Knowledge of a region's injury epidemiology enables the identification of priorities for directing better allocation of resources, the nature and distribution of injury prevention activities, financing of the system, and health policy initiatives.

The epidemiology of injury is obtained by analyzing data from multiple sources. These sources might include vital statistics, hospital administrative discharge databases, and data from emergency medical services (EMS), emergency departments (EDs), and trauma registries. Motor-vehicle crash data might also prove useful, as would data from the criminal justice system focusing on interpersonal conflict. It is important to assess the burden of injury across specific population groups (for example, children, elderly people and ethnic groups) to ensure that specific needs or risk factors are identified. It is critical to assess rates of injury appropriately and, thus, to identify the appropriate denominator (for example, admissions per 100,000 populations). Without such a measure, it becomes difficult to provide valid comparisons across geographic regions and over time.

To establish injury policy and develop an injury prevention and control plan, the trauma system, in conjunction with the state or regional epidemiologist, should complete a risk assessment and gap analysis using all available data. These data allow for an assessment of the "injury health" of the population (community, state, or region) and will allow for the assessment of whether injury prevention programs are available, accessible, effective, and efficient.

An ongoing part of injury epidemiology is public health surveillance. In the case of injury surveillance, the trauma system provides routine and systematic data collection and, along with its partners in public health, uses the data to complete injury analysis, interpretation, and dissemination of the injury information. Public health officials and trauma leaders should use injury surveillance data to describe and monitor injury events and emerging injury trends in their jurisdictions; to identify emerging threats that will call for a reassessment of priorities and/or reallocation of resources; and to assist in the planning, implementation, and evaluation of public health interventions and programs.

Optimal Elements

I. There is a thorough description of the epidemiology of injury in the system jurisdiction using population-based data and clinical databases. **(B-101)**

a. There is a thorough description of the epidemiology of injury mortality in the system jurisdiction using population-based data. **(I-101.1)**

b. There is a description of injuries within the trauma system jurisdiction, including the distribution by geographic area, high-risk populations (pediatric, elderly, distinct cultural/ethnic, rural, and others), incidence, prevalence, mechanism, manner, intent, mortality, contributing factors, determinants, morbidity, injury severity (including death), and patient distribution using any or all the following: vital statistics, ED data, EMS data, hospital discharge data, state police data (data from law enforcement agencies), medical examiner data, trauma registry, and other data sources. The description is updated at regular intervals. **(I-101.2)**
Note: Injury severity should be determined through the consistent and system-wide application of one of the existing injury scoring methods, for example, Injury Severity Score (ISS).

c. There is comparison of injury mortality using local, regional, statewide, and national data. **(I-101.3)**

d. Collaboration exists among EMS, public health officials, and trauma system leaders to complete injury risk assessments. **(I-101.4)**

e. The trauma system works with EMS and public health agencies to identify special at-risk populations. **(I-101.7)**

II. Collected data are used to evaluate system performance and to develop public policy. **(B-205)**

a. Injury prevention programs use trauma management information system data to develop intervention strategies. **(I-205.4)**

III. The trauma, public health, and emergency preparedness systems are closely linked. **(B-208)**

a. The trauma system and the public health system have established linkages, including programs with an emphasis on population based public health surveillance and evaluation for acute and chronic traumatic injury and injury prevention. **(I-208.1)**

IV. The jurisdictional lead agency, in cooperation with the other agencies and organizations, uses analytic tools to monitor the performance of population-based prevention and trauma care services. **(B-304)**

a. The lead agency, along with partner organizations, prepares annual reports on the status on injury prevention and trauma care in the state, regional, or local areas. **(I-304.1)**

b. The trauma system management information system database is available for routine public health surveillance. There is concurrent access to the databases (ED, trauma, prehospital, medical examiner, and public health epidemiology) for the purpose of routine surveillance and monitoring of health status that occurs regularly and is a shared responsibility. **(I-304.2)**

Current Status

The Santa Clara County (SCC) Emergency Medical Services (EMS) Agency is fortunate to have a full time epidemiologist with 20% time dedicated to the trauma system program. Having an epidemiologist focus exclusively on the trauma and EMS data systems has enabled the epidemiologist to gain expertise regarding metrics for evaluation of trauma and EMS system performance.

The epidemiologist has access to California vital records and the Hospital Discharge dataset, available through the California web-based epidemiologic resource, Epicenter. Additional data resources include the county trauma registry, the prehospital data for dispatch, EMS, fire, air medical transport, and the Statewide Integrated Traffic Records System (SWITRS). The pattern of injury by mortality, age, ethnicity, and injury mechanisms is easily retrieved with available data sets. Additional databases could potentially be used to further understand mechanisms of injury, such as the Youth Risk Surveillance System (YBRSS) and the Behavior Risk Factor Surveillance System (BRFSS). The hospital discharge dataset could also be used to estimate the under-triage rate from acute care facilities.

While data is readily available, the trauma program does not present the data in a format that informs the public about injury and injury care in Santa Clara County. Templates for such reports are available from states that recently had Centers for Disease Control and Prevention (CDC) Core Injury grants. Preparing the injury data in a format with graphics and interpretation, such as a report for elected officials, injury prevention advocates, and the general public would be helpful when informing the public about the value of the trauma system.

The epidemiologist also serves in a database registrar role, occasionally throughout the year, working to solve problems with the software vendor and managing data validation. While this is essential for the SCC EMS Agency's data quality, it limits the time the epidemiologist has available to prepare more-detailed injury and time-sensitive condition epidemiologic reports and to analyze data for performance improvement. The SCC EMS Agency may consider hiring a database registrar to manage software vendor and validation activities, which would also relieve the epidemiologist from this responsibility, outside of her primary role.

The SCC EMS Agency prepares an annual trauma system report for the County Board of Supervisors that includes some information about the trauma system, as well as the EMS response. While this report is posted on the SCC EMS Agency's website, it is buried and found only if a specific search by name is conducted. This report contains important public information about the need for and value of the trauma and EMS systems. This report should have a more visible location on the SCC EMS Agency website, such as on public information page.

Recommendations

- Use the hospital discharge dataset to obtain the number of injured patients treated at the acute care facilities that are not transferred to a trauma center to calculate the estimated under-triage rate.

- Identify opportunities for the epidemiologist to gain additional education in injury epidemiology and the use of epidemiology software, such as geographic information system (GIS) mapping and probabilistic linkage, to enhance reporting about injuries and injury care in Santa Clara County.

- Develop a comprehensive report of injuries and trauma care for Santa Clara County with comparisons to the state and Bay Area region.

- Prepare an executive summary of the injury report with key information and graphics for use in educating elected officials and the public.

- Post the injury report and the Annual Trauma System Report in a prominent position on the Santa Clara County Emergency Medical Services Agency website to promote the trauma system and its importance for the Santa Clara County residents.
    - Post the new injury report on the Santa Clara County Public Health Department website to increase the number of injury advocates who have access to the data.

- Decrease reliance on the epidemiologist for the management of trauma registry and software vendor issues to increase the time available for data analysis and reporting.

Indicators as a Tool for System Assessment

Purpose and Rationale

In the absence of validated national benchmarks, or norms, the benchmarks, indicators and scoring (BIS) process included in the Health Resources and Services Administration's *Model Trauma System Planning and Evaluation* document provides a tool for each trauma system to define its system-specific health status benchmarks and performance indicators and to use a variety of community health and public health interventions to improve the community's health status. The tool also addresses reducing the burden of injury as a community-wide public health problem, not strictly as a trauma patient care issue.

This BIS tool provides the instrument and process for a relatively objective state and sub-state (regional) trauma system self-assessment. The BIS process allows for the use of state, regional, and local data and assets to drive consensus responses to the BIS. It is essential that the BIS process be completed by a multidisciplinary stakeholder group, most often the equivalent of a state trauma advisory committee. The BIS process can help focus the discussion on various system strengths and weaknesses, can be used to set goals or benchmarks, and provides the opportunity to target often limited resources and energies to the areas identified as most critical during the consensus process. The BIS process is useful to develop a snapshot of any given system at a moment in time. However, its true usefulness is in repeated assessments that reveal progress toward achieving various benchmarks identified in the previous application of the BIS. This process further permits the trauma system to refine goals to be attained before future reassessments using the tool.

Optimal Element

I. Assurance to constituents that services necessary to achieve agreed-on goals are provided by encouraging actions of others (public or private), requiring action through regulation, or providing services directly. **(B-300)**

Current Status

The SCC EMS Agency values system assessment to help improve the trauma system as evidenced by past formal system consultations and the request for the current trauma system consultation (TSC). The SCC EMS Agency has not previously conducted a self-assessment using the Benchmarks, Indicators, and Scoring (BIS) tool contained in the 2006 Health Resources and Services Administration *Model Trauma Systems Planning and Evaluation* document. The SCC EMS Agency's Specialty Program Nurse Coordinator (SPNC) had previously used the BIS tool in another region.

The 16 indicators from the BIS tool selected by the American College of Surgeons (ACS) for completion by trauma systems having a TSC were completed by SCC EMS Agency. The trauma centers' trauma program managers (TPMs) assigned the scores, which were then reviewed by the Trauma Executive Committee prior to submission. The SCC EMS Agency has no plans to perform a BIS self-assessment with all 113 indicators in the near future.

Recommendations

- Identify a timeline to perform a self-assessment of the Santa Clara County Emergency Medical Services Agency's trauma system using the Benchmarks Indicators and Scoring tool with a large group of stakeholders representing all programs contributing to the trauma system.

- Use the findings from the self-assessment to guide strategic planning for trauma system development.

- Plan for repeated self-assessments (e.g., every 5 years) to monitor progress in trauma system development.

TRAUMA SYSTEM POLICY DEVELOPMENT

Statutory Authority and Administrative Rules

Purpose and Rationale

Reducing morbidity and mortality due to injury is the measure of success of a trauma system. A key element to this success is having the legal authority necessary to improve and enhance care of injured people through comprehensive legislation and through implementing regulations and administrative code, including the ability to regularly update laws, policies, procedures, and protocols. In the context of the trauma system, comprehensive legislation means the statutes, regulations, or administrative codes necessary to meet or exceed a pre-described set of standards of care. It also refers to the operating procedures necessary to continually improve the care of injured patients from injury prevention and control programs through post-injury rehabilitation. The ability to enforce laws and rules guides the care and treatment of injured patients throughout the continuum of care.

There must be sufficient legal authority to establish a lead trauma agency and to plan, develop, maintain, and evaluate the trauma system during all phases of care. In addition, it is essential that as the development of the trauma system progresses, included in the legislative mandate are provisions for collaboration, coordination, and integration with other entities also engaged in providing care, treatment, or surveillance activities related to injured people. A broad approach to policy development should include the building of system infrastructure that can ensure system oversight and future development, enforcement, and routine monitoring of system performance; the updating of laws, regulations or rules, and policies and procedures; and the establishment of best practices across all phases of intervention. The success of the system in reducing morbidity and mortality due to traumatic injury improves when all service providers and system participants consistently comply with the rules, have the ability to evaluate performance in a confidential manner, and work together to improve and enhance the trauma system through defined policies.

Optimal Elements

I. Comprehensive state statutory authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development. **(B-201)**

a. The legislative authority states that all the trauma system components, emergency medical services (EMS), injury control, incident management, and planning documents work together for the effective implementation of the trauma system (infrastructure is in place). **(I-201.2)**

b. Administrative rules and regulations direct the development of operational policies and procedures at the state, regional, and local levels. **(I-201.3)**

II. The lead agency acts to protect the public welfare by enforcing various laws, rules, and regulations as they pertain to the trauma system. **(B-311)**

a. Laws, rules, and regulations are routinely reviewed and revised to continually strengthen and improve the trauma system. **(I-311.4)**

Current Status

The State of California has enabling legislation that provides broad trauma system authority to the California EMS Authority and Local EMS Agencies (LEMSAs). In 1980 the Emergency Medical Services System and Prehospital Emergency Care Personnel Act (SB 125) were passed. The Act provided the foundation for EMS in California by creating the EMS Authority and adding Division 2.5 to the Health and Safety Code, Sections 1797-1799.

California has a two-tier structure for managing and regulating the statewide EMS and trauma system. The California EMS Authority is the lead agency for establishing minimum statewide standards and performing overall monitoring of the statewide system. LEMSAs are the lead agency for the EMS and trauma system at the county or regional level. Each LEMSA has regulatory authority.

The SCC EMS Agency is the responsible LEMSA to develop, plan and implement the EMS and trauma system policy in Santa Clara County. This is accomplished through agreements with acute care facilities and trauma centers, the trauma center designation process, and SCC EMS Agency policy. Whenever possible various advisory groups and committees are provided with the opportunity to submit comments to the SCC EMS Agency prior to initial or revised policy implementation. The SCC EMS Agency Director, or designee, may issue Administrative Orders when immediate changes are necessary to protect the public's health and safety. Administrative Orders bypass the review processes and are valid for no greater than one year without being reissued.

The policies of the SCC EMS Agency are scheduled for review every 3 years. This process was described as being very time intensive, and some policies were reported to be more than 4 years old. The SCC EMS Agency has been actively engaged in the review and revision of their policies. It was reported that more than 120 policies (mostly EMS protocols) were revised within the last year. The represented Trauma Centers reported being satisfied with the recent progress made by the SCC EMS Agency.

Though an approved trauma plan is in place the trauma system retains an exclusive model, as all acute care facilities are not integrated into the trauma system. The SCC EMS Agency is authorized to exercise contractual agreements with all of the county's acute care facilities to assure that an organized system of care exists for residents. It is unclear how the current agreement process or language assures the inclusion of all acute care facilities in the over-all trauma system, as the process has historically focused exclusively on designated centers. Contracting language is descriptive, and the non-designated acute care facilities are asked to submit data to the SCC EMS Agency regarding the care provided to injured individuals. The TSC team repeatedly heard during interviews that despite this requirement, these acute care facilities do not submit this data. One explanation reported was that the SCC EMS agency does not have the resources to collect hospital outcomes information into a database, even though other trauma, stroke and STEMI data is collected into one. The agency does have a trauma registry and can maintain and analyze the data. While not pursuing trauma center designation, the acute care facilities are actively pursuing recognition as designated stroke and STEMI centers, under agreement with the county.

The SCC EMS Agency reported that it has limited authority to mandate trauma system participation of the acute care facilities, except by prohibiting the acceptance of 911 patients. However, the SCC EMS Agency has established policy for the uniform investigation and

enforcement of prehospital care and personnel that includes financial penalties. Policy or agreements are silent regarding the imposition of similar penalties to trauma centers and acute care facilities that are noncompliant with provisions of the agreement. Acute care facilities are not subjected to a fee structure that imposes financial penalties or from potentially being prohibited from designation as a stroke or STEMI center for failing to meet contract specifications for data submission and participation in an inclusive trauma system.

Recommendations

- **Revise the hospital contracting language for 9-1-1 receiving centers:**
  - **Outline detailed specifications for participation in the trauma system, including submission of a minimal dataset.**
  - **Outline penalties for failure to comply with contract specifications.**

- Collaborate with other Local Emergency Medical Services Agencies and the California Emergency Medical Service Authority to revise state trauma regulations.

- Develop policy to ensure that the Santa Clara County Emergency Medical Services Agency has sufficient personnel resources to fulfill its mandate to regulate all aspects of the emergency medical services and trauma systems.

System Leadership

Purpose and Rationale

In addition to lead agency staff and consultants (for example, trauma system medical director), there are other significant leadership roles essential to developing mature trauma systems. A broad constituency of trauma leaders includes trauma center medical directors and nurse coordinators, prehospital personnel, injury prevention advocates, and others. This broad group of trauma leaders works with the lead agency to inform and educate others about the trauma system, implements trauma prevention programs, and assists in trauma system evaluation and research to ensure that the right patient, right hospital, and right time goals are met. There is a strong role for the trauma system leadership in conveying trauma system messages, building communication pathways, building coalitions, and collaborating with relevant individuals and groups. The marketing communication component of trauma system development and maintenance begins with a consensus-built public information and education plan. The plan should emphasize the need for close collaboration between coalitions and constituency groups and increased public awareness of trauma as a disease. The plan should be part of the ongoing and regular assessment of the trauma system and be updated as frequently as necessary to meet the changing environment of the trauma system.

When there are challenges to providing the optimal care to trauma patients within the system, the leadership needs to effect change to produce the desired results. Broad system improvements require the ability to identify challenges and the resources and authority to make changes to improve system performance. However, system evaluation is a shared responsibility. Although the leadership will have a key role in the acquisition and analysis of system performance data, the multidisciplinary trauma oversight committee will share the responsibility of interpreting those data from a broad systems perspective to help determine the efficiency and effectiveness of the system in meeting its stated performance goals and benchmarks. All stakeholders have the responsibility of identifying opportunities for system improvement and bringing them to the attention of the multidisciplinary committee or the lead agency. Often, subtle changes in system performance are noticed by clinical care providers long before they become apparent through more formal evaluation processes.

Perhaps the biggest challenge facing the lead agency is to synergize the diversity, complexity, and uniqueness of individuals and organizations into an integrated system for prevention of injury and for the provision of quality care for injured patients. To meet this challenge, leaders in all phases of trauma care must demonstrate a strong desire to work together to improve care provided to injured victims.

Optimal Elements

I. Trauma system leaders (lead agency, trauma center personnel, and other stakeholders) use a process to establish, maintain, and constantly evaluate and improve a comprehensive trauma system in cooperation with medical, professional, governmental, and other citizen organizations. **(B-202)**

II. Collected data are used to evaluate system performance and to develop public policy. **(B-205)**

III. Trauma system leaders, including a trauma-specific statewide multidisciplinary, multiagency advisory committee, regularly review system performance reports. **(B-206)**

IV. The lead agency informs and educates state, regional, and local, constituencies and policy makers to foster collaboration and cooperation for system enhancement and injury control. **(B-207)**

Current Status

The SCC trauma system was designed and conceived in the late 1980's, following an exclusive trauma system philosophy. This trauma system model concentrates exclusively on the management of the severely injured patient, characterized as the major trauma victim (MTV) in county policy. The SCC trauma system has functioned at a high level for more than 20 years.

The underlying structure of the trauma system has not been updated to reflect the more current public health-based inclusive model intended to address the broader spectrum of injury. As a result, organized injury care is isolated to the three designated trauma centers with minimal participation from the other eight acute care facilities. Adoption of an inclusive trauma system approach has the potential to increase the engagement of these acute care facilities, improving care for the patients with less severe injuries, enabling a more population-based assessment of the burden of injury, and enhancing surge capacity in case of disaster or mass casualty incident (MCI). This model acknowledges the fact that all acute care facilities will care for injured patients, and should participate in the trauma system at a level appropriate to their capacity and population need.

The leadership structures are well established, with consistent involvement of the core stakeholder group derived from the three trauma centers, the EMS community, and the SCC EMS Agency. The trauma system is integrated into the EMS system and benefits from its networks of providers and committees that assure system coordination and accountability. Participants present during the TSC reported a good relationship between the stakeholders and the SCC EMS Agency, despite past instability of agency leadership. The stakeholders reported that the current SCC EMS Agency Director and EMS Medical Director are open, responsive, and committed to improvement of the trauma system. The TSC review team perceived a strong feeling of cooperation and collaboration between the SCC EMS Agency and the trauma system advisory committees.

Consistent with the current trauma system design, the system leadership is strongly focused on the three trauma centers, which contribute the majority of active representation to the advisory committees. The Trauma Care System Quality Improvement Committee (TCSQIC), a collaborative group of regional medical providers, serves as an advisory body to the SCC EMS Medical Director for the administration of the system-wide quality improvement program and monitoring trauma center performance improvement activities. The three trauma centers have a strong relationship that demonstrates significant mutual trust and a willingness to share and learn from their combined experience. The TCSQIC routinely evaluates the trauma system using a number of metrics to assess how well the system is meeting population need, the quality of care, and the overall efficiency of the process. Though this analysis is regularly performed, the processes used are not well-described or codified in policy.

The TCSQIC and its Trauma Executive Committee have a relatively narrow base of functional stakeholder involvement, specifically lacking regular representation from non-designated acute care facilities. While this representation is consistent with the current system design parameters,

engaging a broader constituency that reflects an inclusive trauma systems approach would strengthen the trauma system. In particular, the degree of disengagement of the non-designated acute care facilities presents challenges in regional resource utilization, surge capacity for disaster and MCI, and in collection of data that are truly population-based. Increased multidisciplinary representation reflecting the continuum of trauma care would also be beneficial.

Along with efforts to broaden the stakeholder representation on the trauma advisory committee, the trauma system would benefit from more concentrated efforts to educate and inform the public, regional stakeholders, and policy makers regarding the function and accomplishments of the trauma system and the SCC EMS agency. These efforts will be important to generate support for much-needed expansion of human resources within the lead agency.

Recommendations

- **Establish an updated vision for the trauma system that embraces an inclusive trauma system model.**

- **Develop a policy and procedure for ongoing assessment of the trauma system effectiveness, specifically addressing the:**
    - **Number and level of trauma centers**
    - **Trauma catchment areas**
    - **Role of non-designated acute care facilities**
    - **Cooperation and interaction with neighboring counties**

- Broaden stakeholder involvement in the Trauma Care System Quality Improvement Committee, specifically including representation from all acute care facilities.

- Increase efforts to inform and educate the public, regional stakeholders, and policy makers regarding the trauma system and injury control.

Coalition Building and Community Support

Purpose and Rationale

Coalition building is a continuous process of cultivating and maintaining relationships with constituents (interested citizens) in a state or region who agree to collaborate on injury control and trauma system development. Key constituents include health professionals, trauma center administrators, prehospital care providers, health insurers and payers, data experts, consumers and advocates, policy makers, and media representatives. The coalition of key constituents comprises the trauma system's stakeholders. The involvement of these key constituents is important for the following:

- Trauma system plan development
- Regionalization: promoting collaboration rather than competition between trauma centers
- System integration
- State policy development: authorizing legislation and regulations
- Financing initiatives
- Disaster preparedness

The coalition should be effectively organized through the formation of multidisciplinary state and regional advisory groups to coordinate trauma system planning and implementation efforts. Constituents also communicate with elected officials and policy leaders regarding the development and sustainability of the trauma system. Information and education are needed by constituents to be effective partners in policy development for trauma system planning. Regular communication about the status of the trauma system helps these key partners to recognize needs and progress made with trauma system implementation.

One of the most effective ways to educate elected officials and the public is through an organized public information and education effort that may involve a media campaign about the burden of injury in the state and the need for trauma system development. Information and education are important to reduce the incidence of injury in all age groups and to demonstrate the value of an effective trauma system when a serious injury occurs.

Optimal Element

I. The lead agency informs and educates state, regional, and local constituencies and policy makers to foster collaboration and cooperation for system enhancement and injury control. **(B-207)**

Current Status

The SCC EMS Agency has several committees with stakeholder representation that serve as its coalition for trauma and EMS system development. The multidisciplinary Emergency Medical Care Committee (EMCC) is a subcommittee of the Health Advisory Commission, which reports directly to the SCC Board of Supervisors. The EMCC provides input on the EMS strategic plan, Annual Trauma Report, EMS system and trauma system plans, and injury prevention activities.

The SCC EMS Agency also has a Trauma Care System Quality Improvement Committee (TCSQIC) that is advisory to the SCC EMS Agency Medical Director. This committee has a wide variety of trauma system constituents including trauma surgeons, emergency department (ED) representatives, and prehospital medical directors. The TCSQIC has limited representation from rehabilitation and injury prevention stakeholders, who are included on an ad-hoc bases; however, the public is currently not integrated, even in a limited capacity, with no representation within the TCSQIC. The committee appears to be very active and provides input on trauma system issues, trends, quality improvement, research, education, treatment, regional and state initiatives, planning and provides standardized review of trauma care.

The Bay Area Regional Trauma Coordinating Committee (RTCC) includes representation from eight contiguous counties in the San Francisco Bay area. It serves as a forum to promote collaboration and system integration between LEMSAs, trauma centers, acute care hospitals and EMS providers. The Bay Area RTCC includes the state trauma system coordinator, representatives from county trauma systems, the trauma centers, acute care hospitals, prehospital providers, and EMS medical directors. It was reported that attendance by the hospitals without trauma designation is sporadic. However, one major accomplishment of this committee was the development and distribution of the re-triage guide and poster that is used for all acute care facilities. This guide has helped to facilitate the stabilization and rapid transfer of patients to trauma centers that can best meet the patient's needs.

The SCC EMS Agency Medical Director and SPNC actively represent the county trauma system at regional and state forums, including the state's Performance Improvement and Patient Safety (PIPS) Plan subcommittee, other state and regional planning activities and the annual California Trauma Summit.

The SCC EMS Agency generally mobilizes its stakeholders through the various committees. The committees meet either quarterly or bi-monthly and minutes are maintained. The agency's website, Facebook and Twitter pages are used to communicate with the public, providers and stakeholders. The website is also designed to collect information about issues and concerns with the trauma system, using the variance reporting system to alert program staff about these issues.

The SCC EMS Agency should be commended for its effort to identify a specific goal in the trauma plan to "Promote public awareness and information regarding trauma services and injury prevention." A video reflecting the operations of the EMS system was developed. However, the video does not describe the need for or value of a trauma system, or the aspects of the EMS system that impacts the public and policymakers. An approach could be for the SCC EMS Agency to develop a public assessment survey to determine the public's current understanding of the trauma system. After the Trauma Managers Association of California produces a video or other public awareness material, ensure that they are widely disseminated in the county. The public assessment survey could be re-administered to determine the effectiveness of the public awareness materials.

The SCC EMS Agency also joined the coalition with the SCC Public Health Department and the California Highway Patrol to develop a pedestrian safety program. This broad-based coalition includes representation from urban planning, other county agencies, and community organizations. Other coalitions in which the SCC EMS Agency participates include the Emergency Medical Services for Children (EMSC) program, highway safety, preparedness healthcare, and injury prevention. Trauma system stakeholders are encouraged to continue

participation in these forums to expand the trauma system stakeholder base, enhance planning and policy development, and to the share resources.

5Recommendations

- Seek opportunities to engage and collaborate with the Emergency Medical Services for Children program and other associated coalitions to increase public awareness about the trauma system and to promote injury prevention efforts.

- Continue participation with the Trauma Managers Association of California and collaborate on the development of public awareness resources.
    - Widely disseminate trauma system public awareness materials throughout Santa Clara County.

- Engage the Trauma Executive Committee (TEC), Trauma System Care Quality Improvement Committee (TSCQIC), and the Santa Clara County trauma manager group to develop a survey to assess the public's view of the county's trauma centers and trauma system.

- Enhance the membership of trauma system committees, subcommittees or workgroups to include consumers, payers, elected officials, injury prevention advocates, and rehabilitation specialists.

- Collaborate with partners, such as Highway Safety and the Public Health Department, to develop integrated injury prevention strategic plans based on injury epidemiology and implement targeted prevention programs.

- Continue efforts to accomplish public awareness goals outlined in the Emergency Medical Services' strategic plan and report the status to the Trauma Executive Committee and TSCQIC.
    - Seek input from these committee members when making future plans regarding trauma system public awareness.

- Continue participation in the Bay Area Regional Trauma Coordinating Committee.
    - Use this forum to enhance trauma system integration and performance improvement, as well as to share resources for public awareness, and injury prevention activities.

Lead Agency and Human Resources within the Lead Agency

Purpose and Rationale

Each trauma system (state, regional, local, as defined in state statute) should have a lead agency with a strong program manager who is responsible for leading the trauma system. The lead agency, usually a government agency, should have the authority, responsibility, and resources to lead the planning, development, operations, and evaluation of the trauma system throughout the continuum of care. The lead agency, empowered through legislation, ensures system integrity and provides for program integration with other health care and community-based entities, namely, public health, EMS, disaster preparedness, emergency management, law enforcement, social services, and other community-based organizations.

The lead agency works through a variety of groups to accomplish the goals of trauma system planning, implementation, and evaluation. The ability to bring multidisciplinary, multiagency advisory groups together to accomplish trauma system goals is essential in developing and maintaining the trauma system and is part of providing leadership to evolving and mature systems.

The lead agency's trauma system program manager coordinates trauma system design, the adoption of minimum standards (prehospital and in-hospital), and provides for overall system evaluation through performance indicator assessment and assurance. In addition to a trauma program manager, the lead agency must be sufficiently staffed to actively participate in each phase of development and in maintaining the system through a clearly defined structure for decision making (policies and procedures) and through proactive surveillance and evaluation. *Minimum* staffing usually consists of a trauma system program manager, data entry and analysis personnel, and monitoring and compliance personnel. Additional staff resources include administrative support and a part-time commitment from the public health epidemiology service to provide system evaluation and research support.

Within the leadership and governance structure of the trauma system, there is a role for strong physician leadership. This role is usually fulfilled by a full- or part-time trauma medical director within the lead agency.

Optimal Elements

I. Comprehensive state statutory authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development. **(B-201)**

a. The legislative authority (statutes and regulations) plans, develops, implements, manages, and evaluates the trauma system and its component parts, including the identification of the lead agency and the designation of trauma facilities. **(I-201.1)**

b. The lead agency has adopted clearly defined trauma system standards (for example, facility standards, triage and transfer guidelines, and data collection standards) and has sufficient legal authority to ensure and enforce compliance. **(I-201.4)**.

II. Sufficient resources, including financial and infrastructure-related, support system planning, implementation, and maintenance. **(B-204)**

Current Status

The State of California has a two-tier structure for administrative leadership. The California EMS Authority, a department of the California Health and Human Services Agency, is the state lead agency for the trauma system. Each county designates a LEMSA that serves as the lead agency for the implementation and operation of the local trauma system. The SCC EMS Agency is the designated LEMSA for Santa Clara County. The SCC EMS Agency is charged with implementation and oversight of comprehensive emergency care delivery services that includes the trauma system, as well as emergency medical services, stroke, and STEMI.

The SCC EMS was recently restructured and moved from the SCC Public Health Department to its current home as part of the Health and Hospital Committee. The restructuring established the SCC EMS Agency as an independent SCC department. With restructuring, the SCC EMS Agency has a direct line of report to the Deputy County Executive Officer.

While making great strides over its long history and through reorganization, the SCC EMS Agency does not have personnel that are solely dedicated to the trauma system. Personnel resources are leveraged from or shared with other programs within the SCC EMS Agency to accomplish much of the trauma system work. Specifically, the resources available include the following:

- The EMS Director provides the administrative direction and leadership for the trauma system. An interim director currently fills this position. The EMS Director is allocated 0.03 full time equivalents (FTE) to the trauma system.
- The SCC EMS Medical Director position was recently increased to full time status. This individual provides clinical leadership and medical control for EMS, the trauma system, and other time-sensitive conditions. An estimated 0.10 FTE time of the EMS Medical Director is dedicated to trauma system.
- The Specialty Program Nurse Coordinator (SPNC) has more than 13 years' experience in trauma system management, with 2.6 of those years at the SCC EMS Agency. The day-to-day activities required to manage the comprehensive trauma system are the responsibility of this individual. The workload for SPNC continues to build with the integration of the stroke and STEMI programs, as well as EMS for Children coordination. While passionate about the trauma system, the SPNC dedicates only 0.25 FTE to trauma system activities.
- An epidemiologist position was added to the SCC EMS Agency in 2014, to expand clinical programs, develop data reporting methods, and support research. This position is reported to have ongoing dialogue with the trauma registry vendor and responsibility for validation of data submissions. These activities limit this individual's time, and may detract from a focus on traditional epidemiology functions, such as the enhancement of the reports and research centered on trauma and EMS. This position has approximately 0.20 FTE dedicated to the trauma system, while the remaining FTE is allocated between stroke, STEMI, EMS QI and other acute care foci.
- An EMS Specialist from the SCC EMS Agency may be used for specific tasks related to the trauma system. It is estimated that individuals in the EMS Specialist role contribute 0.13 FTE to the trauma system.

Combining all positions, a total of 0.71 FTE is dedicated to the trauma system. The biggest impediment to further trauma system development is the limited personnel within the SCC EMS Agency to promote planning and implementation.

Representatives from the designated trauma centers and the SCC EMS Agency expressed significant interest in the trauma system and its ongoing development. The individual trauma centers often assumed leadership roles in the trauma system when the SCC EMS Agency previously was unresponsive or hindered due to staffing. The restructuring has mitigated many of the trauma center concerns, and the SCC EMS Agency is now focused on clinical aspects of the overall system. However, the SCC EMS Agency personnel will continue to be pulled away from the trauma system activities as the stroke and STEMI centers demand additional attention.

With the current level of staffing and the forecasted activities, the SCC EMS Agency appears to lack sufficient resources to meet the demands of all programs. For example, the agency does not have an individual to fill the roles of a qualified data system registrar and an internal information technology support position. Filling these positions could also assist with further implementation of data registries for the stroke and STEMI programs.

Because of the future complexities, an additional SPNC position would be beneficial to assist with coordination of the other time-sensitive condition programs within the SCC EMS Agency. This would allow the current SPNC to devote more time for further development of the trauma system with participation by designated trauma centers and acute care facilities.

Recommendations

- **Provide an additional two or three full time equivalent positions for additional support and technical assistance of the trauma system and time-sensitive conditions to potentially include the following:**
    - **Registrar/data analyst**
    - **Information technology (IT) support**
    - **Specialty Programs Nurse Coordinator**

Trauma System Plan

Purpose and Rationale

Each trauma system, as defined in statute, should have a clearly articulated trauma system planning process resulting in a written trauma system plan. The plan should be built on a completed inventory of trauma system resources identifying gaps in services or resources and the location of assets. It should also include an assessment of population demographics, topography, or other access enhancements (location of hospital and prehospital resources) or barriers to access. It is important that the plan identify special populations (for example, pediatric, elderly, in need of burn care, ethnic groups, rural) within the geographic area served and address the needs of those populations within the planning process. A needs assessment (or other method of identifying injury patterns, patient care review/preventable death study) should also be completed for initial trauma system planning and updated periodically as needed to assess system changes over time.

The trauma system plan is developed by the lead trauma agency based on the results of a needs assessment and other data resources available for review. It describes the system design, integrated and inclusive, with adopted standards of care for prehospital and hospital personnel and a process to regularly review the plan over time. The plan is built on input from trauma advisory committees (or stakeholder groups) that assist in analyzing data, identifying resources, and developing system standards of care, including system policies and procedures and overall system design. Ideally, although every stakeholder group may not be satisfied with the plan or system design, the plan, to the extent possible, should be based on consensus of the advisory committees and stakeholder groups. These advisory groups should be able to review the plan before final adoption and approve the plan before it is submitted to the lead agency with authority for plan approval.

The trauma system plan is used to guide system development, implementation, and management. Each component of the trauma system (for example, prehospital, hospital, communications, and transportation) is clearly defined and an established service level identified (baseline) with goals for enhancement (benchmark). Within the plan are incorporated other planning documents used to ensure integration of similar services and build collaboration and cooperation with those services. Service plans for emergency preparedness, EMS, injury prevention and control, public health, social services, and mental health are examples of services for which the trauma system plan should include an interface between agencies and services.

Optimal Element

I. The state lead agency has a comprehensive written trauma system plan based on national guidelines. The plan integrates the trauma system with EMS, public health, emergency preparedness, and incident management. The written trauma system plan is developed in collaboration with community partners and stakeholders. **(B-203)**

a. The trauma system plan clearly describes the system design (including the components necessary to have an integrated and inclusive trauma system) and is used to guide system implementation and management. For example, the plan includes references to regulatory standards and documents and includes methods of data collection and analysis. **(I-203.4)**

Current Status

The SCC EMS Agency is vested with authority in Title 22 for planning, implementing, managing and evaluating the SCC trauma system. The SCC Agency developed its first trauma system plan in 1986. In accordance with the 1999 promulgated revisions of the California State Regulations, Santa Clara County provided the California EMS Authority an amended plan. The SCC trauma system plan received final approval from the California EMS Authority in 2001.

Following an external review and needs assessment by the Abaris group in 2005, the trauma system plan was revised in 2008, and again in 2010 and 2015. The current version is a comprehensive document of approximately 250 pages, following the California EMS Authority template. The most recent update includes specific goals and objectives with an implementation schedule. The trauma system plan is reviewed and updated annually by SCC EMS Agency staff, with input from the Trauma Executive Committee. The plan is submitted to the Emergency Medical Care Committee (EMCC), and then to the Health and Hospital Committee for approval prior to submission to the California EMS Authority.

Santa Clara County continues to experience population growth and community development, especially in the southern portion of the county. Santa Clara County's geography varies from sea level areas to mountainous terrain. Many areas of the county are undeveloped, while the northern portion is largely developed and heavily populated.

The SCC trauma centers additionally serve the population from neighboring counties (Alameda, San Mateo, Santa Cruz, San Benito and Monterey). The Bay Area RTCC is intended to facilitate regional system development, but it has no statutory authority. This RTCC does provide a forum for communication between trauma centers and EMS providers in the multi-county region. The collaboration within the RTCC was reported to result in the appropriate distribution of injured patients within the region and across county lines as necessary.

The SCC trauma system plan states the design is inclusive, with all acute care facilities working together to provide the best possible outcome for the trauma patient. The field trauma triage criteria identifies the "major trauma victims" and directs EMS providers to triage and transport them to the closest, most appropriate designated trauma center. Acute care facilities are responsible for stabilizing "in extremis" patients, and evaluating patients who walk-in or have a delayed presentation of traumatic injury prior, to transferring them to the nearest designated trauma center. However, due to short EMS transport times and easily accessible trauma centers, these acute care facilities have limited engagement with the trauma system, resulting in a more exclusive trauma system model.

The identified catchment areas for trauma patients are based on geographic considerations, as well as other factors affecting access, such as traffic conditions. The catchment areas were established following the 2005 Abaris consultation, and they have remained stable since that time. By system design, trauma patients with major injuries are transported from the field directly to the trauma center that affords them the shortest time to definitive care. Burn patients are transported directly to the regional burn center at Valley Medical Center, verified by the American Burn Association (ABA). Pediatric patients with serious injury are transported directly the closest Pediatric Trauma Center. Patients with spinal cord injury and traumatic brain injury are transported the nearest designated trauma center.

A policy and a specific process for a trauma system needs-based assessment with identified metrics should be created and implemented. Potential metrics may include elements such as current and projected changes in population growth and density; trauma patient volume and number with an injury severity score (ISS) greater than 15; distribution of existing trauma centers; transport times to trauma centers; and diversion times. Plans for new trauma centers in neighboring counties should also be factored into the metrics, as this will affect SCC trauma center patient volume. Once the needs-based assessment has been completed and analyzed, decisions regarding the number and distribution of trauma centers and their catchment areas can be made more effectively. The trauma system plan should then be revised and simultaneously streamlined and consolidated. That would make the trauma system plan more useful to the TCSQIC to guide ongoing development.

Recommendations

- **Develop a specific process and policy with metrics for needs-based assessment of possible changes to the trauma system.**
    - **Consider including elements such as current and projected changes in population growth and density, trauma patient volume, injury severity score greater than 15, distribution for existing trauma centers, transport times to trauma centers, diversion times, and plans of other counties to designate new trauma centers.**

- **Streamline, update, and consolidate the current trauma system plan.**

- Engage the Bay Area Regional Trauma Coordinating Committee to develop and adopt a regional trauma system plan with a focus on the potential location and Level (II, III or IV) of additional trauma centers, standardized field triage and destination protocols.

- Perform a comprehensive review and update of both county and regional trauma system plans in alignment with the California State Trauma Plan every 3-5 years.

System Integration

Purpose and Rationale

Trauma system integration is essential for the daily care of injured people and includes such services as mental health, social services, child protective services, and public safety. The trauma system should use the public health approach to injury prevention to contribute to reducing the entire burden of injury in a state or region. This approach enables the trauma system to address primary, secondary, and tertiary injury prevention through closer integration with community health programs and mobilizing community partnerships. The partnerships also include mental health, social services, child protection, and public safety services. Collaboration with the public health community also provides access to health data that can be used for system assessment, development of public policy, and informing and educating the community.

Integration with EMS is essential because this system is linked with the emergency response and communication infrastructure and transports severely injured patients to trauma centers. Triage protocols should exist for treatment and patient delivery decisions. Regulations and procedures should exist for online and off -line medical direction. In the event of a disaster affecting local trauma centers, EMS would have a major role in evacuating patients from trauma centers to safety or to other facilities or to make beds available for patients in greater need.

The trauma system is a significant state and regional resource for the response to mass casualty incidents (MCIs). The trauma system and its trauma centers are essential for the rapid mobilization of resources during MCIs. Preplanning and integration of the trauma system with related systems (public health, EMS, and emergency preparedness) are critical for rapid mobilization when a disaster or MCI occurs. The extensive impact of disasters and MCIs on the functioning of trauma centers and the EMS and public health systems within the affected region or state must be considered, and joint planning for optimal use of all resources must occur to enable a coordinated response to an MCI. Trauma system leaders need to be actively involved in emergency management planning to ensure that trauma centers are integrated into the local, regional, and state disaster response plans.

Optimal Elements

I. The state lead agency has a comprehensive written trauma system plan based on national guidelines. The plan integrates the trauma system with EMS, public health, emergency preparedness, and incident management. The written trauma system plan is developed in collaboration with community partners and stakeholders. **(B-203)**

a. The trauma system plan has established clearly defined methods of integrating the trauma system plan with the EMS, emergency, and public health preparedness plans. **(I-203.7)**

II. The trauma, public health, and emergency preparedness systems are closely linked. **(B-208)**

Current Status

The EMCC was recently created through a merger of the EMS Committee and the Prehospital Provider Group. The EMCC members are stakeholders engaged in care of time-sensitive conditions, including trauma, stroke and STEMI. This committee represents designated trauma centers, and acute care facilities designated as stroke and STEMI centers. The EMCC should be the focal point of system integration efforts. The collaborative planning by the EMCC offers an opportunity to develop a coordinated mass casualty mutual aid plan, to refine the rapid re-triage policy, and to seek other means to increase participation in an inclusive regional trauma system.

The SCC EMS Agency, EMS provider agencies, and trauma centers work closely with SCC Public Health Department on emergency management plans, drills, education and local activities. The SCC EMS Multiple Patient Management Plan (MPMP) was written with input from the trauma center leadership and EMS stakeholders. Santa Clara County recently demonstrated its capability for joint agency mass casualty event preparation when hosting Super Bowl 50 in February 2016.

Both the SCC EMS Agency and the SCC Public Health Department conduct injury epidemiology. Data are provided to various community organizations and stakeholders for prevention efforts. Both the EMS provider agencies and trauma centers actively participate in injury prevention activities, though this is not coordinated at by the SCC EMS Agency trauma system. The “Every 15 Minute” program, conducted annually in the school system, illustrates community collaboration with law enforcement, EMS and fire departments, high school educators, local hospitals, trauma centers, as well as a video production crew, community officials, funeral homes, and a wide cross-section of the community at- large. The program is a two-day production focused on prevention of traffic fatalities caused when teens drive while impaired.

The City of San Jose Parks, Recreation and Neighborhood Services have a collaborative partnership with the Santa Clara Valley Medical Center’s Violence Intervention and Clean Slate program. This program is sponsored through the City of San Jose's Mayor’s Gang Prevention Task Force Division, aimed at decreasing interpersonal violence in San Jose and throughout Santa Clara County.

The SCC EMS Agency is participating in a countywide task force to evaluate the increasing number of behavioral health transports within the County. This task force is developing a mobile emergency response unit aimed at decreasing the number of patients admitted into the healthcare system and diffusing crisis events at the scene. Santa Clara Valley Medical Center has an inpatient Behavioral Health Center that houses both adult and pediatric patients on campus.

The Child Death Review team evaluates the death of every child in the County. The Coroner’s Office and the SCC Public Health Department co-lead the team, and members include Child Protective Services, Behavioral Health, the District Attorney’s office, the SCC EMS Agency staff, and hospital representatives. The Child Death Review team is active in preventive efforts to reduce the number of accidental deaths in children within Santa Clara County.

Recommendations

- **Utilize the reorganized Emergency Medical Care Committee (EMCC) as the forum for coordinated interdepartmental planning for all time-sensitive conditions, including trauma, stroke and ST-elevation myocardial infarction (STEMI).**

- Enhance collaboration with public health, emergency management, law enforcement, social services, and other agencies to raise public awareness and support for the comprehensive care of injured patients.

Financing

Purpose and Rationale

Trauma systems need sufficient funding to plan, implement, and evaluate a statewide or regional system of care. All components of the trauma system need funding, including prehospital, acute care facilities, rehabilitation, and prevention programs. Lead agency trauma system management requires adequate funding for daily operations and other important activities such as advisory committee meetings, development of regulations, data collection, performance improvement, and public awareness and education. Adequate funding to support the operation of trauma centers and their state of readiness to care for seriously injured patients within the state or region is essential. The financial health of the trauma system is essential for ensuring its integrity and its improvement over time.

The trauma system lead agency needs a process for assessing its own financial health, as well as that of the trauma system. A trauma system budget should be prepared, and costs should be reported by each component, if possible. Routine collection of financial data from all participating health care facilities is encouraged to fully identify the costs and revenues of the trauma system, including costs and revenues pertaining to patient care, administrative, and trauma center operations. When possible, the lead agency financial planning should integrate with the budgets and costs of the EMS system and disaster, rehabilitation, and prevention programs to enable development of a comprehensive financial health report.

Trauma system financial planning should be related to the trauma plan outcome measures (for example, patient outcome measures such as mortality rates, length of stay, and quality-of-life indicators). Such information may demonstrate the value added by having a trauma system in place.

Optimal Elements

I. Sufficient resources, including financial and infrastructure-related, support system planning, implementation, and maintenance. **(B-204)**

a. Financial resources exist that support the planning, implementation, and ongoing management of the administrative and clinical care components of the trauma system. **(I 204.2)**

b. Designated funding for trauma system infrastructure support (lead agency) is legislatively appropriated. **(I-204.3)**

c. Operational budgets (system administration and operations, facilities administration and operations, and EMS administration and operations) are aligned with the trauma system plan and priorities. **(I-204.4)**

II. The financial aspects of the trauma systems are integrated into the overall performance improvement system to ensure ongoing fine tuning and cost-effectiveness. **(B-309)**

a. Collection and reimbursement data are submitted by each agency or institution on at least an annual basis. Common definitions exist for collection and reimbursement data and are submitted by each agency. **(I-309.2)**

Current Status

The SCC EMS Agency has several funding sources for the trauma system's administrative components of planning, implementation and evaluation. Sources of funding include the fees assessed for trauma center, stroke and STEMI designations, ambulance permits, EMS provider certifications, and the accreditation and approval of EMS training programs.

California Code provides statutory authority to Santa Clara County to assess fees for the designation and re-designation of trauma centers. After an analysis of direct, indirect and overhead costs associated with implementation of the trauma system designation process and the trauma system program, an annual program fee is determined and approved by the SCC Board of Supervisors. The annual fee is split equally between the trauma centers, and for each designated trauma center it is currently $105,000. The SCC EMS Agency recently increased the $100,000 annual fee by 5% to adjust for increasing costs, the first increase since 2011. The SCC EMS Agency also collects fees from stroke and STEMI-designated centers. While calculation of designation and program costs for these programs performed the same way, but the individual designated centers pay a smaller fee of $10,500 because the costs are divided between more centers.

Through SB 12 that authorized the Maddy Emergency Services Fund, physicians and hospitals receive funds to reimburse uncompensated emergency care, but these funds are not specifically for trauma care. The funds originate from an assessment on fines, penalties and forfeitures, and the account is administered by another county agency. The SCC EMS Agency is the recipient of 17% of the Maddy Fund (discretionary account), which is used for EMS purposes. For FY16-17 Santa Clara County projected revenues and expenses for the Maddy Fund at $3 million. However, the hospitals are experiencing a shift from uncompensated care to under-compensated care with the Affordable Care Act, which the Maddy Fund does not reimburse.

The SCC EMS Agency also receives some funds from the EMS Trust Fund, which was established as a revenue account to collect fines and penalties from EMS provider agencies not meeting contract expectations, such as ambulance response times. In 2001, the account had a balance of approximately $5 million, but the revenues have dwindled to $629,000 per year. The contracted EMS agencies are now meeting performance measures, and revenues have decreased substantially. It is anticipated that the EMS Trust Fund will be depleted by 2019. The EMS Trust Fund has been used by the SCC EMS Agency for training and education, system benefits, special initiatives, and the reserve account.

One prior source of funding through California's Trauma Care Fund, established in 2001, has not had funds allocated by the state legislature since 2006. The Richie Fund, a subset of the Maddy Fund legislation, serves to improve pediatric trauma care. However, Santa Clara County currently does not assess the additional fines that support the Richie Fund, nor does it benefit from this resource. The SCC EMS Agency also does not receive funding from other program sources such as the Hospital Preparedness Program, or Highway Safety. Partnering with the county, regional, or state organizations that manage these funds to accomplish common initiatives could potentially assist the SCC EMS agency to meet additional trauma system goals.

The Abaris Group conducted a trauma center financial performance assessment in 2005. The two designated trauma centers in 2005 voluntarily contributed financial information. No more recent trauma center financial viability assessments have been conducted.

The financial data tracking for the trauma system is limited currently to the SCC EMS Agency annual budget that reflects the revenues and expenses of the lead agency. This report is provided to the California EMS Authority, the SCC Board of Supervisors, and the Trauma Executive Committee.

With the implementation of Trauma One trauma registry software, an opportunity exists to collect limited financial information on primary and secondary payor sources and total charges. If the SCC EMS Agency were able to include the submission of these data elements as part of the trauma center and acute care facility agreements, it would be able to gain some financial information for the trauma system. These data could be easily analyzed and regularly reported in the annual reports.

While no specific financial goal is identified in the current trauma plan for system funding, the financial resources for administration of the trauma system appear to be in alignment with the trauma plan priorities. The recent trauma plan and annual report clearly demonstrate that the SCC EMS Agency utilizes funds received to designate trauma centers, implement the data collection system, conduct performance improvement activities, and support advisory committees. However, trauma system functions such as coalition building, injury prevention, outreach, performance improvement, data system management, and data analysis would benefit from additional funding. Additional funding is also needed to educate the public and policymakers about the need for a trauma system; assess the effectiveness of the patient care provided; enhance system integration with acute care facilities and LEMSAs in neighboring counties; and to ensure the implementation of an inclusive trauma system for the citizens of Santa Clara County.

Recommendations

- **Secure a stable and sustainable funding source to support additional trauma system program personnel in the Santa Clara County Emergency Medical Services (EMS) Agency to perform coalition building, outreach and injury prevention, data system management, and performance improvement functions.**

- Seek additional funding sources to support the collection of a minimum trauma dataset from all acute care facilities.

- Seek guidance from the California EMS Authority to identify sources of cost and value information.
    - Utilize the information to inform the public and elected officials about the importance of maintaining trauma center readiness and the need for the Santa Clara County trauma system.

TRAUMA SYSTEM ASSURANCE

Prevention and Outreach

Purpose and Rationale

Trauma systems must develop prevention strategies that help control injury as part of an integrated, coordinated, and inclusive trauma system. The lead agency and providers throughout the system should be working with business organizations, community groups, and the public to enact prevention programs and prevention strategies that are based on epidemiologic data gleaned from the system.

Efforts at prevention must be targeted for the intended audience, well defined, and structured, so that the impact of prevention efforts is system-wide. The implementation of injury control and prevention requires the same priority as other aspects of the trauma system, including adequate staffing, partnering with the community, and taking advantage of outreach opportunities. Many systems focus information, education, and prevention efforts directly to the general public (for example, restraint use, driving while intoxicated). However, a portion of these efforts should be directed toward emergency medical services (EMS) and trauma care personnel safety (for example, securing the scene, infection control). Collaboration with public service agencies, such as the department of health is essential to successful prevention program implementation. Such partnerships can serve to synergize and increase the efficiency of individual efforts. Alliances with multiple agencies within the system, hospitals, and professional associations, working toward the formation of an injury control network, are beneficial.

Activities that are essential to the development and implementation of injury control and prevention programs include the following:

- A needs assessment focusing on the public information needed for media relations, public officials, general public, and third-party payers, thus ensuring a better understanding of injury control and prevention
- Needs assessment for the general medical community, including physicians, nurses, prehospital care providers, and others concerning trauma system and injury control information
- Preparation of annual reports on the status of injury prevention and trauma care in the system
- Trauma system databases that are available and usable for routine public health surveillance

Optimal Elements

I. The lead agency informs and educates state, regional, and local constituencies and policy makers to foster collaboration and cooperation for system enhancement and injury control. **(B-207)**

a. The trauma system leaders (lead agency, advisory committees, and others) inform and educate constituencies and policy makers through community development activities, targeted media messaging, and active collaborations aimed at injury prevention and trauma system development. **(I-207.2)**

II. The jurisdictional lead agency, in cooperation with other agencies and organizations, uses analytic tools to monitor the performance of population based prevention and trauma care services. **(B-304)**

a. The lead agency, along with partner organizations, prepares annual reports on the status of injury prevention and trauma care in state, regional, or local areas. **(I-304.1)**

III. The lead agency ensures that the trauma system demonstrates prevention and medical outreach activities within its defined service area. **(B-306)**

a. The trauma system is active within its jurisdiction in the evaluation of community based activities and injury prevention and response programs. **(I-306.2)**

b. The effect or impact of outreach programs (medical and community training and support and prevention activities) is evaluated as part of a system performance improvement process. **(I-306.3)**

Current Status

Prevention

Trauma centers, fire fighters, and EMS providers are active in conducting a wide range of injury prevention programs in Santa Clara County. The injury mechanisms most commonly addressed include transportation-related injuries (motor vehicle, bicycle, and pedestrian), falls, and violence-related injuries. The program focus areas correspond well with leading injury mechanisms in the county.

Trauma centers select the focus for injury prevention outreach after reviewing their trauma registry data. They often partner with other injury prevention advocates to implement programs and to disseminate prevention education materials. Examples of trauma center programs include child passenger safety seat installation stations, Safe Kids Coalition, Kids Can't' Fly, Farewell to Falls, the "Every 15 Minutes" program, and the Trauma for Triumph Intervention program.

The SCC EMS Agency epidemiologist and the SPNC produce an annual report on the status of trauma and the California Epicenter data are used to describe the county's injury patterns. An increased number of elderly falls was identified, which resulted in the development of a Falls Prevention and Home Assessment Tool Training for first responders, a fall prevention campaign for seniors, and development of a fall prevention workgroup.

EMS providers and fire fighters are also engaged in prevention activities, including suicide prevention and the Fall Prevention and Home Safety Assessment. The SCC Public Health Department co-sponsors the Traffic Safety Community Network that focuses bicycle and pedestrian safety. Many other community groups partner in this network.

While many of the described injury prevention programs have an education focus, some examples of evidence-based prevention programs were described, along with some evaluation of prevention interventions. A few programs also involve environmental change and enforcement, such as child passenger safety seats, Home Safety Assessment for fall risk, dedicated bicycle lanes, and the distance required between motorists and bikers.

The SCC Public Health Department website also provides several recent fact sheets about major mechanisms of injuries. Some California state government websites have an injury prevention focus with valuable information for SCC injury prevention advocates, such as the California Office of Traffic Safety and the California Safe and Active Communities program. Making this information easier to locate for SCC injury prevention advocates would be valuable. For example, an injury prevention page on the Public Information section of the SCC EMS Agency website could be developed with links to these resources.

A significant concern of the SCC EMS Agency and the SPNC is the inability to coordinate the injury prevention programs and outreach in the county because of time constraints. Individual prevention initiatives often have a coordinator, but no individual in the SCC EMS Agency or the SCC Public Health Department coordinates all county prevention efforts. It was recognized that this lack of coordination has the potential to limit the effectiveness of prevention programs. For example, communities that would benefit from outreach may not be targeted and the needs of special populations (e.g. ethnic groups) may be overlooked. Injury prevention program managers would benefit from coordination and access to information regarding effective injury prevention programs, communities to be targeted, and program evaluation methodology. Promoting greater collaboration between partners may have the benefit successfully reaching a larger portion of the county's population with injury programs and messages.

Outreach

The acute care facilities have no formal relationship with the trauma system, yet it is recognized that they may receive patients with severe injuries. Coordinated outreach to these acute care facilities regarding their role in the trauma system, as well as education to manage the resuscitation and initial stabilization of the severely injured patient, is important in an inclusive trauma system. Elements of the Rural Trauma Team Development Course (RTTDC) may be beneficial in helping acute care facilities to plan an effective response when a patient in extremis or by private transport arrives in the emergency department.

Recommendations

- Develop an Injury Prevention page on the Santa Clara County Emergency Medical Services (EMS) Agency website that includes injury prevention resources for the trauma and EMS system providers, such as fact sheets and evidence-based programs.
    - Provide website links to county, state, and national websites that have an injury prevention focus
    - Report information about injury prevention activities conducted by trauma centers and EMS providers.

- Identify a mechanism to coordinate the injury prevention activities of the trauma centers and EMS providers with other community organizations.

- Collaborate with the Santa Clara County Public Health Department in the development and implementation of injury prevention activities.

- **Plan a coordinated outreach program to non-designated acute care facilities to offer education and support regarding their roles in an inclusive trauma system as well as topics in the care of the injured patient.**

Emergency Medical Services

Purpose and Rationale

The trauma system includes, and/or interacts with, many different agencies, institutions, and systems. The EMS system is one of the most important of these relationships. EMS is often the critical link between the injury-producing event and definitive care at a trauma center. Even though at its inception the EMS system was a very broad system concept, over time, EMS has come to be recognized as the prehospital care component of the larger emergency health care system. It is a complex system that not only transports patients, but also includes public access, communications, personnel, triage, data collection, and quality improvement activities.

The EMS system medical director must have statutory authority to develop protocols, oversee practice, and establish a means of ongoing quality assessment to ensure the optimal provision of prehospital care. If not the same individual, the EMS system medical director must work closely with the trauma system medical director to ensure that protocols and goals are mutually aligned. The EMS system medical director must also have ongoing interaction with EMS agency medical directors at local levels, as well as the state EMS for Children program, to ensure that there is understanding of and compliance with trauma triage and destination protocols.

Ideally, a system should have some means of ensuring whether resources meet the needs of the population. To achieve this end, a resource and needs assessment evaluating the availability and geographic distribution of EMS personnel and physical resources is important to ensure a rapid and appropriate response. This assessment includes a detailed description of the distribution of ground ambulance and aeromedical locations across the region. Resource allocations must be assessed on a periodic basis as needs dictate a redistribution of resources. In communities with full-time paid EMS agencies, ambulances should be positioned according to predictable geographic or temporal demands to optimize response efficiencies. Such positioning schemes require strong prehospital data collection systems that can track the location of occurrences over time. Periodic assessment of dispatch and transport times will also provide insight into whether resources are consistent with needs. Each region should have objective criteria dictating the level of response (advanced life support [ALS], basic life support [BLS]), the mode of transport, and the disposition of the patient based on the location of the incident and the severity of injury. A mechanism for case-based review of trauma patients that involves prehospital and hospital providers allows bidirectional information sharing and continuing education, ensuring that expectations are met at both ends. Ongoing review of triage and treatment decisions allows for continuing quality improvement of the triage and prehospital care protocols. A more detailed discussion of in-field (primary) triage criteria is provided in the section titled: System Coordination and Patient Flow (p 20) (White Book).

Human Resources

Periodic workforce assessments of EMS should be conducted to ensure adequate numbers and distribution of personnel. EMS, not unlike other health care professions, experiences shortages and maldistribution of personnel. Some means of addressing recruitment, retention, and engagement of qualified personnel should be a priority. It is critical that trauma system leaders work to ensure that prehospital care providers at all levels attain and maintain competence in trauma care. Maintenance of competence should be ensured by requiring standards for credentialing and certification and specifying continuing educational requirements for all prehospital personnel involved in trauma care. The core curricula for First Responder,

Emergency Medical Technician (EMT) Basic, EMT-Intermediate, EMT Paramedic, and other levels of prehospital personnel have an essential orientation to trauma care for all ages. However, trauma care knowledge and skills need to be continuously updated, refined, and expanded through targeted trauma care training such as Prehospital Trauma Life Support®, Basic Trauma Life Support®, and age-specific courses. Mechanisms for the periodic assessment of competence, educational needs, and education availability within the system should be incorporated into the trauma system plan.

Systems of excellence also encourage EMS providers to go beyond meeting state standards for agency licensure and to seek national accreditation. National accreditation standards exist for ground-based and air medical agencies, as well as for EMS educational programs. In some states, agency licensure requirements are waived or substantially simplified if the EMS agency maintains national accreditation.

EMS is the only component of the emergency health care and trauma system that depends on a large cadre of volunteers. In some states, substantially more than half of all EMS agencies are staffed by volunteers. These agencies typically serve rural areas and are essential to the provision of immediate care to trauma patients, in addition to provision of efficient transportation to the appropriate facility. In some smaller facilities, EMS personnel also become part of the emergency resuscitation team, augmenting hospital personnel. The trauma care system program should reach out to these volunteer agencies to help them achieve their vital role in the outcome of care of trauma patients. However, it must be noted that there is a delicate balance between expecting quality performance in these agencies and placing unrealistic demands on their response capacity. In many cases, it is better to ensure that there is an optimal BLS response available at all times rather than a sporadic or less timely response involving ALS personnel. Support to volunteer EMS systems may be in the form of quality improvement activities, training, clinical opportunities, and support to the system medical director.

Owing to the multidisciplinary nature of trauma system response to injury, conferences that include all levels of providers (for example, prehospital personnel, nurses, and physicians) need to occur regularly with each level of personnel respected for its role in the care and outcome of trauma patients. Communication with and respect for prehospital providers is particularly important, especially in rural areas where exposure to major trauma patients might be relatively rare.

Integration of EMS within the Trauma System

In addition to its critical role in the prehospital treatment and transportation of injured patients, EMS must also be engaged in assessment and integration functions that include the trauma system and also public health and other public safety agencies. EMS agencies should have a critical role in ensuring that communication systems are available and have sufficient redundancy so that trauma system stakeholders will be able to assess and act to limit death and disability at the single patient level and at the population level in the case of mass casualty incidents (MCIs). Enhanced 911 services and a central communication system for the EMS/trauma system to ensure field-to-facility bidirectional communications, inter-facility dialogue, and all-hazards response communications among all system participants are important for integrating a system’s response. Wireless communications capabilities, including automatic crash notification, hold great promise for quickly identifying trauma-producing events, thereby reducing delays in discovery and decreasing prehospital response intervals.

Further integration might be accomplished through the use of EMS data to help define high-risk geographic and demographic characteristics of injuries within a response area. EMS should

assist with the identification of injury prevention program needs and in the delivery of prevention messages. EMS also serves a critical role in the development of all-hazards response plans and in the implementation of those plans during a crisis. This integration should be provided by the state and regional trauma plan and overseen by the lead agency. EMS should participate through its leadership in all aspects of trauma system design, evaluation, and operation, including policy development, public education, and strategic planning.

Optimal Elements

I. The trauma system is supported by an EMS system that includes communications, medical oversight, prehospital triage, and transportation; the trauma system, EMS system, and public health agency are well integrated. **(B-302)**

a. There is well-defined trauma system medical oversight integrating the specialty needs of the trauma system with the medical oversight for the overall EMS system. **(I-302.1)**

b. There is a clearly defined, cooperative, and ongoing relationship between the trauma specialty physician leaders (for example, trauma medical director within each trauma center) and the EMS system medical director. **(I-302.2)**

c. There is clear-cut legal authority and responsibility for the EMS system medical director, including the authority to adopt protocols, to implement a performance improvement system, to restrict the practice of prehospital care providers, and to generally ensure medical appropriateness of the EMS system. **(I-302.3)**

d. The trauma system medical director is actively involved with the development, implementation, and ongoing evaluation of system dispatch protocols to ensure they are congruent with the trauma system design. These protocols include, but are not limited to, which resources to dispatch, for example, ALS versus BLS, air ground coordination, early notification of the trauma care facility, pre-arrival instructions, and other procedures necessary to ensure that resources dispatched are consistent with the needs of injured patients. **(I-302.4)**

e. The retrospective medical oversight of the EMS system for trauma triage, communications, treatment, and transport is closely coordinated with the established performance improvement processes of the trauma system. **(I-302.5)**

f. There is a universal access number for citizens to access the EMS/trauma system, with dispatch of appropriate medical resources. There is a central communication system for the EMS/trauma system to ensure field- to- facility bidirectional communications, inter-facility dialogue, and all-hazards response communications among all system participants. **(I-302.7)**

g. There are sufficient and well-coordinated transportation resources to ensure that EMS providers arrive at the scene promptly and expeditiously transport the patient to the correct hospital by the correct transportation mode. **(I-302.8)**

II. The lead trauma authority ensures a competent workforce. **(B-310)**

a. In cooperation with the prehospital certification and licensure authority, set guidelines for prehospital personnel for initial and ongoing trauma training, including trauma-specific courses and courses that are readily available throughout the state. **(I-310.1)**

b. In cooperation with the prehospital certification and licensure authority, ensure that prehospital personnel who routinely provide care to trauma patients have a current trauma training certificate, for example, Prehospital Trauma Life Support or Basic Trauma Life Support and others, or that trauma training needs are driven by the performance improvement process. **(I-310.2)**

c. Conduct at least 1 multidisciplinary trauma conference annually that encourages system and team approaches to trauma care. **(I-310.9)**

III. The lead agency acts to protect the public welfare by enforcing various laws, rules, and regulations as they pertain to the trauma system. **(B-311)**

a. Incentives are provided to individual agencies and institutions to seek state or nationally recognized accreditation in areas that will contribute to overall improvement across the trauma system, for example, Commission on Accreditation of Ambulance Services for prehospital agencies, Council on Allied Health Education Accreditation for training programs, and American College of Surgeons (ACS) verification for trauma facilities. **(I-311.6)**

Current Status

Santa Clara County encompasses 1,132 square miles. One-third of the county is very urban and two-thirds is considered rural. However the rural portion of the county is experiencing a significant increase in residential development. The county's resident population is 1.8 million, which increases during the day to 2.2 million with commuter activity.

The SCC EMS system is composed of two separate but cooperating exclusive EMS catchment areas within the county. One EMS catchment area and provider agency is the city of Palo Alto and its fire department. The Palo Alto Fire Department provides advanced life support (ALS) response and transport. County Ambulance, contracted to Rural Metro ALS Ambulance Service, is the 9-1-1 ALS response and transport agency for the remainder of Santa Clara County. The county response for EMS activation is tiered. The SCC EMS Agency also has agreements with nine fire departments to provide basic life support (BLS) or ALS services. These fire department EMS providers are generally first on scene and provide initial care until County Ambulance arrives to continue care and transport the patient to the appropriate facility.

Two air medical services are authorized to respond in Santa Clara County, and their response is most frequently to the rural areas of the county. The air medical services can provide scene care and inter-facility transport. The helicopters are strategically located in the county, one in the northern part of the county and the other in the south. In 2015 the air medical services responded to 136 emergency (911) calls and transported of 67 patients.

Eight private ground ambulance companies provide inter-facility transport services in Santa Clara County. BLS, ALS, and Critical Care Transport (CCT)-RN level care are available as needed. These ground ambulance services are also available for the 911 response when needed for surge capacity. Inter-facility transport by ground and air for pediatric patients is available through Stanford Children's Health.

Thirteen Public Safety Answering Points (PSAPs) route 9-1-1 calls to six Emergency Medical Dispatch (EMD) Centers. Currently Santa Clara County does not have enhanced wireless E-911 access, although that communication system is currently under evaluation.

Emergency Medical Technicians (EMTs) and paramedics are required to have initial NREMT certification. While recertification with the NREMT is not mandated, it is accepted as one of the paths to recertification. Upon successful completion of initial training EMTs are issued a two-year certification and paramedics are issued a two-year license. Santa Clara County does have recertification continuing education requirements; however, none are specific to trauma or pediatrics. Developing a specific adult and pediatric continuing education requirement based on county trauma data, quality improvement activities, and receiving facility input would support the SCC EMS Agency's goal to continually improve trauma care in the county.

Online or direct medical direction is provided by one base hospital, the Santa Clara Valley Medical Center. A mobile intensive care nurse or emergency department physician handles the calls. The current revision of the EMS protocols, still in process, includes format changes and updated treatment algorithms. The protocols are to be used as standing orders to allow the EMS provider to expedite treatment per protocol and to decrease the need for online medical direction.

No formal process exists for hospitals to provide feedback to EMS providers regarding care provided. Serious concerns are sent to the SCC EMS Medical Director. Informal information may be shared at TCSQIC meetings when opportunities for performance improvement exist; however, the number of cases reviewed is small. The trauma centers should be encouraged to establish a process of performance feedback to EMS providers, especially when the EMS provider actions had a positive or negative influence on patient outcomes.

While it appears that some input from the EMTs and paramedics to the SCC EMS Agency leadership can occur, no clearly defined forum for prehospital providers to collaborate with system leaders on EMS issues currently exists. Re-establishing a formal prehospital provider advisory group should be considered.

In 2015, the SCC EMS Agency was restructured to become an independent department that reports directly to the Health and Hospital Governing Board. A fulltime EMS Medical Director (off line medical director) was hired who is board certified in emergency medicine with subspecialty certification in Emergency Medical Services. The EMS Medical Director has reviewed and updated numerous policies, procedures, and protocols, and he is active in the quality improvement process. The restructuring of the EMS office and the addition of a full time off-line EMS medical director was perceived by the TSC team to have a significant positive impact on the EMS system

Recommendations

- Develop trauma specific recertification educational requirements for emergency medical service (EMS) providers based on the findings of trauma quality improvement activities.

- Develop a system for trauma center feedback on prehospital trauma care as a prehospital quality improvement tool.

- Re-establish a forum by which prehospital providers can collaborate and provide input to the Santa Clara County Emergency Medical Services Agency leadership.

Definitive Care Facilities

Purpose and Rationale

Inclusive trauma systems are the systems that include all acute health care facilities, to the extent that their resources and capabilities allow and in which the patient's needs are matched to hospital resources and capabilities. Thus, as the core of a regional trauma system, acute care facilities operating within an inclusive trauma system provide definitive care to the entire spectrum of patients with traumatic injuries. Acute care facilities must be well integrated into the continuum of care, including prevention and rehabilitation, and operate as part of a network of trauma-receiving hospitals within the public health framework. All acute care facilities should participate in the essential activities of a trauma system, including performance improvement, data submission to state or regional registries, representation on regional trauma advisory committees, and mutual operational agreements with other regional hospitals to address inter-facility transfer, educational support, and outreach. The roles of all definitive care facilities, including specialty hospitals (for example, pediatric, burn, severe traumatic brain injury [TBI], spinal cord injury [SCI]) within the system should be clearly outlined in the regional trauma plan and monitored by the lead agency. Facilities providing the highest level of trauma care are expected to provide leadership in education, outreach, patient care, and research and to participate in the design, development, evaluation, and operation of the regional trauma system.

In an inclusive system, patients should be triaged to the appropriate facility based on their needs and facility resources. Patients with the least severe injuries might be cared for at appropriately designated facilities within their community, whereas the most severe should be triaged to a Level I or II trauma center. In rural and frontier systems, smaller facilities must be ready to resuscitate and initiate treatment of the major injuries and have a system in place that will allow for the fastest, safest transfer to a higher level of care.

Trauma receiving facilities providing definitive care to patients with other than minor injuries must be specifically designated by the state or regional lead agency and equipped and qualified to do so at a level commensurate with injury severity. To assess and ensure that injury type and severity are matched to the qualifications of the facilities and personnel providing definitive care, the lead agency should have a process in place that reviews and verifies the qualifications of a particular facility according to a specific set of resource and quality standards. This criteria-based process for review and verification should be consistent with national standards and be conducted on a periodic cycle as determined by the lead agency. When centers do not meet set standards, there should be a process for suspension, probation, revocation, or de-designation.

Designation by the lead agency should be restricted to facilities meeting criteria or statewide resource and quality standards and based on patient care needs of the regional trauma system. There should be a well-defined regulatory relationship between the lead agency and designated trauma facilities in the form of a contract, guidelines, or memorandum of understanding. This legally binding document should define the relationships, roles, and responsibilities between the lead agency and the medical leadership from each designated trauma facility.

The number of trauma centers by level of designation and location of acute care facilities must be periodically assessed by the lead agency with respect to patient care needs and timely access to definitive trauma care. There should be a process in place for augmenting and restricting, if necessary, the number and/or level of acute care facilities based on these periodic

assessments. The trauma system plan should address means for improving acute care facility participation in the trauma system, particularly in systems in which there has been difficulty addressing needs.

Human Resources

The ability to deliver high-quality trauma care is highly dependent on the availability of skilled human resources. Therefore, it is critical to assess the availability and educational needs of providers on a periodic basis. Because availability, particularly of subspecialty resources, is often limited, some means of addressing recruitment, retention, and engagement of qualified personnel should be a priority. Periodic workforce assessments should be conducted. Maintenance of competence should be ensured by requiring standards for credentialing and certification and specifying continuing educational requirements for physicians and nurses providing care to trauma patients. Mechanisms for the periodic assessment of ancillary and subspecialty competence, educational needs, and availability within the system for all designated facilities should be incorporated into the trauma system plan. The lead trauma centers in rural areas will need to consider teleconferencing and telemedicine to assist smaller facilities in providing education on regionally identified needs. In addition, lead trauma centers within the region should assist in meeting educational needs while fostering a team approach to care through annual educational multidisciplinary trauma conferences. These activities will do much to foster a sense of teamwork and a functionally inclusive system.

Integration of Designated Trauma Facilities within the Trauma System

Designated trauma facilities must be well integrated into all other facets of an organized system of trauma care, including public health systems and injury surveillance, prevention, EMS and prehospital care, disaster preparedness, rehabilitation, and system performance improvement. This integration should be provided by the state and/or regional trauma plan and overseen by the lead agency.

Each designated acute care facility should participate, through its trauma program leadership, in all aspects of trauma system design, evaluation, and operation. This participation should include policy and legislative development, legislative and public education, and strategic planning. In addition, the trauma program and subspecialty leaders should provide direction and oversight to the development, implementation, and monitoring of integrated protocols for patient care used throughout the system (for example, TBI guidelines used by prehospital providers and non-designated transferring centers), including region specific primary (field) and secondary (early transfer) triage protocols. The highest level trauma facilities should provide leadership of the regional trauma committees through their trauma program medical leadership. These medical leaders, through their activities on these committees, can assist the lead agency and help ensure that deficiencies in the quality of care within the system, relative to national standards, are recognized and corrected. Educational outreach by these higher levels centers should be used when appropriate to help achieve this goal.

Optimal Elements

I. Acute care facilities are integrated into a resource efficient, inclusive network that meets required standards and that provides optimal care for all injured patients. **(B-303)**

a. The trauma system plan has clearly defined the roles and responsibilities of all acute care facilities treating trauma and of facilities that provide care to specialty populations (for example, burn, pediatric, SCI, and others). **(I-303.1)**

II. To maintain its state, regional, or local designation, each hospital will continually work to improve the trauma care as measured by patient outcomes. **(B-307)**

a. The trauma system engages in regular evaluation of all licensed acute care facilities that provide trauma care to trauma patients and of designated trauma hospitals. Such evaluation involves independent external reviews. **(I-307.1)**

III. The lead trauma authority ensures a competent workforce. **(B-310)**

a. As part of the established standards, set appropriate levels of trauma training for nursing personnel who routinely care for trauma patients in acute care facilities. **(I-310.3)**

b. Ensure that appropriate, approved trauma training courses are provided for nursing personnel on a regular basis. **(I-310.4)**

c. In cooperation with the nursing licensure authority, ensure that all nursing personnel who routinely provide care to trauma patients have a trauma training certificate (for example, Advanced Trauma Care for Nurses, Trauma Nursing Core Course, or any national or state trauma nurse verification course). As an alternative after initial trauma course completion, training can be driven by the performance improvement process. **(I-310.5)**

d. In cooperation with the physician licensure authority, ensure that physicians who routinely provide care to trauma patients have a current trauma training certificate of completion, for example, Advanced Trauma Life Support® (ATLS®) and others. As an alternative, physicians may maintain trauma competence through continuing medical education programs after initial ATLS completion. **(I-310.8)**

e. Conduct at least 1 multidisciplinary trauma conference annually that encourages system and team approaches to trauma care. **(I-310.9)**

f. As new protocols and treatment approaches are instituted within the system, structured mechanisms are in place to inform all personnel about the changes in a timely manner. **(I-310-10)**

Current Status

Santa Clara County currently has 11 acute care facilities with emergency departments. Of these the SCC EMS Agency has designated 2 adult Level I trauma centers, 1 adult Level II trauma center, 1 pediatric Level I facility, 1 pediatric Level II facility, and 1 burn center. The trauma centers are well-established, high functioning facilities. Each is verified by the ACS Verification Review Program, a requirement for designation by the SCC EMS Agency. It was apparent to the TSC team that the trauma centers are very collaborative. Diversion times are tracked closely and are not currently viewed as a problem in the county.

Geographically, the trauma centers are positioned appropriately to serve the county's population and to provide service to neighboring counties. Well-defined catchment areas effectively divide the patients between the trauma centers. EMS transport times are minimal. The southern part of the county is a potential area of future concern. As the southern county population grows the access time to trauma care should be carefully monitored. EMS transport times from this area are currently acceptable, but the trauma centers are all located in the northern part of the county.

Special populations are well served in the current system. The pediatric trauma centers are both high functioning and stable. The burn center is a unique resource to the SCC EMS Agency and the neighboring counties. Furthermore, subspecialty care throughout the region appears appropriate, and the TSC team identified no concerns. Few transfers were reported to occur out of the Level II trauma center.

The fairly low volume of trauma patients at each of the trauma centers is of concern as these trauma centers are near the minimum volume requirements to maintain current ACS verification levels. The SCC trauma system was recently tested by the addition of a new trauma center in neighboring Monterey County. This new trauma center significantly decreased the volume of trauma patients in Santa Clara County. Recently another SCC acute care facility asked to be designated as a Level II trauma center. The currently established trauma centers are concerned about the ability to sustain current patient volumes if an additional trauma center is designated. The requested addition of a trauma center requires the SCC EMS Agency to perform a needs assessment. Methods to perform this needs assessment are not well defined, and scheduled periodic assessments (exclusive of trauma center addition requests) are not routinely performed, although the SCC EMS Agency's commitment to evaluate monthly diversion reports, trauma center volumes, evaluation of IFT's and with the annual trauma plan updates was noted throughout the review.

The non-designated acute care facilities receive 9-1-1 emergency patients from EMS, but they are not engaged in the trauma system. Secondary to the excellent geographic distribution of the trauma centers, defined catchment areas, and short EMS transport times, these non-designated acute care facilities do not often receive trauma patients. However, no current mechanism exists to track trauma patients who arrive at these acute care facilities and their outcomes. Research conducted by trauma systems nationally has identified the geriatric population with fall injuries is particularly vulnerable to this under-triage. It is difficult to ensure appropriate trauma care in the county without engagement and data from all the acute care facilities. Minimal outreach is made to these facilities by the existing trauma centers. The SCC EMS Agency is functioning effectively as an exclusive trauma system.

Two of the acute care facilities repatriate patients from the trauma centers. The trauma centers have worked closely with these facilities to ensure that the repatriated patients are appropriate for transfer after stabilization. Unfortunately a lack of data flows back to the trauma centers about the final outcome and disposition of these patients.

Recommendations

- **Apply the needs assessment process developed within the trauma system plan prior to the designation of additional trauma centers.**

- **Require all acute care facilities to submit a minimum trauma patient dataset to form a comprehensive profile of injury care in the county.**
    - **Request stakeholders in the Bay Area Regional Trauma Care Committee to consider a similar recommendation to facilitate future regional trauma care planning.**

- Engage all acute care facilities in the improvement of the trauma system (transitioning from an exclusive to an inclusive trauma system) and to improve system-wide planning and care of injured patients managed by the Santa Clara County acute care facilities.

System Coordination and Patient Flow

Purpose and Rationale

To achieve the best possible outcomes, the system must be designed so that the right patient is transported to the right facility at the right time. Although on the surface this objective seems relatively straightforward, patients, geography, and transportation systems often conspire to present significant challenges. The most critically injured trauma patient is often easy to identify at the scene by virtue of the presence of coma or hypotension. However, in some circumstances, the patients requiring the resources of a Level I or II center may not be immediately apparent to prehospital providers. Primary or field triage criteria aid providers in identifying which patients have the greatest likelihood of adverse outcomes and might benefit from the resources of a designated trauma center. Even if the need is identified, regional geography or limited air medical (or land) transport services might not allow for direct transport to an appropriate facility.

Primary triage of a patient from the field to a center capable of providing definitive care is the goal of the trauma system. However, there are circumstances (for example, airway management, rural environments, inclement weather) when triaging a patient to a closer facility for stabilization and transfer is the best option for accessing definitive care. Patients sustaining severe injuries in rural environments might need immediate assessment and stabilization before a long-distance transport to a trauma center. In addition, evaluation of the patient might bring to light severe injuries for which needed care exceeds the resources of the initial receiving facility. Some patients might have specific needs that can be addressed at relatively few centers within a region (for example, pediatric trauma, burns, severe TBI, SCI, and re-implantation). Finally, temporary resource limitations might necessitate the transfer of patients between acute care facilities.

Secondary triage at the initial receiving facility has several advantages in systems with a large rural or suburban component. The ability to assess patients at non-designated or Level III to V centers provides an opportunity to limit the transfer of only the most severely injured patients to Level I or II facilities, thus preserving a limited resource for patients most in need. It also provides patients with lesser injuries the possibility of being cared for within their community.

The decision to transfer a trauma patient should be based on objective, prospectively agreed-on criteria. Established transfer criteria and transfer agreements will minimize discussions about individual patient transfers, expedite the process, and ensure optimal patient care. Delays in transfer might increase mortality, complications, and length of stay. A system with an excess of transferred patients might tax the resources of the regional trauma facility. Conversely, inappropriate retention of patients at centers without adequate facilities or expertise might increase the risk of adverse outcomes. Given the importance of timely, appropriate inter-facility transfers, the time to transfer, as well as the rates of primary and secondary over-triage basis, and corrective actions should be instituted when problems are identified. Data derived from tracking and monitoring the timeliness of access to a level of trauma care commensurate with injury type and severity should be used to help define optimal system configuration.

A central communications center with real-time access to information on system resources greatly facilitates the transfer process. Ideally, this center identifies a receiving facility, facilitates dialogue between the transferring and receiving centers, and coordinates inter-facility transport.

To ensure that the system operates at the greatest efficiency, it is important that patients are repatriated back to community hospitals once the acute phase of trauma care is complete. The process of repatriation opens up the limited resources available to care for severely injured patients. In addition, it provides an opportunity to bring patients back into their local environment where their social network might help reintegrate patients into their community.

Optimal Elements

I. The trauma system is supported by an EMS system that includes communications, medical oversight, prehospital triage, and transportation; the trauma system, EMS system, and public health agency are well integrated. **(B-302)**

a. There are mandatory system-wide prehospital triage criteria to ensure that trauma patients are transported to an appropriate facility based on their injuries. These triage criteria are regularly evaluated and updated to ensure acceptable and system-defined rates of sensitivity and specificity for appropriately identifying a major trauma patient. **(I-302.6)**

b. There is a universal access number for citizens to access the EMS/trauma system, with dispatch of appropriate medical resources. There is a central communications system for the EMS/trauma system to ensure field-to- facility bidirectional communications, inter-facility dialogue, and all-hazards response communications among all system participants. **(I-302.7)**

c. There is a procedure for communications among medical facilities when arranging for inter-facility transfers, including contingencies for radio or telephone system failure. **(I-302.9)**

II. Acute care facilities are integrated into a resource-efficient, inclusive network that meets required standards and that provides optimal care for all injured patients. **(B-303)**

a. When injured patients arrive at a medical facility that cannot provide the appropriate level of definitive care, there is an organized and regularly monitored system to ensure that the patients are expeditiously transferred to the appropriate system-defined trauma facility. **(I-303.4)**

Current Status

The SCC EMS Agency uses the CDC/ACS Trauma Field Triage Guidelines. All three trauma centers manage the initial treatment for traumatic brain injury (TBI) and spinal cord injury (SCI). Pediatric trauma victims (15 years old and younger) with major trauma are referred to Santa Clara Valley Medical Center or Stanford University Medical Center that are designated pediatric trauma centers.

The Bay Area RTCC developed Trauma Transfer Re-triage Guidelines that were adopted by SCC trauma centers to encourage rapid re-triage by all acute care facilities to designated trauma centers in Santa Clara County. Posters were developed and provided to all SCC acute care facilities. The immediate transfer criteria are contained in a red box at the top of the guidelines, while the urgent transfer criteria are in a blue box below the red box. Patients who meet the red box criteria are expected to have automatic acceptance at any trauma center that is open to receiving patients. Although not apparent during the discussions, it was noted that all acute care facilities utilize these triage protocols.

No trauma-specific training is provided in a coordinated manner by the trauma system or the trauma centers to the acute care facilities. Education and preparation to resuscitate a trauma patient in extremis can positively impact the quality of trauma care. This has been successfully implemented in rural acute care facilities that have participated in the RTTDC. A similar program or adaptation of the RTTDC could be developed to meet the needs of Santa Clara County acute care facilities.

Inter-facility transfer agreements are required of each facility, but these agreements are generic and encompass trauma in general. No process exists to track a patient from prehospital care to the initial treating facility to the trauma center to the patient's ultimate discharge or transfer to rehabilitation. This information would be useful for trauma system assessments, performance improvement, and for disaster response.

Recommendations

- Assess the compliance of acute care facilities with trauma transfer guidelines.
    - Communicate compliance rates with trauma transfer guidelines to stakeholders, and determine a strategy to improve compliance, if necessary.

- Engage all acute care facilities via educational opportunities that target trauma care and timely inter-facility transfer for those patients who require continued care at a trauma center.

- Consider identifying and using a patient tracking system on a regular basis to improve data linkage that will also work well in the event of a disaster.

Rehabilitation

Purpose and Rationale

As an integral component of the trauma system, rehabilitation services in acute care and rehabilitation centers provide coordinated care for trauma patients who have sustained severe or catastrophic injuries, resulting in long-standing or permanent impairments. Patients with less severe injuries may also benefit from rehabilitative programs that enhance recovery and speed return to function and productivity. The goal of rehabilitative interventions is to allow the patient to return to the highest level of function, reducing disability and avoiding handicap whenever possible. The rehabilitation process should begin in the acute care facility as soon as possible, ideally within the first 24 hours. Inpatient and outpatient rehabilitation services should be available. Rehabilitation centers should have CARF (Commission on Accreditation of Rehabilitation Facilities) accreditation for comprehensive inpatient rehabilitation programs, and accreditation of specialty centers (SCI and TBI) should be strongly encouraged.

The trauma system should conduct a rehabilitation needs assessment (including specialized programs in SCI, TBI, and for children) to identify the number of beds needed and available for rehabilitation in the geographic region. Rehabilitation specialists should be integrated into the multidisciplinary advisory committee to ensure that rehabilitation issues are integrated into the trauma system plan. The trauma system should demonstrate strong linkages and transfer agreements between designated trauma centers and rehabilitation facilities located in its geographic region (in or out of state). Plans for repatriation of patients, especially when rehabilitation centers across state lines are used, should be part of rehabilitation system planning. Feedback on functional outcomes after rehabilitation should be made available to the trauma centers.

Optimal Elements

I. The lead agency ensures that adequate rehabilitation facilities have been integrated into the trauma system and that these resources are made available to all populations requiring them. **(B-308)**

a. The lead agency has incorporated, within the trauma system plan and the trauma center standards, requirements for rehabilitation services, including inter-facility transfer of trauma patients to rehabilitation centers. **(I-308.1)**

b. Rehabilitation centers and outpatient rehabilitation services provide data on trauma patients to the central trauma system registry that include final disposition, functional outcome, and rehabilitation costs and also participate in performance improvement processes. **(I-308.2)**

II. A resource assessment for the trauma system has been completed and is regularly updated. **(B-103**)

a. The trauma system has completed a comprehensive system status inventory that identifies the availability and distribution of current capabilities and resources. **(I-103.1)**

Current Status

Santa Clara Valley Medical Center is a Commission on Accreditation of Rehabilitation Facilities (CARF)-certified rehabilitation regional resource for traumatic brain and spinal cord injury. The facility has a 32-bed TBI unit and a 30-bed SCI unit. On an annual basis, the facility treats an average 320 patients with TBI and 150 patients with SCI. The providers are board-certified rehabilitation physicians. They manage the most complicated patients such as those patients who require mechanical ventilation and/or have co-existing medical conditions. In collaboration with the burn center providers, they help manage burn patient rehabilitation. In addition, they actively participate in trauma rehabilitation research and publication.

Currently, no rehabilitation outcome data is shared with the trauma centers regarding transferred patients. A method to link rehabilitation outcome data to the individual trauma center registries or the SCC trauma registry would be beneficial to fully describe trauma outcomes.

The Rehabilitation Medical Directors are invited to participate in the TSCQIC meetings, and they are consulted on the development and revision of EMS policies that deal with brain and spinal cord trauma. Consideration should be given to add a rehabilitation provider as a formal member for other appropriate committees.

Other rehabilitation resources were reported to exist in the Santa Clara County; however, their ability to contribute to rehabilitation of the trauma patient is unknown.

Recommendations

- Develop methodology to link rehabilitation outcome data to the trauma registry.
- Catalog the trauma rehabilitation capability of all rehabilitation programs, including outpatient services in Santa Clara County.
- Include a rehabilitation representative on the Trauma Executive Committee and the Emergency Medical Care Committee.

Disaster Preparedness

Purpose and Rationale

As critically important resources for state, regional, and local responses to MCIs, the trauma system and its trauma centers are central to disaster preparedness. Trauma system leaders need to be actively involved in public health preparedness planning to ensure that trauma system resources are integrated into the state, regional, and local disaster response plans. Acute care facilities (sometimes including one or more trauma centers) within an affected community are the first line of response to an MCI. However, an MCI may result in more casualties than the local acute care facilities can handle, requiring the activation of a larger emergency response plan with support provided by state and regional assets.

For this reason, the trauma system and its trauma centers must conduct a resource assessment of its surge capacity to respond to MCIs. The resource assessment should build on and be coupled to a hazard vulnerability analysis. An assessment of the trauma system's response to simulated incident or tabletop drills must be conducted to determine the trauma system's ability to respond to MCIs. Following these assessments, a gap analysis should be conducted to develop statewide MCI response resource standards. This information is essential for the development of an emergency management plan that includes the trauma system.

Planning and integration of the trauma system with plans of related systems (public health, EMS, and emergency management) are important because of the extensive impact disasters have on the trauma system and the value of the trauma system in providing care. Relationships and working cooperation between the trauma system and public health, EMS, and emergency management agencies support the provision of assets that enable a more rapid and organized disaster response when an event occurs. For example, the EMS emergency preparedness plan needs to include the distribution of severely injured patients to trauma centers, when possible, to make optimal use of trauma center resources. This plan could optimize triage through directing less severely injured patients to lower level trauma centers or non-designated facilities, thus allowing resources in trauma centers to be spared for patients with the most severe injuries. In addition, the trauma system and its trauma centers will be targeted to receive additional resources (personnel, equipment, and supplies) during major MCIs.

Mass casualty events and disasters are chaotic, and only with planning and drills will a more organized response be possible. Simulation or tabletop drills provide an opportunity to test the emergency preparedness response plans for the trauma system and other systems and to train the teams that will respond. Exercises must be jointly conducted with other agencies to ensure that all aspects of the response plan have the trauma system integrated.

Optimal Elements

I. An assessment of the trauma system's emergency preparedness has been completed, including coordination with the public health agency, EMS system, and the emergency management agency. **(B-104)**

   a. There is a resource assessment of the trauma system's ability to expand its capacity to respond to MCIs in an all-hazards approach. **(I-104.1)**

b. There has been a consultation by external experts to assist in identifying current status and needs of the trauma system to be able to respond to MCIs. **(I-104.2)**

c. The trauma system has completed a gap analysis based on the resource assessment for trauma emergency preparedness. **(I-104.3)**

II. The lead agency ensures that its trauma system plan is integrated with, and complementary to, the comprehensive mass casualty plan for natural and manmade incidents, including an all-hazards approach to planning and operations. **(B-305)**

a. The EMS, the trauma system, and the all-hazards medical response system have operational trauma and all-hazards response plans and have established an ongoing cooperative working relationship to ensure trauma system readiness for all-hazards events. **(I-305.1)**

b. All-hazards events routinely include situations involving natural (for example, earthquake), unintentional (for example, school bus crash), and intentional (for example, terrorist explosion) trauma-producing events that test the expanded response capabilities and surge capacity of the trauma system. **(I-305-2)**

c. The trauma system, through the lead agency, has access to additional equipment, materials, and personnel for large-scale traumatic events. **(I-305.3)**

Current Status

The SCC EMS Agency has a long-standing history of planning and implementing policy for EMS and healthcare facility disaster response. It is evident to the TSC team that the trauma centers have previously and continue to play a pivotal role in the county's medical surge capabilities. An active Medical Reserve Corp of 947 volunteers was reported. The volunteers include medical professionals and ancillary personnel that can be activated during times of need.

Annually the EMS Plan is reviewed to assess of the healthcare system and to identify the known gaps in the disaster response planning. The last disaster preparedness assessment was conducted as part of the pre-planning efforts for Super Bowl 50 in early 2016. The SCC EMS Agency worked with multiple stakeholder groups, including the trauma centers. This assessment identified a need for redundant communications systems that could be accessed in the event of large-scale disaster. In preparation for Super Bowl 50, key stakeholders also traveled to the Federal Emergency Management Agency's (FEMA) Center for Domestic Preparedness in Anniston, Alabama. The educational trip allowed stakeholders, hospitals and response agencies to train on various scenarios that could potentially be encountered during the Super Bowl.

The SCC EMS Agency provides a rotational on-call duty officer in the event a disaster or MCI should impact the region. This rotational on-call duty officer is not directly connected to or housed in the trauma program of the EMS agency. However, evidence of ongoing collaboration between programs was identified.

The EMS Agency is responsible as the lead agency for coordination of the annual disaster preparation exercises. The focus for 2016 was an MCI that involved multiple patients being transported to area trauma centers. Trauma center representatives, present during consultation

visit, acknowledged participation in drills and exercises. The extent of participation of other acute care facilities in this disaster preparation and exercises was not clear at the time of deliberations; however, it was reported that all hospitals are engaged.

The SCC EMS Agency preparedness personnel reported an inability to track patients through the continuum of care. The current MCI triage and tagging system is adequate for tracking most patients from the scene of injury to the initial acute care facility. The system appears to lack the capability and capacity to track patients that may require transfer for secondary treatment or rehabilitation centers. The SCC EMS Agency is to be commended for exploring ways to mitigate this identified shortcoming.

The emergency preparedness program has incorporated EM Systems/Resource software that links acute care facilities and trauma centers for real-time communications and resource management. This enables facilities to update bed status and receive event-specific alerts. This is paramount in the event that common radio communication is compromised.

EM Systems/Resource is also utilized for tracking diversion status among trauma centers. The SCC EMS Agency reports that they mandate a 60:90 policy for diversions. In short, a trauma center can be on diversion status for 60 minutes and then must accept patients for 90 minutes before considering continued diversion.

Recommendations

- Ensure that all acute care facilities, as participants in the inclusive trauma system, have appropriate resources and education to care for the injured patient in the event of a disaster.
- Explore a standardized method of tracking patients through the multiple healthcare facilities during disasters.
- Complete development of an interoperable communication system that integrates hospitals, specialty centers, and emergency medical services transporting agencies.

System-wide Evaluation and Quality Assurance

Purpose and Rationale

The trauma lead agency has responsibility for instituting processes to evaluate the performance of all aspects of the trauma system. Key aspects of system-wide effectiveness include the outcomes of population based injury prevention initiatives, access to care, as well as the availability of services, the quality of services provided within the trauma care continuum from prehospital and acute care management phases through rehabilitation and community reintegration, and financial impact or cost. Intrinsic to this function is the delineation of valid, objective metrics for the ongoing quality audit of system performance and patient outcomes based on sound benchmarks and available clinical evidence. Trauma management information systems (MISs) must be available to support data collection and analysis.

The lead agency should establish forums that promote inclusive multidisciplinary and multiagency review of cases, events, concerns, regulatory issues, policies, procedures, and standards that pertain to the trauma system. The evaluation of system effectiveness must take into account the integration of these various components of the trauma care continuum and review how well personnel, agencies, and facilities perform together to achieve the desired goals and objectives. Results of customer satisfaction (patient, provider, and facility) appraisals and data indicative of community and population needs should be considered in strategic planning for system development. System improvements derived through evaluation and quality assurance activities may encompass enhancements in technology, legislative or regulatory infrastructure, clinical care, and critical resource availability.

To promote participation and sustainability, the lead agency should associate accountability for achieving defined goals and trauma system performance indicators with meaningful incentives that will act to cement the support of key constituents in the health care community and general population. For example, the costs and benefits of the trauma system as they relate to reducing mortality or decreasing years of productive life lost may make the value of promoting trauma system development more tangible. A facility that achieves trauma center verification/designation may be rewarded with monetary compensation (for example, ability to bill for trauma activation fees) and the ability to serve as a receiving center for trauma patients. The trauma lead agency should promote ongoing dialog with key stakeholders to ensure that incentives remain aligned with system needs.

Optimal Elements

I. The trauma MIS is used to facilitate ongoing assessment and assurance of system performance and outcomes and provides a basis for continuously improving the trauma system, including a cost-benefit analysis. **(B-301)**

a. The lead trauma authority ensures that each member hospital of the trauma system collects and uses patient data, as well as provider data, to assess system performance and to improve quality of care. Assessment data are routinely submitted to the lead trauma authority. **(I-301.1)**

II. The jurisdictional lead agency, in cooperation with other agencies and organizations, uses analytic tools to monitor the performance of population based prevention and trauma care services. **(B-304)**

III. The financial aspects of the trauma system are integrated into the overall performance improvement system to ensure ongoing fine tuning and cost-effectiveness. **(B-309)**

a. Financial data are combined with other cost, outcome, or surrogate measures, for example, years of potential life lost, quality-adjusted life years, and disability adjusted life years; length of stay; length of intensive care unit stay; number of ventilator days; and others, to estimate and track true system costs and cost- benefits. **(I-309.4)**

Current Status

The SCC EMS Agency has clear authority to establish trauma system standards and develop a formal performance improvement (PI) process to assess the effectiveness of trauma care provided throughout the trauma system. As part of the strategic planning process, specific PI-related objectives were identified, such as:

- Collect and validate data to improve care provided to trauma patients
- Participate in the Bay Area RTCC
- Evaluate trauma care policies and procedures to ensure quality care is provided
- Coordinate PI activities with trauma system participants

Within the trauma system plan, more detail is provided about the Trauma System Quality Improvement (QI) Plan, the trauma system medical audit process, the minimum screening criteria used for trauma case review, and guidelines for classifying the preventability of mortality. The SPNC and a few stakeholders have also participated on the California EMS Authority PIPS Plan Committee and in the development of the state PI plan.

The TCSQIC and Trauma Executive Committee meet bimonthly to advise the SCC EMS Agency on trauma system standards and policy. The TCSQIC serves as a forum for discussion of trauma system care, trends, research, data analysis, quality improvement, strategic planning, and determining benchmarks for quality improvement strategies. The committee also conducts and shares intensive reviews of challenging and educational cases to highlight opportunities for improvement in care processes and clinical care delivery. The committee is broad based and inclusive of burn and pediatric representatives, as well as, rehabilitation specialists when appropriate. This committee reports to the SCC EMS Agency Medical Director. In addition to the TSCQIC, other PI committees include the Trauma Executive Committee that screens cases for presentation to the TSCQIC, the Prehospital QI Committee, and the Bay Area RTCC that reviews trauma care within an eight county region.

According to the trauma plan, the Trauma Executive Committee applies the minimum screening criteria to identify cases for review in the TSCQIC. Some of these criteria include deaths, holdovers, delays in trauma team activation or surgical response, as well as, errors in diagnosis. The cases are then reviewed in the TCSQIC, and if applicable, they are presented for review by the Prehospital Quality Improvement Committee. The guidelines for classifying mortality (non-preventable, possibly preventable, and probably preventable) are applied to the trauma center cases. The most common corrective action used to address issues identified by the PI process is provider education.

The California Evidence Code protects the PI process. In addition, members of the respective review committees sign statements of confidentiality to further protect the data, patient and provider information, and the PI process.

An established set of SCC trauma system PI indicators includes prehospital airway management, triage, missing information, specific hospital indicators, provider errors, and delays. These indicators were last revised in 2015.

The SCC EMS Agency collects trauma registry data from the three trauma centers and patient care reports from prehospital providers. Trauma data are not collected from all acute care facilities; thus the county is unable to accurately determine the rate for trauma patient under-triage. The goal for any time-sensitive specialty care system is to ensure that the right patient gets to the right facility in the right amount of time. Being able to determine under- and over-triage rates is important for measuring the effectiveness of the trauma system. Fortunately, the over-triage rate can be assessed, which was reported at 45.31%. Stakeholders stated that over-triage is likely become one of the next PI initiatives.

The SCC trauma registry and EMS data provide the foundation for trauma system PI and injury prevention activities. The SCC EMS Agency is fortunate to have an epidemiologist who is familiar with the trauma system, processes, and stakeholders. Data generated from the data registries have been used for the development of the annual report, semi-annual report, and trauma center activity report. Not only are the data being utilized to assess and report outcomes, they are used to improve processes. Various studies and reports have been generated, including a prehospital airway study, over-triage study, an assessment of delays in transition of care within the EDs, diversions, autopsy rates, and the RTCC re-triage study.

While financial data are not collected from trauma centers, the trauma registry does provide information on length of stay and potential life lost that is used in the annual trauma report. The SCC EMS Agency engaged in an external review for trauma center viability by contracting with the Abaris Group in 2005. The results of the analysis were included in the trauma plan describing the fiscal impact on the system.

In addition to patient care PI assessment, the SCC EMS Agency has established various evaluation mechanisms to assess compliance with standards for each component of the trauma system. Beginning with the trauma centers, the agency regularly reviews and updates the trauma center standards for designation and ensures compliance through regular two-year site visits. During the designation process, trauma centers are reviewed for the effectiveness of conducting PI and in obtaining loop closure to resolve issues identified or to address deviations in care. In addition to the internal trauma care review process performed by the trauma centers, all three designated trauma centers participate in the ACS Trauma Quality Improvement Program (TQIP), which provides each center with standardized reports comparing the care provided by the center with other similar trauma centers across the country.

Regarding the prehospital component of the trauma system, the SCC EMS Agency has agreements in place with ambulance providers that establish performance benchmarks, such as response times, that are regularly monitored for compliance. The EMS providers are required to submit patient care data to the SCC EMS Agency for use in evaluating care processes and outcomes at the county, regional and state levels. Prehospital providers also are routinely reviewed for compliance with ambulance and equipment standards. The EMS provider agency medical directors perform internal evaluations of patient care. However stakeholders reported

that EMS provider agency medical directors are not consistently available to accomplish PI. In addition to the EMS providers, the primary dispatch center is accredited through the National Academies of Emergency Dispatch (NAED), and this center conducts QI activities that are benchmarked nationally.

Recommendations

- **Develop a Santa Clara County Emergency Medical Service Agency performance improvement and patient safety (PIPS) plan that is distinct from the state trauma plan.**
    - **Ensure alignment of the PIPS Plan with the process and indicators identified in the California EMS Authority trauma system PIPS plan.**
    - **Engage stakeholders in the process of developing the PIPS plan.**
    - **Modify the Trauma System Quality Improvement policy to reflect the PIPS plan.**

- Establish a mechanism to collect minimum trauma data from all acute care facilities to enable assessment of under- and over-triage of trauma patients.

- Focus the efforts of the epidemiologist on using available data to assess trauma system trends and identify patterns to be addressed in the performance improvement process.

- Expand the trauma patient care data collection system to include rehabilitation data in order to more accurately assess patient outcomes and the effects of injury on trauma patients' quality of life.

- Continue participation in the Bay Area Regional Trauma Coordinating Committee to address patient care and trauma systems integration issues across county borders.

Trauma Management Information Systems

Purpose and Rationale

Hospital-based trauma registries developed from the idea that aggregating data from similar cases may reveal variations in care and ultimately result in a better understanding of the underlying injury and its treatment. Hospital-based registries have proven very effective in improving trauma care within an institution but provide limited information regarding how interactions with other phases of health care influence the outcome of an injured patient. To address this limitation, data from hospital-based registries should be collated into a regional registry and linked such that data from all phases of care (prehospital, hospital, and rehabilitation) are accessible in 1 data set. When possible, these data should be further linked to law enforcement, crash incident reports, ED records, administrative discharge data, medical examiner records, vital statistics data (death certificates), and financial data. The information system should be designed to provide system-wide data that allow and facilitate evaluation of the structure, process, and outcomes of the entire system; all phases of care; and their interactions. This information should be used to develop, implement, and influence public policy.

The lead agency should maintain oversight of the information system. In doing so, it must define the roles and responsibilities for agencies and institutions regarding data collection and outline processes to evaluate the quality, timeliness, and completeness of data. There must be some means to ensure patient and provider confidentiality is in keeping with federal regulations. The agency must also develop policies and procedures to facilitate and encourage injury surveillance and trauma care research using data derived from the trauma MIS. There are key features of regional trauma MISs that enhance their usefulness as a means to evaluate the quality of care provided within a system. Patient information collected within the management system must be standardized to ensure that noted variations in care can be characterized in a similar manner across differing geographic regions, facilities, and EMS agencies. The composition of patients and injuries included in local registries (inclusion criteria) should be consistent across centers, allowing for the evaluation of processes and outcomes among similar patient groups. Many regions limit their information systems to trauma centers. However, the optimal approach is to collect data from all acute care facilities within the region. Limiting required data submission to hospitals designated as trauma centers allows one to evaluate systems issues only among patients transported to appropriate facilities. It is also important to have protocols in place to ensure a uniform approach to data abstraction and collection. Research suggests that if the process of case abstraction is not routinely calibrated, practices used by abstractors begin to drift.

Finally, every effort should be made to conform to national standards defining processes for case acquisition, case definition (that is, inclusion criteria), and registry coding conventions. Two such national standards include the National Highway Traffic Safety Administration’s National Emergency Medical Services Information System (NEMSIS), which standardizes EMS data collection, and the American College of Surgeons National Trauma Data Standard, which addresses the standardization of hospital registry data collection. Strictly adhering to national standards markedly increases the value of state trauma MISs by providing national benchmarks and allowing for the use of software solutions that link data sets to enable a review of the entire injury and health care event for an injured patient.

To derive value from the tremendous amount of effort that goes into data collection, it is important that a similar focus address the process of data reporting. Dedicated staff and resources should be available to ensure rapid and consistent reporting of information to vested parties with the authority and vision to prevent injuries and improve the care of patients with injuries. An optimal information reporting process will include standardized reporting tools that allow for the assessment of temporal and/or system changes and a dynamic reporting tool, permitting anyone to tailor specific "views" of the information.

Optimal Elements

I. There is an established trauma MIS for ongoing injury surveillance and system performance assessment. **(B-102)**

a. There is an established injury surveillance process that can, in part, be used as an MIS performance measure. **(I-102.1)**

b. Injury surveillance is coordinated with statewide and local community health surveillance. **(I-102.2)**

c. There is a process to evaluate the quality, timeliness, completeness, and confidentiality of data. **(I-102.4)**

d. There is an established method of collecting trauma financial data from all health care facilities and trauma agencies, including patient charges and administrative and system costs. **(I-102.5)**

II. The trauma MIS is used to facilitate ongoing assessment and assurance of system performance and outcomes and provides a basis for continuously improving the trauma system, including a cost-benefit analysis. **(B-301)**

a. The lead trauma authority ensures that each member hospital of the trauma system collects and uses patient data, as well as provider data, to assess system performance and to improve quality of care. Assessment data are routinely submitted to the lead trauma authority. **(I-301.1)**

b. Prehospital care providers collect patient care and administrative data for each episode of care and not only provide these data to the hospital, but also have a mechanism to evaluate the data within their own agency, including monitoring trends and identifying outliers. **(I-301.2)**

c. Trauma registry, ED, prehospital, rehabilitation, and other databases are linked or combined to create a trauma system registry. **(I-301.3)**

d. The lead agency has available for use the latest in computer/technology advances and analytic tools for monitoring injury prevention and control components of the trauma system. There is reporting on the outcome of implemented strategies for injury prevention and control programs within the trauma system. **(I-301.4)**

Current Status

The SCC EMS Agency currently collects and aggregates data from several different sources. It is actively working to improve the availability, validity, reliability, and linkage of these data to provide a useful tool for system oversight and research. At present, this work is fragmented, with data linkages and integration between the databases noted as areas of opportunity. The IT

service and data cleaning resources at the SCC EMS Agency are limited, pending further resources and developmental investment. Thus, the trauma system will benefit from the development of a unified strategy and increased allocation of resources toward maintenance and development of data infrastructure and stewardship, potentially through a fully integrated information system. A significant opportunity exists to combine resources to efficiently meet the parallel data collection needs for other time-sensitive condition programs, as well.

The three designated trauma centers have maintained trauma registries for more than twenty years. Although the three trauma centers and the SCC EMS Agency all use the same registry software (Lancet, Trauma One), significant variability has occurred because each of the trauma centers implemented some custom fields. This had resulted in problems with data field mapping and comparability of data between the trauma centers. The SCC EMS Agency has concentrated significant effort on solving these problems and creating a useful aggregate trauma registry with consistent data validation strategies. Weekly calls with Lancet are coordinated to maintain forward progress with data mapping issues. The data in the registry dating from 2014 are felt to be of high quality. Data collected prior to 2014 are largely unavailable because of issues related to a change in registry vendor, incomplete work in data linkage, or data verification.

No specific IT or registrar staff support exists within the SCC EMS Agency for data infrastructure or registry support. The trauma registry is on a county server within a SCC IT department. It was unclear at the time of discussions how and what regular support this IT department provided to the SCC EMS Agency data systems. Over the past two years, the SCC EMS Agency's epidemiologist has performed the registrar and IT support roles for the trauma registry with the support of the SPNC. Both of these individuals lack formal training for these roles. Both individuals are to be commended for their contributions and accomplishments with regard to improved data mapping and data validation. However, both the epidemiologist and SPNC have many other responsibilities and only part-time commitment to the trauma system. The time spent in IT and registry-related tasks results in significant limitations in the ability to expand capabilities beyond basic trauma registry management, rather than a focus on data analysis.

The three trauma centers independently submit data to the National Trauma Data Bank (NTDB) and participate in the ACS Trauma Quality Improvement Program (TQIP). The data from these national benchmarks are not available at the county level, and are not utilized for system analysis. However, interest was expressed in having a TQIP Collaborative program either at the state or county level.

Limited data linkage between the trauma registry and prehospital datasets (EMS, fire, and dispatch data sources) currently exists. ImageTrend is the software for the prehospital data sets. The SCC EMS Agency is in the process of implementing a unified software hub that will integrate prehospital data with receiving EDs. The system will assign a unique Prehospital Care Report (PCR) identifier to each prehospital encounter. The PCR will enable deterministic linkage of patient records across the continuum of care. This system offers great potential once fully implemented, but some significant barriers to achieving this goal still exist. The SCC EMS Agency has limited resources available to assist with implementation, and no immediate plans for creation and maintenance of linkage with trauma registry data were reported. Additionally, the PCR will only work for the initial transport to the ED. If the patient needs inter-facility transfer to a trauma center, the PCR will not remain linked to the patient.

In addition to the trauma registry and prehospital data, the SCC EMS Agency is also actively involved with the collection of limited registry data on patients with stroke and STEMI. The epidemiologist and SPNC are also managing these data projects. Further, the management

approach for these data systems are not coordinated, and each uses a different platform: one an SQL-based server maintained in the SCC IT department, and one is Excel spreadsheet with facility data submitted directly to the epidemiologist. This fragmentation of effort and non-uniformity of approach limits the ability to make progress for all time-sensitive condition programs.

As the quality and utility of the data systems improves, it is likely that the SCC EMS Agency will receive requests for data from outside entities. Currently no policies and procedures exist to define what data may be released, how it might be used, or how individual requests will be evaluated and processed.

The SCC EMS Agency needs to collect injury data from acute care facilities to have population-based data. One major barrier to the collection of this data is the perceived lack of resources within the SCC EMS Agency to collect, house and analyze it. Collection of a minimal dataset from these facilities that can be uploaded to the trauma registry should be implemented. These acute care facilities are designated as stroke or STEMI centers and submit data for those programs. The acute care facilities are currently required by their 911 receiving hospital contracts to submit trauma data. Capability for data collection exists at these facilities, if provided with a minimal dataset that is not overly burdensome. The addition of personnel to manage the SCC EMS Agency trauma registry and other time-sensitive condition data systems could provide the resources needed for implementing a minimal data set and uploading submitted data to the trauma registry.

An additional opportunity is the data linkage from sources outside the agency, such as rehabilitation, Fatality Analysis Reporting System (FARS), and medical examiner data. This potential is also largely unrealized due to resource limitations at the SCC EMS Agency.

Recommendations

- **Create a unit within the Santa Clara County Emergency Medical Services Agency responsible for prehospital, trauma, stroke, and ST-Elevation Myocardial Infarction data systems that has a:**
    - **Fulltime registrar**
    - **Fulltime IT support**

- Standardize and unify minimum data sets, data submission practices, and data validation procedures.

- Establish procedures to utilize the unique patient identifier from prehospital data system as a global identifier for patients tracked through all registry systems.

- Establish a policy and procedures for release of research data to requesting entities.

- Establish procedures to link rehabilitation data to registry and pre-hospital data.

Research

Purpose and Rationale

Overview of Research Activity

Trauma systems are remarkably diverse. This diversity is simply a reflection of authorities tailoring the system to meet the needs of the region based on the unique combination of geographic, economic, and population characteristics within their jurisdiction. In addition, trauma systems are not fixed in their organization or operation. The system evolves over years in response to lessons learned, critical review, and changes in population demographics. Given the diversity of organization and the dynamic nature of any particular system, it is valuable when research can be conducted that evaluates the effectiveness of the regional or statewide system. Research drives the system and will provide the foundation for system development and performance improvement. Research findings provide value in defining best practices and might alter system development. Thus, the system should facilitate and encourage trauma-related research through processes designed to make data available to investigators. Competitive grants or contracts made available through lead authorities or constituencies should provide funds to support research activities. All system components should contribute to the research agenda. The extent to which research activities are required should be clearly outlined in the trauma system plan and/or the criteria for trauma center designation.

The sources of data used for research might be institutional and regional trauma registries. As an alternative, population-based research might provide a broader view of trauma care within the region. Primary data collection, although desirable, is expensive but might provide insights into system performance that might not be otherwise available.

Trauma Registry–based Research

Investigators examining trauma systems can use the information recorded in trauma registries to great advantage to determine the prevalence and annual incidence rate of injuries, patterns of care that occur to injured patients in the system's region, and outcomes for the patients. These data can be compared with standards available from other trauma registries, such as the NTDB. Such comparisons can then enable investigators to determine if care within their region is within standards and can allow for benchmarking. Initiating and sustaining injury prevention initiatives is a vital goal in mature trauma systems. Investigators can take a leadership role in performing research using trauma registry data that identify emerging threats and instituting public health measures to mitigate the threats. For example, a recent surge in death and disability related to off -road vehicles can be identified and the scope of the problem defined in terms of who, where, and how riders are injured, and then, through presentations and publications, the public can be informed of a new threat.

Trauma system administrators have a responsibility to control investigators' access to the registry. The integrity and reliability of data in a trauma systems registry are essential if accurate research and valid conclusions are to be reached using the data. Trauma system administrators should have a process that screens data entered into the system's composite registry from individual institutions. There should be a mechanism that ensures that the information is stored in a secure manner. Investigators who seek access to the trauma registry must follow a written policy and procedure that includes approval by an authorized institutional review board. Trauma registry data may include unique identifiers, and system administrators must ensure that patient confidentiality is respected, consistent with state and federal regulations.

Population-based Trauma System Research

A major disadvantage of using only trauma registry data to conduct research that evaluates injured patients in a region is the bias resulting from missing data on patients not treated at trauma centers. Specifically, most registry data are restricted to information from hospitals that participate in the trauma system. Although ideally all facilities participate in the form of an inclusive system, many systems do not attain this goal. Thus, a population-based data set provides investigators with the full spectrum of patients, irrespective of whether they have been treated in trauma centers or non-designated centers or were never admitted to the hospital owing to death at the scene of incident or because their injuries were insufficiently severe to require admission. The state and national hospital discharge databases are examples of population-based data. These discharge databases contain information that was abstracted from medical records for billing purposes by hospital employees who enter these data into an electronic database. For investigators seeking a wider perspective on the care of injured patients in their region, these more inclusive data sets, compared with registries, are essential tools. Other population-based data that may be of help include mortality vital statistics data recorded in death certificates. Selected regions might have outpatient data to capture patients who are assessed in the ED and then released.

Investigators can use these population-based data to study the influence of a regional trauma system on the entire spectrum of patients within its catchment area.

Participation in Research Projects and Primary Data Collection

Multi-institutional research projects are important mechanisms for learning new knowledge that can guide the care of injured patients. Investigators within trauma systems can participate as coinvestigators in these projects. Investigators can participate by recruiting patients into prospective studies, being leaders in the design and administration of grants, and preparing manuscripts and reports. Evidence of this collaboration is that investigators within a trauma system are recognized in announcements of grants or awards. Lead agency personnel should identify and reach out to resources within the system with research expertise. These include academic centers and public health agencies.

Measures of Research Activity

Research can be broadly defined as hypothesis-driven data analysis. This analysis leads the investigators to a conclusion, which might become a recommendation for system change. Full manuscripts published in peer reviewed research journals are an exemplary form of research activity. Research reported in annual reviews or in public information formats intended to inform the trauma system's constituency can also be considered legitimate research activity.

Optimal Elements

I. The trauma MIS is used to facilitate ongoing assessment and assurance of system performance and outcomes and provides a basis for continuously improving the trauma system, including a cost-benefit analysis. **(B-301)**

a. The lead agency has available for use the latest in computer/technology advances and analytic tools for monitoring injury prevention and control components of the trauma system. There is reporting on the outcome of implemented strategies for injury prevention and control programs within the trauma system. **(I-301.4)**

II. The lead agency ensures that the trauma system demonstrates prevention and medical outreach activities within its defined service area. **(B-306)**

a. The trauma system has developed mechanisms to engage the general medical community and other system participants in their research findings and performance improvement efforts. **(I-306.1)**

b. The effect or impact of outreach programs (medical community training/support and prevention activities) is evaluated as part of a system performance improvement process. **(I-306.3)**

III. To maintain its state, regional, or local designation, each hospital will continually work to improve the trauma care as measured by patient outcomes. **(B-307)**

a. The trauma system implements and regularly reviews a standardized report on patient care outcomes as measured against national norms. **(I-307.2)**

Current Status

Significant improvements in the county trauma registry have created a dataset that is now appropriate for research. Previously researchers were hesitant to use the dataset secondary to quality concerns. With the profound improvement in data validation, the county now has an accurate trauma registry for research projects, though it is not representative of an inclusive county-wide trauma system.

The SCC EMS Agency and trauma system stakeholders have not established research priorities. The epidemiologist, the primary data manager, has direction over which projects to prioritize, through collaboration with the SPNC, medical director and the TAC members, although there is opportunity for regular management of this aspect. A research agenda established jointly by the SCC EMS Agency and the TCSQIC would ensure that proposed research projects align with current system goals and initiatives. Further refinement and monitoring of these initiatives could be accomplished by the formation of a research subcommittee.

The SCC EMS Agency serves as a repository for the system trauma registry as well as a number of other datasets, but no defined method to access this data for research projects has been established. The trauma centers have conducted joint research in the past by combining registry data from individual centers, rather than accessing the trauma system registry. Engaging the SCC EMS Agency would ensure a standard dataset that all centers could work from, enable the lead agency to track system research, and ensure research activities align with established priorities.

Significant effort is focused on linking multiple datasets for both accurate quality improvement and future research. The integration of EMS patient care reports, trauma system data, and rehabilitation outcomes has great promise. Efforts should continue with a focus on an improved mechanism by which to track individual patients through the system.

Santa Clara County has several trauma system researchers. However, the research conducted is primarily from a single trauma center, and the projects do not always involve the lead agency. In order to ensure that the invaluable and growing dataset the SCC EMS Agency has acquired continues to inform research efforts within the county and a more enhanced research capability, the lead agency, academic institutions and all system-wide researchers would need to collaborate more effectively than current practices. The further involvement of the planned EMS fellow in trauma system research would also boost productivity and help with the human resource time constraints.

Recommendations

- Develop a trauma system research agenda with priorities established jointly by the Trauma Care System Quality Improvement Committee and the Santa Clara County Emergency Medical Services Agency.
    - Consider the addition of a research subcommittee that can focus on system projects.

- Establish a research policy for accessing the county trauma data that prioritizes projects that align with the research agenda.

- Improve collaboration between the trauma centers and the Santa Clara County Emergency Medical Services Agency for system research projects.

- Investigate the availability of additional academic resources to support trauma system research.

NEEDS-BASED ASSESSMENT: Review Regarding Additional Trauma Centers

The structure of the Santa Clara trauma system has been stable for many years, with no fundamental change in the number or level of designated trauma centers. The system routinely evaluated metrics of performance and quality of patient care down to the individual case level. Utilizing a poorly codified methodology, which has included evaluation of individual trauma center case volume, transport time, time spent on bypass and transfer patterns from outside the county, the SCC EMS Agency has periodically assessed the need for additional trauma center resources. To date, the SCC EMS Agency has not identified a need to increase the number of designated centers, or a need to modify designation levels.

The SCC EMS Agency reports that it has received an inquiry from one of the current non-designated acute care facilities expressing the desire to be designated as a level II trauma center. As part of the current system assessment, the consultation team was asked to specifically address the question of current need for an additional level II center in the Santa Clara County system. To initiate the evaluation, as part of the pre-visit process, the SCC EMS Agency was asked to utilize the current draft version of the American College of Surgeons Committee on Trauma Needs-Based Assessment of Trauma Systems (NBATS) tool, which is currently being developed to aid in such decisions. This tool, along with information describing its development and intended use, are attached as Appendix A. The SCC EMS Agency's responses and the results generated by the tool are included as Appendix B. The draft NBATS tool suggests that the current number of designated trauma centers is sufficient to meet population need.

The consultation team independently evaluated available data regarding trauma system operations and trauma center function, focusing on access to care, capacity of existing centers, expected population growth, and quality of care provided.

Access

Santa Clara County has an estimated population of 1.8 million with daytime expansion to 2.2 million. The county covers 1304 square miles. The mean population density is 1400 per square mile. Despite the mean population density, the county has regions that are rural and remote.

The existing three adult trauma centers, Stanford Health Care, Santa Clara Valley Medical Center, and Regional Medical Center, and the two associated pediatric trauma centers at Stanford Health Care and Santa Clara Valley Medical Center, are located near major highways and well distributed through the county's densest population center to geographically to serve the population. With the support of appropriately utilized air medical resources, these trauma centers are all well located for rapid access by EMS and the population. This assessment is supported by 2011 data on trauma center access which show that over 95% of the population and 95% of the land area of Santa Clara County are within 60 minutes transport time by ground or air (Appendix C references the current trauma center map data).

Median transport times to existing trauma centers are 10-20 minutes, well within commonly accepted guidelines.

Diversion rates for the existing trauma centers are low, well below 5%, based on data available to the consult team.

Capacity

Each of the three existing centers operate at relatively low volume compared to similar centers nationwide, and the two level I centers are near the minimum volume threshold needed to maintain their level of designation. This data, combined with evaluation of diversion hours, and the size and structure of the individual hospitals suggest that all three existing trauma centers have the capacity to significantly increase their annual volume. Further, data from other trauma systems suggest that such increases in center volume would have potential to improve outcomes within each center.

The total number of patients reported by the five SCC trauma centers (three adult, two pediatric) in 2015 was 7796. The pediatric patient volume (ages 0 to 15 years) was 779, roughly 10% of the total volume. Overall patient volume has been fairly consistent since 2011.

Approximately 33% of the patient volume came from counties surrounding Santa Clara, and experience has shown this volume can be substantially affected by trauma center designation decisions made outside of Santa Clara County. In 2015, a new Level II trauma center opened in Monterey County, which has decreased patient volume at the Santa Clara County center that had previously served this region.

Quality

The ongoing medical audit process has not identified any quality issues related to lack of trauma center access or to insufficient trauma center resources due to volume. As reported in the trauma registry, the number of patients with a severe injury (Injury Severity Score [ISS] > 15) was 774 in 2015. As reported in the SCC trauma registry, each of the adult trauma centers currently discharges approximately 200 patients with such severe injuries annually. The current total volume of admitted trauma patients and patients with severe injuries at the existing trauma centers are adequate to meet criteria for verification by the American College of Surgeons Verification Review Program and to maintain competence of health professionals. However, the current volume is in the lower range of required patient volume. The addition of another Level II trauma center that would pull from the current catchment areas has the potential to threaten the essential volume needed for verification and ongoing health professional competence.

Recommendations

- Current trauma center resources are serving the population of Santa Clara County well.
- Given its current population, anticipated growth, existing injury patterns and patient volumes at existing Level I and Level II trauma centers, Santa Clara County does not need an additional Level II Trauma Center at this time.
- Current practices for assessment of the Santa Clara County trauma system should be codified, and ongoing assessments conducted on a regular basis.

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APPENDIX A: ACS COT Needs-Based Assessment of Trauma Systems (NBATS) Tool

The ACS NBATS Tool was developed by the Needs Based Trauma Center Designation Consensus Conference, convened by the American College of Surgeons Committee on Trauma.

- Held in Chicago on August 24–25, 2015
- The participants in the conference are listed in Appendix 1.

Introductory Notes

The Needs-Based Trauma Center Designation Consensus Conference was held in Chicago on August 24–25, 2015. The conference was convened by the American College of Surgeons Committee on Trauma, and was comprised of a broad group of people involved in the process of trauma center designation in the context of an inclusive regional trauma system. The conference participants are listed in Appendix 1. The group was unanimous in support of the principle that trauma center designation within a regional trauma system should be based upon the needs of the population served, as outlined in the recent position statement put forward by the American College of Surgeons Committee on Trauma. The group was also unanimous in its opinion that there is immediate need for a practical tool, based upon data that is currently available, that can be used to assist regions currently struggling with this issue of new trauma center designation.

The group worked to develop such a model tool to assist regions in the performance of an assessment and the determination of the number of trauma centers needed in a region. The conference workgroup was fully cognizant of the challenges involved in this process, not the least of which is a lack of proven metrics of need. The goal was to produce a pragmatic and relatively simple tool that could be used based upon data currently available, while also starting the process that would lead to future improvements and refinements in the approach. This was constructed to aid in the performance of an assessment of the number of trauma centers needed in a specified geographical region, which will be called a Trauma Service Areas (TSA). This tool presumes that the TSA to be evaluated has already been defined, and could range in size from a small county to a multi-state region. The tool is designed to evaluate the number of centers needed within the TSA, starting from a clean slate and then making adjustments for existing trauma centers (Level I, II, and III) in the TSA. This tool does not attempt to specifically assess the impact of adding an additional center to a TSA, nor does it attempt to determine the relative merit of a particular facility becoming a trauma center within the TSA.

The tool assigns points based upon four elements: population, transport time, community support, and number of severely injured patients (ISS > 15) discharged from centers in the TSA that are not Level I, Level II, or Level III trauma centers. This raw score is then adjusted based upon the number of existing Level I, Level II, and Level III centers, and based upon the volume of severely injury patients seen at those existing centers. The final score provides a guideline for the number of trauma centers needed in the TSA.

The conference working group acknowledges that there is no clear evidence to support the use of any of the specific measures proposed, and as a result all recommendations reflect the expert opinion of the convened group, derived through a deliberative group process. The tool itself, along with point assignments for each element, and the point totals to determine trauma center need in this draft are for initial evaluation purposes only. It is anticipated that both the

individual element scores as well as the final target ranges will vary depending upon the demographics of the particular TSA (e.g. population, population density, size, geography) and will also reflect the balance of priorities within the specific trauma system. The tool is being circulated to a larger audience of people and groups involved in the trauma center designation process for comment and for initial testing in a range of existing systems; as proof of concept and to begin to collect data that can be used to improve and refine the tool.

Please review the tool and try it out in your particular circumstances. You may modify any of the parameters used if you feel this will improve the accuracy of the model in your region. Please feel free to submit any comments, as well as any trial data generated, to the conference working group through the Feedback Form. Please also feel free to contact Maria Alvi, Manager, Trauma Systems and Quality Programs (malvi@facs.org) with any additional questions or concerns.

Thank you for your interest and your willingness to participate in this important project.

Robert J. Winchell, MD, FACS
Chairman
Trauma Systems Evaluation and Planning Committee

Ronald M. Stewart, MD, FACS
Chairman
Committee on Trauma

On behalf of the Needs-Based Trauma Center Designation Consensus Conference working group

ACS NBATS Tool

Preliminary Draft 1–September 4, 2015

1. Population

a. Total TSA population of less than 600,000 received 2 points
b. Total TSA population of 600,000–1,200,000 received 4 points
c. Total TSA population of 1,200,000–1,800,000 received 6 points
d. Total TSA population of 1,800,000–2,400,000 received 8 points
e. Total TSA population of greater than 2,400,000 received 10 points

Points Assigned: _____

2. Median Transport Times (combined air and ground–scene only no transfer)

a. Median transport time of less than 10 minutes received 0 points
b. Median transport time of 10–20 minutes receives 1 point
c. Median transport time of 21–30 minutes receives 2 points
d. Median transport time of 31–40 minutes receives 3 points
e. Median transport time of greater than 41 minutes receives 4 points

Points Assigned: _____

3. Lead Agency/System Stakeholder/Community Support
Lead agency support for a trauma center (if none exist) or an additional trauma center in the TSA – 5 points
Trauma System Advisory Committee (or equivalent body) statement of support for a trauma center (if none exist) or an additional trauma center in the TSA – 5 points
Community support demonstrated by letters of support from 25–50% of city and county governing bodies within the TSA – 1 point
Community support demonstrated by letters of support from over 50% of city and county governing bodies within the TSA – 2 points

Points Assigned: _____

4. Severely injured patients (ISS > 15) discharged from acute care facilities not designated as Level I, II, or III trauma centers.

a. Discharges of 0-200 severely injured patients receives 0 points
b. Discharges of 201–400 severely injured patients receives 1 point
c. Discharges of 401–600 severely injured patients receives 2 points
d. Discharges of 601–800 severely injured patients receives 3 points
e. Discharges of greater than 800 severely injured patients receives 4 points

Points Assigned: _____

5. Level I Trauma Centers

a. For the existence of each verified Level I trauma center already in the TSA assign 1 negative point
b. For the existence of each verified Level II trauma center already in the TSA assign 1 negative point
c. For the existence of each verified Level III trauma center already in the TSA assign 0.5 negative points

Points Assigned: _____

6. Numbers of severely injured patients (ISS > 15) seen in trauma centers (Level I and II) already in the TSA
The expected number of high-ISS patients is calculated as:
500 x (# of Level I and Level II centers in the TSA) = _____

a. If the TSA has more than 500 severely injured patients above the expected number assign 2 points
b. If the TSA has 0-500 severely injured patients above the expected number assign 1 point
c. If the TSA has 0-500 fewer severely injury patients than the expected number assign 1 negative point
d. If the TSA has more than 500 fewer severely injured patients than the expected number assign 2 negative points

Points Assigned: _____

The following scoring system shall be used to allocate trauma centers within the TSAs:

- TSAs with scores of 5 points or less shall be allocated 1 trauma center
- TSAs with scores of 6-10 points shall be allocated 2 trauma centers
- TSAs with score of 11-15 points shall be allocated 3 trauma centers
- TSAs with scores of 16-20 points shall be allocated 4 trauma centers

If the number of trauma centers allocated by the model is greater than the existing number of trauma centers in the TSA, efforts should be undertaken to recruit and designate additional trauma centers.

If the number of trauma centers allocated by the model is greater than the number allocated by the model, the lead agency should not designate additional trauma centers in the TSA.

ACS COT Consensus Conference Participants List

Eileen Whalen, MHA, RN	President and COO; Acting CNO	The University of Vermont Medical Center
Michele Ziglar, RN, MSN	Vice President of Trauma Services	HCA Healthcare
Betty J Bartleson, MSN	Vice President of Nursing and Clinical Services	California Hospital Association
Robert Gfeller	Executive Director	Childress Institute for Pediatric Trauma
Robert Fojut	Editor	Trauma System News
Charles William Mains, MD, FACS	Surgeon	Surgical Specialists of Colorado
Dennis Maier, MD	Medical Director	Surgical Associates PC
Robert Todd Maxson, MD	Pediatric Surgeon	Arkansas Children's Hospital
Debra Perina, MD, FACEP	Director	American College of Emergency Physicians (ACEP); NAEMSP
N. Clay Mann, PhD, MS	Professor of Surgery	NEMSIS TAC PI, University of Utah
Ellen Mackenzie, PHD	Fred and Julie Soper Professor and Chair	Johns Hopkins Bloomberg School of Public Health
Robert Mackersie, MD	Professor of Surgery and Director of Trauma Services	University of California San Francisco; San Francisco General Hospital and Trauma Center
Eric Chaney, MBA	Representing the Deputy Director (Acting), Workforce Health and Medical Support Division	US Department of Homeland Security (DHS)
Gregg S Margolis, PhD, NRP	Director of the Division of Health System Policy, Office of the Assistant Secretary for Preparedness and Response	US Department of Health and Human Services (HHS); ASPR
Brendan G Carr, MD, MA, MS	Director of ECCC; Division of Health System Policy	US Department of Health and Human Services (HHS); ASPR
Beth Edgerton, MD, MPH	Director of the Division of Child, Adolescent and Family Health (DCAFH)	Health Resources and Services Administration (HRSA)
Cathy Gotschall, ScD	Senior Health Scientist	National Highway and Traffic Safety Administration (NHTSA)
Drew Dawson	Director, Office of EMS	National Highway and Traffic Safety Administration (NHTSA)
Fergus Laughridge, Captain, CPM	Professional Services and Compliance Officer	Humbolt General Hospital EMS and Rescue, State of Nevada
Eric Epley	Executive Director	Southwest Texas Regional Advisory Council (STRAC); Regional Structure
Robert Jex, RN	Specialty Care Program Manager	Utah Dept. of Health, Bureau of EMS; Utah Office of Rural Health
John Armstrong, MD	Surgeon General; Secretary of Health	Florida Department of Health
Chuck Kearns, MBA	President	NAEMT
Ronald M Stewart, MD, FACS	Chair COT	ACS Trauma
Leonard J Weireter, MD, FACS	Vice Chair COT	ACS Trauma
Robert J Winchell, MD, FACS	Chair TSEPC, COT	ACS Trauma
Jean Clemency	Administrative Director of ACS Trauma Programs	ACS Trauma Programs
Nels D Sanddal, PhD, REMT	Manager of Trauma Systems and Trauma Centers Verification Programs	ACS Trauma Programs
Maria Alvi, MHA	Manager of Trauma Systems and Quality Programs	ACS Trauma Programs
Jane Ball, RN, DrPH	ACS Trauma Consultant	ACS Trauma Programs
Justin Rosen	State Affairs Associate; COT Advocacy Committee	ACS Advocacy and Health Policy
Molly Lozada	Manager of Trauma Centers Quality VRC Programs	ACS Trauma Programs
Matt Coffron	Manager of Policy Development	ACS Advocacy and Health Policy
Melanie Neal	NTDB Manager	ACS Trauma Programs
Scott Matthews	Graphic Recorder, Company Co-founder	Tremendousness

APPENDIX B: SCC EMS Agency Completed NBATS Tool

ACS NBATS Tool
Preliminary Draft 1 – September 4, 2015

1. Population -

a. total TSA population of less than 600,000 received 2 point
b. total TSA population of 600,000 to 1,200,000 received 4 points
c. total TSA population of 1,200,000 to 1,800,000 received 6 points
d. total TSA population of 1,800,000 to 2,400,000 received 8 points
e. total TSA population of greater than 2,400,000 received 10 points

Points Assigned: _8___

2. Median Transport Times (combined air and ground – scene only no transfer)

a. Median transport time of less than 10 minutes received 0 points
b. Median transport time of 10 – 20 minutes receives 1 points
c. Median transport time of 21- 30 minutes receives 2 points
d. Median transport time of 31 – 40 minutes receives 3 points
e. Median transport time of greater than 41 minutes receives 4 points

Points Assigned: _1__

3. Lead Agency/System Stakeholder/Community Support

Lead agency support for a trauma center (if none exist) or an additional trauma center in the TSA – 5 points.

Trauma System Advisory Committee (or equivalent body) statement of support for a trauma center (if none exist) or an additional trauma center in the TSA – 5 points.

Community support demonstrated by letters of support from 25- 50% of city and county governing bodies within the TSA – 1 points

Community support demonstrated by letters of support from over 50% of city and county governing bodies within the TSA – 2points

Points Assigned: _1__

4. Severely injured patients (ISS > 15) discharged from acute care facilities not designated as Level I, II, or III trauma centers.

a. Discharges of 0-200 severely injured patients receives 0 points
b. Discharges of 201 – 400 severely injured patients receives 1 points
c. Discharges of 401 – 600 severely injured patients receives 2 points
d. Discharges of 601- 800 severely injured patients receives 3 points
e. Discharges of greater than 800 severely injured patients receives 4 points

Points Assigned: __1__

5. Level I Trauma Centers

a. For the existence of each verified Level I trauma center already in the TSA assign 1 negative point
b. For the existence of each verified Level II trauma center already in the TSA assign 1 negative point
c. For the existence of each verified Level III trauma center already in the TSA assign 0.5 negative points

Points Assigned: __-3__

6. Numbers of severely injured patients (ISS > 15) seen in trauma centers (Level I and II) already in the TSA

The expected number of high-ISS patients is calculated as:

500 x (# of Level I and Level II centers in the TSA) = _1500___

a. If the TSA has more than 500 severely injured patients above the expected number assign 2 points
b. If the TSA has 0-500 severely injured patients above the expected number assign 1 point
c. If the TSA has 0-500 fewer severely injury patients than the expected number assign 1 negative point
d. If the TSA has more than 500 fewer severely injured patients than the expected number assign 2 negative points

Points Assigned: __-2__

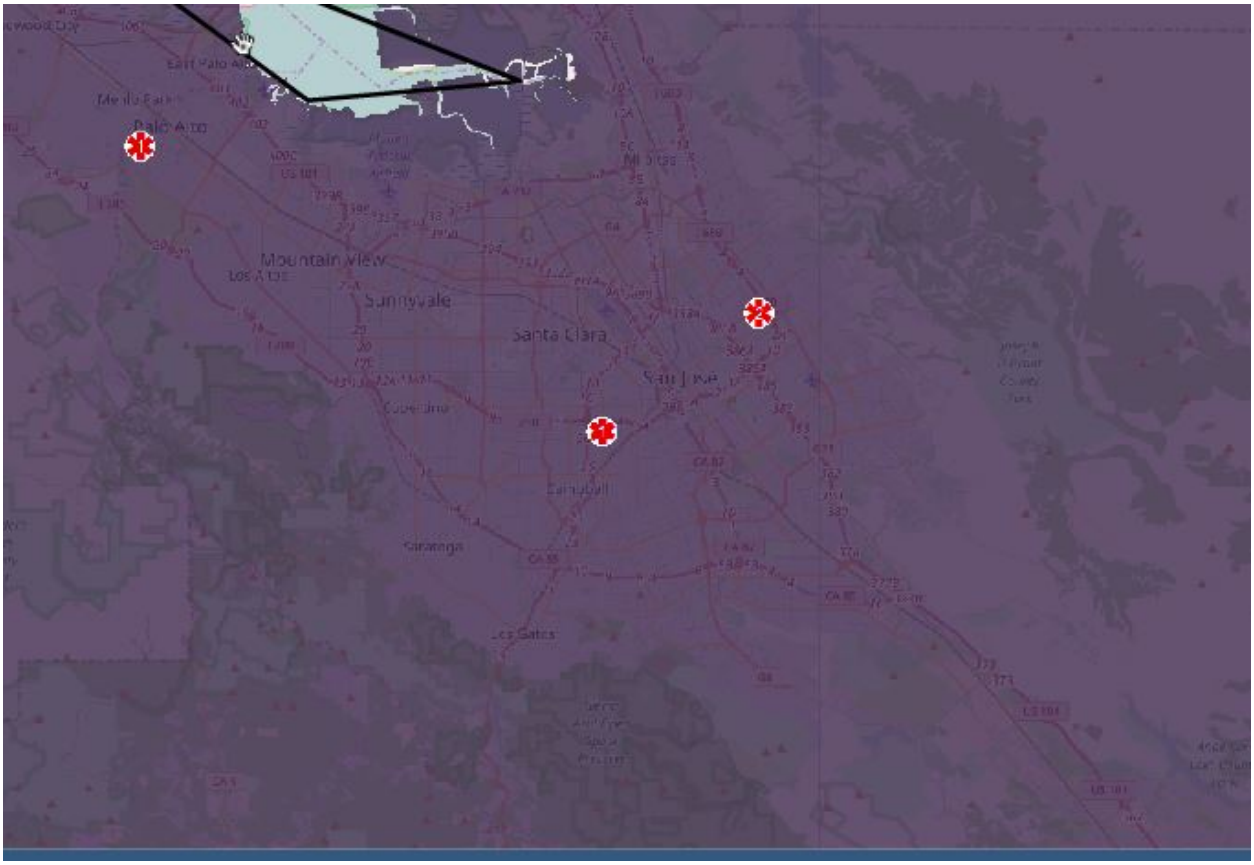
The following scoring system shall be used to allocate trauma centers within the TSAs:

1. TSAs with scores of 5 points or less shall be allocated 1 trauma center
2. TSAs with scores of 6-10 points shall be allocated 2 trauma centers: (6)
3. TSAs with score of 11-15 points shall be allocated 3 trauma centers
4. TSAs with scores of 16-20 points shall be allocated 4 trauma centers

If the number of trauma centers allocated by the model is greater than the existing number of trauma centers in the TSA, efforts should be undertaken to recruit and designate additional trauma centers.

If the number of trauma centers allocated by the model is less than the number of existing trauma centers, the lead agency should not designate additional trauma centers in the TSA.

APPENDIX C: SCC Trauma Center Map Data



Map and Data Source: http://www.traumamaps.org/

APPENDIX D: Acronyms

ABA – American Burn Association
ACS – American College of Surgeons
ALS – advanced life support

BIS – Benchmarks, Indicators, and Scoring
BLS – basic life support
BRFSS – Behavior Risk Factor Surveillance System

CCT – critical care transport
CDC – Centers for Disease Control and Prevention

ED – emergency department
EMCC – Emergency Medical Care Committee
EMD – emergency medical dispatch
EMS – emergency medical services
EMSC – Emergency Medical Services for Children
EMT – emergency medical technician

FARS – Fatality Analysis Reporting System
FEMA – Federal Emergency Management Agency
FTE – fulltime equivalent

GIS – geographic information system

ISS – injury severity score
IT – information technology

LEMSAs – Local EMS Agencies

MCI – mass casualty incident
MPMP – multiple patient management plan
MTV – major trauma victim

NAED – National Academies of Emergency Dispatch
NREMT – National Registry of Emergency Medical Technicians
NTDB – National Trauma Data Bank

PCR – Prehospital CaRe identifier
PI – performance improvement
PIPS – performance improvement and patient safety
PRQ – pre-review questionnaire
PSAP – public safety answering point

QI – quality improvement

RTCC – Regional Trauma Coordinating Committee
RTTDC – Rural Trauma Team Development Course

SCC – Santa Clara County
SCI – spinal cord injury

SPNC – specialty program nurse coordinator
STEMI – ST-elevation myocardial infarction
SWITRS – Statewide Integrated Traffic Records System

TBI – traumatic brain injury
TCSQIC – Trauma Care System Quality Improvement Committee
TMAC – Trauma Managers Association of California
TPM – trauma program manager
TQIP – Trauma Quality Improvement Program
TSC – trauma system consultation

YBRSS – Youth Behavior Risk Surveillance System

APPENDIX E: Methodology

The Santa Clara County EMS Authority requested this trauma system consultation, which was conducted under the auspices of the American College of Surgeons (ACS), Trauma System Consultation (TSC) Program. The multidisciplinary trauma system consultation team consisted of: three trauma surgeons, one emergency physician, a state EMS/trauma director, a trauma program manager, one trauma systems consultant, the ACS trauma systems program manager and additional supervisory staff. Biographical sketches for team members are included as Appendix C of this report.

The primary objective of the ACS trauma system consultation was to guide and help promote a sustainable effort in the graduated development of an inclusive and integrated system of trauma care for Santa Clara County, California. The format of this report correlates with the public health framework of assessment, policy development, and assurance outlined in the ACS *Regional Trauma Systems Optimal Elements, Integration, and Assessment: System Consultation Guide*. Prior to the visit, the TSC team reviewed the ACS Pre-Review Questionnaire (PRQ) submitted by the EMS Authority, along with a number of additional supporting documents. Information available on government websites was also viewed.

The TSC team convened in San Jose, CA, on November 15 – 18, 2016, to review the Santa Clara County trauma system. The meetings during the four-day visit consisted of plenary sessions during which the TSC team engaged in interactive dialogue with a broad range of representative trauma system participants. There was also an opportunity for informal discussion with the participants and time devoted to questions and answers. During the survey, the TSC team also met in sequestered sessions for more detailed reviews and discussion, and for the purpose of developing team consensus on the various issues, preparing a report of their findings, and developing recommendations for future development of the trauma system in Santa Clara County. This report was developed independently of any other trauma system consultations or assessments.

APPENDIX F: Reviewer Biographies

ROBERT J. WINCHELL, MD, FACS
Role: Surgeon, Team Leader

Dr. Winchell received his undergraduate degree from the California Institute of Technology, his M.D. from Yale University, and did his internship, General Surgery residency, and Trauma and Critical Care Fellowship at the University of California, San Diego, where he remained on the faculty as Associate Professor of Clinical Surgery in the Division of Trauma through 1999. After leaving the University of California, Dr. Winchell established and subsequently directed the Tacoma Trauma Center in Tacoma, Washington, which continues to operate successfully as a joint venture between two previously competing hospitals. In 2001, Dr. Winchell moved to the Maine Medical Center and assumed the role of Head of the Division of Trauma and Burn Surgery in 2004. He remained in that position for 10 years, also serving as an Associate Professor of Surgery at the Tufts University School of Medicine. Under his direction, Maine Medical Center became a verified Level I trauma center for the first time in 2007. After leaving Maine, Dr. Winchell served as Chief of Trauma and Visiting Professor of Surgery at the University of Texas Health Science Center at Houston and Chief of Trauma at Memorial Hermann -Texas Medical Center until assuming his current post. In July 2015, Dr. Winchell joined the faculty in the Department of Surgery at Weill Cornell Medical College as Chief of the Division of Trauma, Burns, Acute and Critical Care and Director of the Trauma Center at New York-Presbyterian Weill Cornell Medical Center.

Dr. Winchell has been deeply interested and involved in the development and evolution of trauma systems for his entire career. He has been involved in trauma center and trauma systems design and operation in a wide variety of settings covering the spectrum of system development. He was instrumentally involved in leadership roles with both the day-to-day operations and ongoing development of the San Diego County trauma system for over ten years and served as chair of the San Diego and Imperial County Committee on Trauma. He participated in the leadership, operation and ongoing development of the Washington state trauma system, serving on the state advisory board, and as chair of the Southwest EMS region. During Dr. Winchell's tenure in Maine, he helped to develop the Maine state system, serving as a member of the state advisory board and as a chairman of the Maine State Committee on Trauma. In Texas, he served on the Trauma Systems subcommittee of the Governor's EMS and Trauma Advisory Council. Dr. Winchell is a leader in international trauma systems development, and the founding representative from the American College of Surgeons to the World Health Organization's Global Alliance for the Care of the Injured.

In parallel to his clinical and research work, Dr. Winchell has had the honor to serve the American College of Surgeons Committee on Trauma for almost 20 years, first as a State Chair for San Diego County and for Maine, and currently as a member and part of the Executive Committee. His leadership and forethought have been instrumental to the Trauma Systems consultation program of the COT since 2006, and he currently serves as Chair of the Trauma Systems Evaluation and Planning Committee. In that role, he has conducted expert consultation in 18 states and regions, serving as team leader for 14 of these, and has also participated in trauma systems work internationally. Dr. Winchell is also a senior reviewer for the trauma center verification program of the College. He has participated in 18 state and regional trauma system consultations.

Dr. Winchell has dedicated almost two decades to the advancement care of the injured as a part of national public health policy, and the implementation of state and regional trauma systems based upon and supported by that policy.

Dr. Winchell is Board certified in General Surgery, with added qualifications in Surgical Critical Care. He is a Fellow of the American College of Surgeons as well as a member of the American Association for the Surgery of Trauma, the Association for Academic Surgery, the Southwest Surgical Congress, the Society of Critical Care Medicine and the New England Surgical Society. Dr. Winchell is author of more than 50 scientific papers and book chapters, and has given over 100 regional, national and international presentations. He is an ad hoc reviewer for the Journal of Trauma and Acute Care Surgery, the Archives of Surgery and the World Journal of Surgery.

MICHAEL H. THOMASON, MD, FACS
Role: Surgeon

Dr. Thomason is Vice Chair of the Department of Surgery, Specialty Medical Director-Surgery Care Division, and Medical Director-Carolinas Trauma Network for Carolinas HealthCare System. He served as Trauma Medical Director of the F.H. "Sammy" Ross Trauma Center, an ACS verified Level I and Pediatric Level II center in Charlotte, NC., from 1985-2015. He is also Clinical Professor of Surgery at UNC School of Medicine. Dr. Thomason received his undergraduate degree from Davidson College and graduated from the University of North Carolina School of Medicine in 1978. After completing general surgery training at Charlotte Memorial Hospital (now Carolinas Medical Center), he became the second full time faculty member in general surgery in an institution that has since evolved from a community hospital training program into the only non-university academic medical center in North Carolina, the Carolinas Medical Center.

In 1985, he helped to develop and direct the trauma program from its inception as a Level II state designated trauma center to an ACS Level I trauma center serving the 20 county Metrolina region of North and South Carolina. He has served several terms as Chairman of the Metrolina Trauma Advisory Committee, and has been both Vice Chairman and Chairman of the North Carolina Committee on Trauma. During this time, he also participated in creation and direction of the State Trauma Advisory Committee (STAC). Subsequently, he was appointed Chief of Region IV (Southeastern US) for the ACS Committee on Trauma. He is currently a member of the national COT, and is a site visitor for the COT Verification Review Committee.

Following recommendations made by the COT Trauma Systems Review of North Carolina in 2004 he became, in 2008, the first and current Trauma Medical Advisor to the Office of Emergency Medical Services, the regulatory agency for the statewide trauma system.

As Medical Director of the Ross Trauma Center, he recruited a diverse group of 14 trauma/ critical care/ acute care surgeons who provide continuous in house coverage for the highest volume trauma center in the state.

PETER E. FISCHER, MD, MS, FACS
Role: Observer – Surgeon

Dr. Fischer is an Associate Professor of Surgery at the University of Tennessee Health Science Center in Memphis, TN. He completed his residency in general surgery at the University of Tennessee at Memphis and subsequently a surgical critical care fellowship at Oregon Health and Science University in Portland, OR.

He was previously at Carolinas Medical Center in Charlotte, NC before returning to Memphis in 2016.

He has been an active member in the fire service as a firefighter & paramedic since 1998, and thus his main areas of interest include trauma systems and prehospital care.

JAMES D. UPCHURCH, MD, MA, FAAFP, FACEP
Role: ED Physician

Dr. Upchurch began his medical career in 1971 as a Special Forces Medic courtesy of the US Army. He graduated from the University of Texas Medical Branch at Galveston in 1982 and completed a Family Practice residency from the University of Oklahoma in 1985. From 1985 until 2015, he has served as an Indian Health Service (IHS) Physician on the Crow Indian Reservation in Montana. During that time the majority of his clinical practice involved emergency medicine (EM), Emergency Medical Services (EMS),

surgery and obstetrics. In 2003, he completed a Masters Degree in educational technology from George Washington University. His current practice includes emergency services for a local rural hospital.

Dr. Upchurch is a long-standing member of the National Association of EMS Physicians, and the American College of Emergency Physicians. Since 1986, he has functioned as EMS medical director for Big Horn County in Montana and guided their basic care program to the advanced life support level, including critical care inter-facility transport. He also provides EMS medical direction for the Incident Medical Specialist Program and Missoula Smoke Jumpers, US Forest Service, Region I.

Dr. Upchurch is director of a small non-profit organization, EMS Education & Training. They offer distance and face-to-face educational opportunities to rural and frontier EMS personnel in Montana who desire to advance their level of care. He is an active ACLS, ACLS EP, ATLS, PALS, PHTLS and CALS instructor.

Dr. Upchurch served many years as the volunteer state EMS medical director for Montana and represented Montana on the National Council of State EMS Medical Directors of the National Association of State EMS Officials. Until recently he functioned at the IHS national level as a consultant on EM and EMS issues. He is a member of the Montana Board of Medical Examiners who license physicians and EMTs.

FERGUS LAUGHRIDGE, Captain, CPM
Role: State EMS Director

Mr. Laughridge has a diverse professional background as a police officer, firefighter, paramedic, and manager of EMS systems and operations. Mr. Laughridge has served as the Director of Nevada State Health Division, Emergency Medical Systems and Trauma program where he was responsible for assuring the quality of pre-hospital emergency medical and trauma services throughout Nevada. As State EMS Director, he was involved with numerous federal, state, and community activities relating to emergency preparedness and response.

Mr. Laughridge is currently employed by Humboldt General Hospital EMS and Rescue in Winnemucca, Nevada. Mr. Laughridge has the responsibilities of coordinating public health preparedness for Humboldt General Hospital and surrounding county. Mr. Laughridge is also responsible for assuring regulatory compliance for a high performance and dynamic rural emergency medical system.

Mr. Laughridge is continually requested to serve on various committees centered on quality patient care, trauma systems, and credentialing of EMS systems.

JOLENE R. WHITNEY, MPA
Role: Trauma Program Manager

Ms. Whitney has worked with the Bureau of Emergency Medical Services and Preparedness, Utah Department of Health for 35 years. She is currently serving as the Director of Specialty Care and Performance Improvement. She also served as Deputy Director for the Bureau for seven years, which included managing several programs including Trauma System Development, state grants program, fiscal reporting, Chemical Stockpile Emergency Preparedness, EMS Strike teams, ED, Trauma and Pre-hospital databases, CISM, medical direction coordination, EMS Licensing and Operations, and EMS for Children.

Ms. Whitney has a Master in Public Administration from Brigham Young University and a B.S. in Health Sciences, with an emphasis in Community Health Education from the University of Utah

Ms. Whitney is a co-author of eight publications on preventable trauma mortality, domestic violence, challenges of rural trauma in the western states, pediatric vital signs, Crisis Standards of Care Framework and Toolkit and medical surge capacity planning. She served as Chair, Vice Chair and Regional Representative for the State Trauma Managers Council with the National Association of State EMS

Officials. She is a member of the American Trauma Society, Utah Public Health Association, International Association of Emergency Managers and Utah Emergency Managers Association.

In 2010, Ms. Whitney participated on an Institute of Medicine planning committee and served as a panel Chair for a Rural Response to MCI workshop. She also served on the IOM Crisis Standards of Care Committee which developed the CSC Framework and Toolkit. She recently participated on the IOM planning committee and workshops for Regional Disaster Response Coordination to Support Health Outcomes. She assisted in the development of the Utah DMAT-1 and has served as a member of the team since its inception in 2010.

Ms. Whitney has served on several national committees and teams, including numerous state EMS system assessments for NHTSA, trauma system consultations for the American College of Surgeons, reviewed rural trauma grant applications for HRSA, contributed to the HRSA model trauma system plan, the National Trauma Data Standards, and the NASMESO trauma system planning guide.

JANE W. BALL, RN, DRPH
Role: Technical Advisor

Dr. Ball has served as a consultant to the Trauma Systems Evaluation and Planning Committee of the American College of Surgeons Committee on Trauma since 2006. As such, she has participated on more than 20 state and regional trauma system consultations. She was the Director of the National Resource Center (NRC) at the Children's National Medical Center in Washington, D.C. from 1991 through 2006. The NRC provided support to two Federal Programs in the U. S. Department of Health and Human Services' Health Services and Resources Administration (HRSA): the Emergency Medical Services for Children (EMSC) Program and the Trauma-Emergency Medical Services Systems Program. As director of the NRC, she participated in the development of the HRSA Model Trauma Systems Evaluation and Planning document. She also provided technical assistance to states regarding strategic planning, providing guidance in securing funding, developing and implementing grants, developing injury prevention plans and programs, building coalitions, shaping public policy, conducting training, and producing educational resource materials.

Dr. Ball has authored numerous articles and publications as well as several health care textbooks, including Mosby's Guide to Physical Examination (8 editions), Child Health Nursing (3 editions), Pediatric Nursing: Caring for Children (6 editions), Maternal and Child Nursing Care (4 editions), and Pediatric Emergencies: A Manual for Prehospital Care Providers (2 editions). One of these texts, Pediatric Nursing: Caring for Children, received the1999 and 2001 Robert Wood Johnson Foundation Last Acts Coalition Outstanding Specialty Book Award. Child Health Nursing was recognized as an American Journal of Nursing Book of the Year in 2010. As an expert in the emergency care of children, Dr. Ball has frequently been invited to join committees and professional groups that address the unique needs of children.

Dr. Ball served as the President of the National Academies of Practice, an organization composed of distinguished health care practitioners from 10 disciplines that promote education, research, and public policy related to improving the quality of health care for all through interdisciplinary care.

Dr. Ball graduated from the Johns Hopkins Hospital School of Nursing. She obtained her master's degree and doctorate in Public Health from John Hopkins University School of Hygiene and Public Health. She is a Certified Pediatric Nurse Practitioner. She received the Distinguished Alumni Award from the Johns Hopkins University in 2010.

MELANIE NEAL, MS
Role: Observer – ACS Staff (Senior Manager, Trauma Quality Programs)

Ms. Neal has been with the American College of Surgeons for thirteen years, and is the Senior Manager of Trauma Quality Programs, as well as the Manager of the National Trauma Data Bank (NTDB) and the Trauma Quality Improvement Program (TQIP). In this position, she provides strategic direction and high level management for scientific, business, and product operations areas.

In addition, Ms. Neal works with a variety of data and quality initiatives of the Committee on Trauma that support the mission of the COT to improve care for the injured patient. She represents the COT programs of the ACS on this consultation.

Ms. Neal has a Master's degree in Social Science Research Methods.

JIMM DODD, MS, MA
Role: ACS Staff (Manager, Trauma Systems Programs)

Mr. Dodd joined the American College of Surgeons (ACS) Trauma Department as the Trauma Quality Improvement Programs Manager in July 2015. In this role he is responsible for Performance Improvement and Patient Safety for TQIP facilities.

Prior to joining ACS, Mr. Dodd served in the US Army and US Army Reserves as a medical officer commanding hospitals in support of Operation Iraqi Freedom and Operation Enduring Freedom. He was selected to work on a special task force developing procedures and policies for the integration of Army medicine into State and Local disaster planning and response. He also served on various committees developing initiatives for returning Veterans who were transitioning into civilian careers, creating programming to facilitate their transition. During his time in the military Jimm served as a flight paramedic and an independent duty medic. Mr. Dodd still serves in the Army Reserves as a staff officer with CEMARS-G at Fort Sheridan, Illinois.

Mr. Dodd graduated from Western Carolina University, in Cullowhee North Carolina, with a Bachelor's degree in Emergency Medical Care. He has completed his Masters in Organizational Leadership with a concentration in Servant Leadership from Gonzaga University, in Spokane Washington. Mr. Dodd served as a NREMT- P within the EMS community at various systems during his time in the Army. With his education, Mr. Dodd has had the opportunity to teach future leaders in Army medicine and apply combat experience to help shape the Army healthcare system.

Mr. Dodd was recognized for his combat duty while serving by being awarded the Bronze Star Medal, Meritorious Service Medal and Army Commendation Medals.

HOLLY MICHAELS, MPH
Role: ACS Staff (Manager, TQIP Collaboratives and Systems Programs)

Ms. Michaels has served as the American College of Surgeons (ACS) Trauma Systems Consultation Program and BIS Facilitation Program Administrator since 2007. In this role, Ms. Michaels has facilitated over 20 state and regional consultations and managed several Trauma System Evaluation and Planning Committee projects related to trauma systems development and evaluation.

Ms. Michaels graduated from the University of South Florida in 2001, with a Bachelor of Arts degree in English. She began her career in public health as a health education coordinator at 2-1-1 Tampa Bay Cares, a non-profit organization in Clearwater, Florida connecting the community with health and social service resources.

Ms. Michaels received a Master's in Public Health from the University of Illinois at Chicago in August 2014.

MARIA ALVI, MHA
Role: ACS Staff (Manager, Trauma Systems and Quality Programs)

Ms. Alvi joined the American College of Surgeons (ACS) Trauma Department as the Trauma Systems and Quality Programs Manager in May 2015. In this role, Ms. Alvi provides administrative support to the COT subcommittees of Trauma Systems Evaluation and Planning, Advocacy and Injury Prevention and Control. She also serves as the program manager for the Trauma Systems Consultation Program, the BIS Facilitation Program, and other Trauma Systems and Quality initiatives.

Prior to joining the ACS, Ms. Alvi worked as a healthcare consultant at Truven Health Analytics for 2 years, providing data reporting support to US clients, through the company's trademarked financial, marketing and clinical programs. Her focus at Truven also allowed her to assist with critical analysis and assessment of client data towards improving health outcomes in their patients, and better management of their healthcare programs.

In December 2013, Ms. Alvi earned her Masters of Healthcare Administration (MHA) from UIC School of Public Health in Chicago. As part of her curriculum, she also completed a Preceptorship at Cook County Health and Hospitals System (CCHHS). Through this opportunity, Ms. Alvi employed her strategic planning and program management skills to clinical programs and non-clinical initiatives at John H Stroger Hospital of Cook County and CCHHS.

Although interested in clinical sciences (pre-med curriculum), and licensed as an EMT-B for the State of Illinois until June 2012, Ms. Alvi found her passions truly lay within healthcare management. Ms. Alvi serves as a volunteer member on the ACHE CHEF Communications Committee, is a Young Professional member for the Chicago Council on Global Affairs, and partakes in various early careerist, networking and charitable events throughout the greater Chicago area.

APPENDIX G: County Participants List

#	Name	Position/Title	Organization
1	Alice Naqui-Mieglar	CNO	Santa Clara Valley Medical Center
2	Allison Kerr	VP	Stanford Health Care
3	Chris Duncan	Program Manager	Santa Clara County EMS Agency
4	Daniel Franklin	Program Manager	Santa Clara County EMS Agency
5	Dave Zenker	EMS Program Manager	Rural Metro
6	David Spain	MD	Stanford Health Care
7	Debra Dobosz	RN	Rural Metro
8	Della Garland	MD	Santa Clara Valley Medical Center
9	Denise Dalmon	RN	Regional Medical Center
10	Denise Grasi	RN	Stanford Health Care
11	Eileen Hoover	RN	Santa Clara Valley Medical Center
12	Fannie Rackover	Epidemiologist	Santa Clara County EMS Agency
13	Gilbert Gutierrez	Emergency Preparedness	Santa Clara Valley Medical Center
14	Jackie Lowther	EMS Director (Interim)	Santa Clara County EMS Agency
15	Jacquelyn Nash		Santa Clara County Public Health
16	James Crew	MD	Santa Clara Valley Medical Center
17	Jeff Arnold	Medical Director	Santa Clara County
18	Jill Sproul	RN	Santa Clara Valley Medical Center (Burn Unit)
19	Jim Hinsdale	MD	Good Samaritan Hospital
20	John Sampson	Program Manager	Santa Clara County EMS Agency
21	John Sherck	MD	Santa Clara Valley Medical Center
22	Julie Fuchs	MD	Santa Clara Valley Medical Center (Pediatrics)
23	Kelly Johnson	VP Patient Care Services	Stanford Children's Health
24	Ken Miller	Medical Director	Santa Clara County EMS Agency
25	Kim Roderick	EMS Program Manager	Palo Alto Fire
26	Linda Diaz	Clinical Program Manager	Santa Clara County EMS Agency
27	Melissa Burke		Stanford Children's Health

#	Name	Position/Title	Organization
28	Michele Lew		Stanford Health Care
29	Miguel Marquez	COO	Santa Clara County
30	Mike Cabano	Program Manager	Santa Clara County EMS Agency
31	Mike Jacobs	RN	Alameda County EMS Agency
32	Mike Johnson	CEO	Regional Medical Center
33	Natalie Lodewyk	RN	Santa Clara Valley Medical Center
34	Pam Dudley	RN	Regional Medical Center
35	Patrice Christensen	RN	San Mateo County EMS Agency
36	Patricia Natividad	Finance Manager	Santa Clara County EMS Agency
37	Peter De Souza MD	MD	Stanford Health Care
38	Rick Filippuzzi	Emergency Preparedness	Kaiser Permanente
39	Rick Kline	MD	Regional Medical Center
40	Shelly Woodfall	RN	Stanford Health Care
41	Stephanie Chao	MD	Stanford Children's Health
42	Thao Duong	MD	Santa Clara Valley Medical Center
43	Tim Browder MD	MD	Stanford Health Care
44	Vicki Pham	RN	Santa Clara Valley Medical Center
45	Walter Choto	Service Line Administrator	Good Samaritan Hospital
46	Yovanne Karanas	MD	Santa Clara Valley Medical Center (Burn Unit)

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