



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

Trauma System Consultation Report

State of Hawaii

Honolulu, HI

January 8 – 13, 2017



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

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EXECUTIVE SUMMARY

Overview

Hawaii, the Aloha State, has a unique history, culture, geography, and climate that make it a top vacation destination for visitors from around the world. According to 2016 data from the US Census Bureau, the State of Hawaii has an estimated population of 1.4 million permanent residents. Including estimates of daily visitors, the State estimates its de-facto population to be about 1.6 million. The island of Oahu accounts for over half of this total, at an estimated de-facto population of 1.1 million, with a little more than 200,000 people on the islands of Hawaii (Big Island) and Maui, and approximately 90,000 people on the island of Kauai. The combined land mass of the island group is about 6,400 square miles, with the island of Hawaii comprising over 60%. The State contains urban areas with high population density, as well as sparsely populated rural and remote areas. The State of Hawaii presents unique geographic challenges, spanning nearly 300 miles, with individual counties separated by miles of open water, leading to a heavy reliance on air-medical transportation. The State is also quite isolated, lying over 2,000 miles from the mainland. As is true across the nation, injury is the leading cause of death for those between 1 and 44 years of age, impacting residents and visitors to Hawaii, alike.

Since the last American College of Surgeons (ACS) Trauma System Consultation (TSC) visit in 2005, substantial progress has been made within the State Trauma System, focusing primarily on trauma center development. During the 2005 ACS TSC visit, there was only a single designated trauma center, but now, eight verified trauma centers are distributed across the State, at the time of the 2017 ACS TSC revisit. The Big Island now has three Level III trauma centers, while Maui and Kauai each have one Level III trauma center on the island. Oahu has three trauma centers – the only ACS verified and sole Level II trauma center within the State, an adult Level III, and one pediatric Level III trauma center. Three additional acute care facilities on Oahu have expressed interest in participating within the State Trauma System in the near future. The State has also made substantial investments to support the Level III hospital on Maui, with the hope of creating a second Level II trauma center in the State, and further developing the State Trauma System.

The Hawaii Department of Health (DOH) is assigned the statutory authority for the Trauma System. DOH delegated the Emergency Medical Services Injury Prevention System Branch (EMSIPSB) as lead agency for State Trauma System development and operation. Primary multidisciplinary stakeholder input is provided by the Hawaii Trauma Advisory Council (HTAC). Hawaii Revised Statute recognizes DOH's ability to call ad hoc councils to provide expert advice on trauma care and system matters. HTAC currently serves as the primary ad hoc council, but there are very few operational rules defining its role and relationship to the lead agency. Leadership of the HTAC has been intertwined with that of the lead agency, with either the EMS Branch Chief or the State Trauma Medical Director; the HTAC leadership not only serves under contract to the lead agency, but also served as the Chair of the HTAC, up until mid-2016. This is an unusual arrangement. In most Trauma Systems, the multi-disciplinary stakeholder group operates as an advisory body, independent of the lead agency. The leadership within the EMSIPSB has shown strong commitment to the development of the Hawaii Trauma System, as evidenced by the rapid building of a network of trauma centers in the last few years, and substantial and stable funding accessible to the State Trauma System.

Recent changes in leadership at the lead agency, especially personnel changes involving the Trauma Medical Director, Trauma Program Coordinator, and HTAC chair, have led to significant conflict and division among the trauma stakeholder group, and a loss of shared vision for the future of the State Trauma System. By report, recent HTAC meetings have been contentious. The substantial difference of opinion and distrust between subgroups has slowed forward progress.

The primary unifying goal of the last 12 years – the creation of a state-wide network of trauma centers, has been largely achieved, but with very little governance structure developed to provide operational guidance. This is a critical point in time for the Hawaii Trauma System, as it continues the development of an inclusive Trauma System model for its own growth and sustainability. The broad-based trauma “ohana” (trauma family) has had much success over the past decade, but now faces new challenges to its unity and shared direction. It is therefore the essential task of the stakeholders, the lead agency, and the HTAC to overcome any differences and reclaim a shared vision – to commence the next phase of Trauma System development by establishing the structures, rules, and processes to ensure Trauma System stability and optimal function. The comprehensive State Trauma System Plan (draft) serves as the tool to maintain a shared vision in the future, and provides the strategic outline for the next phase of Trauma System development. It remains imperative for all parties to work together, keeping the best interest of the trauma patient at the forefront.

Assets and Advantages

- A long history of cooperation and success in building the current Trauma System
- Sustained funding for trauma centers and Trauma System operations
- Strong enabling statutory authority
- A new comprehensive draft of the State Trauma System Plan
- Committed new leadership at the lead agency
- Regional trauma advisory committees (RTACs) and the state-level Hawaii Trauma Advisory Council (HTAC)
- Cooperative network of eight designated trauma centers, including one pediatric trauma center
- State trauma registry with linkages to EMS and hospital discharge datasets
- State funds ACS Trauma Quality Improvement Program (TQIP) fees for participating trauma centers
- Strong historical support from the Department of Health, legislative champions, and the trauma ohana (trauma family)
- Strong Emergency Medical Services (EMS) with standing orders for trauma, uniform patient reporting and electronic capture, and air medical coverage
- Multilayer approach to multiple casualty incidents
- Injury prevention embedded within the lead agency and state-wide injury epidemiology data
- Tele-radiology program
- Strong historical Level II trauma center in Honolulu, Oahu
- Capable military treatment facility with potential for significant partnership

Challenges and Vulnerabilities

- No shared vision for the structure and priorities of the State Trauma System
- Very limited administrative rules for the Trauma System governance and operation
- Very limited system-level Performance Improvement (PI), and legal protection for peer review is in doubt
- Current membership of HTAC coalition lacks significant stakeholder groups
- No grassroots public support for the Trauma System
- Additional lead agency Trauma System personnel are needed, including a Trauma System PI coordinator, Trauma System registrar, and more allocation of time for Trauma System focus for the epidemiologist
- Reunification of families separated by inter-island transfers is problematic
- Air medical transport is provided through private companies
- Inconsistent verification standards, for example Level III trauma centers may be verified by two discrete methods
- Workforce shortages, especially nurses, neurosurgeons, and orthopedic surgeons
- Rehabilitation limitations; location, capacity, no beds for ventilator-dependent patients
- Integration of the Trauma System and disaster management is not optimal
- There is limited system-wide coordination of the approach to pediatric injury as a public health problem
- Department of Defense hospital discharge data are not collected
- The trauma registry data are not validated or is used sub-optimally
- Inadequate surgical specialist coverage on neighbor islands
- Single high-level trauma center with no alternate or back-up resource

Themes

- Hawaii is special. Hawaii is different... geographically
- A shared vision for the structure and priorities of the State Trauma System is needed
- Sometimes you need rules
- The time to start is now
- This is a critical moment in the development of the system
- It's time to reconcile differences arising from recent leadership changes
- Ohana: You need to work together, embrace each other – you are all in this together

PRIORITY RECOMMENDATIONS

Injury Epidemiology

- Produce an annual Trauma System report that includes data from the pre-hospital setting, trauma registry, vital records and hospital discharge data
 - Aggregate by geographic area, high risk populations and mechanism of injury
 - Include injury severity and non-mortality outcome measures
 - Develop report section identifying the top e codes for hospital admission and mortality

Statutory Authority and Administrative Rules

- Develop and implement rules governing the Trauma System, including but not limited to:
 - Structure, governance, and reporting structure of the HTAC
 - Periodic review and update of the trauma plan
 - Process for determining priorities in distribution of trauma funds to support state-wide Trauma System development and sustainability
 - Field triage and ambulance destination
 - Designation of trauma centers based on need
- Create a broadly representative sub-council of the HTAC that will work in an advisory capacity with the Emergency Medical Services Injury Prevention Systems Branch to review all statutes and regulations pertaining to trauma with a focus on updating, developing, and/or revising sections needing attention

System Leadership

- Develop a process, led by the HTAC in its advisory role, to create a shared vision for the future of trauma care and Trauma System maturation in Hawaii, utilizing input from all stakeholders
- Restructure HTAC as a formalized advisory committee to the EMSIPSB of DOH (Emergency Medical Services Advisory Council may serve as a model for drafting this section)
 - Chair of HTAC should be elected by the committee, with a fixed term of office, and should not be an employee of the branch
 - Consider use of subcommittees to address specific system components and to broaden stakeholder involvement

Lead Agency

- Create full-time dedicated staff for positions of state Performance Improvement Coordinator and State Trauma Registrar/ Data Manager
 - Develop comprehensive job descriptions for trauma-related positions within EMSIPSB

Trauma System Plan

- Assemble a multidisciplinary trauma task force, under the HTAC, to review, and suggest updates to the draft FY 2016 Trauma System Plan
 - Ensure the plan is consistent with the current standards of trauma care
 - Align the plan with the current statutes and all Trauma System protocols
 - Complete the review, update, and attain approval of the report in a timely manner
 - Include a grid for goals, objectives, timelines, and responsible person/ lead
 - Disseminate the plan to all Trauma System stakeholders

System Integration

- Explore creative options, including tele-medicine and other technologies, to provide consultation, follow-up care, and rehabilitation to enable more patients to remain on their home island

Financing

- Evaluate use of trauma funds and allocate as needed to be sure trauma funds are optimally supporting the future goals and direction established by the updated Trauma System Plan
- Work with the legislature to ensure that a stable funding source for the Trauma System is secured. Funding should be sufficient to support system operation and future development as outlined in the State Trauma System Plan

Prevention and Outreach

- Involve the tourism/ hospitality industry in prevention initiatives

Emergency Medical Services

- Amend EMS Statute to integrate aeromedical services as a vital component of the State Comprehensive Emergency Medical Services System.
 - Authorize DOH to contract for services and bill third-party payers for reimbursement

Definitive Care Facilities

- Determine the optimal level and number of trauma centers, based on population need and system capacity. Metrics might include anticipated volume, available resources, and geography
- Support the development of a Level I or a second Level II trauma center at the facility found to be most appropriate to meet population need as determined by the trauma designation process
- Engage all non-designated acute care facilities in regional and state-wide trauma advisory council activities, including Performance Improvement initiatives.

Disaster Preparedness

- Conduct an assessment of the Trauma System's ability to expand its capacity to respond to MCIs in an all-hazards approach
 - Conduct a gap analysis based on the assessment for trauma emergency preparedness

System-Wide Evaluation and Quality Assurance

- Create a Trauma System PI Master Plan, guided by HTAC in its advisory role
 - Assemble a multidisciplinary ad-hoc workgroup, drawn from the stakeholder community to expedite completion
 - Attain approval within 12 months
 - Disseminate this plan to the Trauma System stakeholders

Trauma Management Information Systems (MIS)

- Establish the position of State Trauma Registrar. Responsibilities should include:
 - Data validation
 - User support for registry use and data entry
 - Ability to create reports for individual centers and at the system level
 - Management of additional data fields for specific system projects
- Consider establishment of a centralized pool of trauma registrars that would be responsible to assist with data entry and report writing at all acute care facilities
- Begin using registry data to look at system performance now. Initial focus might include:
 - Details on patients transferred to higher level of care to ensure timeliness and appropriateness
 - Details on patients kept at Level III centers to compare clinical outcomes to similar patients transferred to higher level centers, either within the state or nationally

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 through 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, 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 injury epidemiologist in the EMSIPSBP uses three population-based databases:

- The Office of Health Status Monitoring of the DOH death certificate database: Subsets from this database (e.g., suicide, drowning, and motor vehicle crash victims) are routinely linked to other databases such as the National Highway Traffic Safety Administration's (NHTSA) Fatality Analysis Reporting System (FARS), autopsy records, and EMS prehospital records.
- Hawaii Health Information Corporation (HHIC) hospital billing data (inpatient and emergency department): The HHIC maintains a repository of hospital and emergency department discharge billing data from all 23 Hawaiian acute care hospitals. These data are not collected from federal facilities, specifically the Veteran's Administration (VA) facility and Tripler Army Medical Center (TAMC). The HHIC database has been linked to EMS records through 2013, the most current data available. The injury epidemiologist stated plans to link EMS data to more current HHIC data when available.
- Hawaii EMS Information System (HEMSIS) prehospital patient care reports: EMS providers enter prehospital data electronically into the HEMSIS online database, and records are available on a near real-time basis. The epidemiologist usually performs a monthly download of a subset of data elements. These records are linked to some death certificates and HHIC records, as described above. The prehospital care report number is also entered by the trauma centers into their trauma registries records of the Hawaii Trauma Registry (HTR) by the trauma centers.

These three databases form the core of trauma injury surveillance in Hawaii. The demonstrated ability of the EMSIPSB injury epidemiologist to electronically link these databases is particularly noteworthy.

The Hawaii Trauma Registry (HTR) provides more detailed clinical data, including diagnoses not related to the reimbursement process, and standardized Injury Severity Scores. Nine facilities (the 8 designated trauma centers and TAMC) enter data into the HTR. Thus this database is not population-based.

The injury epidemiologist estimates that the HHIC data documents about 8,950 injuries that meet National Trauma Data Bank (NTDB) inclusion criteria each year. To date, there has been little use of registry data for the production of comprehensive reports on a regular basis, either for aggregate reporting or by geographic area. Additionally, limited analysis has been conducted comparing HHIC data from non-trauma acute care facilities with HTR data. Such an analysis would inform the EMSIPSB and the HTAC about how many injured patients with significant injuries are not included in the HTR. Having the ability to calculate the Injury Severity Scores (ISS) on the HHIC data would enhance the value of such an analysis.

Several recent comprehensive reports, using population-based data, describe the burden of injury in the state and its counties. Analyses of sub-populations such as pediatrics and older adults, as well as drowning among visitors have been produced. These reports have used HTR

data in a very limited fashion. Two-page injury fact sheets, presentations, and responses to episodic injury data requests complement these larger periodic reports.

Expanding the use of HTR in these reports, and taking advantage of the EMS data would enable the Trauma System to obtain more granular information that could be used in program planning. Hawaii would benefit from the development of an annual Trauma System report that includes EMS and HTR data complementing the population-based injury data to demonstrate the contribution of the Trauma System to health care in Hawaii.

Focused Question (2): How can the State of Hawaii best demonstrate the success of a strong trauma program using metrics other than mortality?

The Trauma System could further demonstrate its effectiveness with some additional non-mortality measures. A comprehensive state Performance Improvement (PI) plan addresses the multiple processes involved in the phases of trauma care, including dispatch, prehospital response, trauma diversion, over and under triage trauma center care, inter-facility transfer, definitive care access, rehabilitation access, trauma registry compliance, disaster management, and injury prevention program outcomes. Data are often collected for each of these components and can be considered additional measures of Trauma System effectiveness.

Various process measures that reflect access to care, timeliness of care, coordination of care, and the Trauma System's response are all Trauma System metrics that can be used to describe success. These measures can be used to demonstrate the Trauma System's response for special populations, counties, or the system as a whole. Reports that reflect a reduction in the burden of injury, improved processes of care, improved systems of care, and system integration reflect the status of Trauma System and can be used to define accomplishments.

Other non-process patient outcome measures that could be used would be various patient outcome measures from the trauma registry, such as the Functional Independence Measure (FIM) score and Length of Stay (LOS). Other measures that may be useful but would require primary data collection are discharge and longitudinal Glasgow Outcome Scores (GOS) and the Short Form (36) Health Survey (SF-36) from the RAND Corporation. Reflecting improvements that are linked to the Trauma System's funding utilization are powerful tools that demonstrate leadership, accountability, transparency and the success of the Trauma System.

Recommendations

- **Produce an annual Trauma System report that includes data from the pre-hospital setting, trauma registry, vital records, and hospital discharge data**
 - Aggregate by geographic area, high risk populations and mechanism of injury
 - Include injury severity and non-mortality outcome measures
 - Develop report section identifying the top e codes for hospital admission and mortality
- Provide a mechanism that enables Trauma System stakeholders to provide input for developing injury data collection priorities
- Determine the feasibility of using ICD-9 or ICD-10 mapping software to calculate Injury Severity Scores from the HHIC data
- Conduct an analysis of spinal cord injuries (SCI) that includes patient demographics, geographic information, SCI injury severity, functional status at discharge, and disposition
- Collaborate with Tripler and Veterans Administration Hospitals to identify mechanisms to include their hospital discharge and emergency department discharge data to HHIC

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

In 2015 the Hawaii trauma program has used the Benchmarks, Indicators, and Scoring (BIS) tool contained in the Health Resources and Services Administration's (HRSA) *Model Trauma System Planning and Evaluation* document. As described by a participant, the 113 indicators were initially screened for applicability to specific issues of interest to the Trauma System, and 18 indicators were selected for scoring. The EMSIPSB Trauma System leadership and the former Trauma Medical Director scored each of the selected 18 indicators. The scores were shared with the members of the HTAC, but a discussion about scores assigned did not occur. The HTAC then participated in developing objectives along with tasks and responsibilities for each of the 18 indicators.

Hawaii is to be commended for making use of the BIS tool. When used as designed, it provides a method of quantifying the level of progress in many aspects of Trauma System development. The tool is designed so that each indicator has qualitative descriptions in incremental order of Trauma System development. Scoring guidelines direct individuals to select a score closest to the development of the Trauma System aspect being evaluated. It is further specified that all qualitative descriptors identified in lower scores should be accomplished before assigning a

higher score. When these guidelines are followed, the tool can then be used at a future time for comparison and to track progress in Trauma System development.

The tool was also intended for use with a large group of stakeholders representing various disciplines and focus areas. For example EMS providers have a different knowledge of certain details regarding system functioning than injury prevention providers. Each stakeholder should score the BIS individually, after which the mean or median scores are calculated. What is important is that the stakeholders have the opportunity to discuss the mean or median scores and to share information that helps educate all Trauma System stakeholders about the system's developmental status. This process often helps clarify priority Trauma System objectives for future development. The Hawaii scores for the 18 indicators reflect the opinion of 2 stakeholders, so knowledge of the larger stakeholder group is not reflected. While the stakeholders reviewed the scores, they had no opportunity to discuss and potentially modify the scores based on their own perceptions.

Of importance however, was the effort to use the information revealed by scoring the 18 indicators to identify objectives and specific tasks or responsibilities that were intended to help promote Trauma System development. The Trauma System program is to be commended for taking this next step after completing a BIS assessment.

Recommendations

- Repeat the Benchmarks, Indicators, and Scoring (BIS) assessment at a future time, involving a broad group of stakeholders
- Use the findings of the BIS assessment to identify priorities for Trauma System development
- Repeat the BIS assessment at 3 to 5 year intervals

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 Hawaii statutes (officially termed Hawaii Revised Statute) for Emergency Medical Services authorization dates back to 1978 (title 11, Chapter 11). The statutes have received some additions, but they have not been fully reviewed and revised since 2003.

Hawaii has enabling legislation (Act 305, §321-322.5) that provides broad authority and funding for the establishment of a comprehensive State Trauma System, enacted in 2006 by the Hawaii Legislature. The purpose of this Act was to establish a Trauma System special fund to ensure the availability of care for trauma patients in the State of Hawaii. The Legislature was also descriptive in the language to include provision for the DOH to convene ad hoc advisory committees and to establish positions within DOH to implement the provisions of Act 305.

The DOH has empowered the EMSIPSB to administer the injury prevention, EMS, and the Trauma System programs. The EMSIPSB has promulgated administrative rules in Title 11, Sections 72 and 72A to administer legislated oversight of the Trauma System components. The rules related to the Trauma System are limited to addressing distribution of the special funds and trauma facility designation.

Stakeholders raised concerns about the lack of comprehensive administrative code or statutory authority to assure the sustainability or improvement of the current Trauma System. Primary themes emerged from participant discussions:

- The scope, function and membership of advisory councils at the regional and state level
- The ability to objectively evaluate the need for additional trauma centers
- Concern that the confidentiality subsections of administrative code are not sufficient to protect data and the Performance Improvement (PI) processes

EMSIPSB leadership also stated that adopting code has posed difficulties. The TSC Review Team perceived from the described rule making process that minimal input from stakeholder groups was sought outside of the common public hearing process. Administrative rules should undergo routine review and potential revision as program changes and conditions occur. Additional administrative rules are needed to guide much of the Trauma System's program development and decision-making.

The DOH leadership also stated that the special fund provisions have come under close scrutiny. It was reported that the Trauma System funds granted by Act 305 may be converted to the general fund; however it will not occur in the next fiscal year budget approval process. If the trauma fund does get converted to general fund, the DOH will be required to seek annual appropriations to maintain level funding and sustainability of the trauma and EMS systems. Converting the trauma fund to general fund may also require that Act 305 be repealed. Since this act contains the authorizing legislation for the Trauma System, a plan for new Trauma System authorizing legislation would be required.

Recommendations

- **Develop and implement rules governing the Trauma System, including but not limited to:**
 - **Structure, governance and reporting structure of the Hawaii Trauma Advisory Council (HTAC)**
 - **Periodic review and update of the trauma plan**
 - **Process for determining priorities in distribution of trauma funds to support state-wide Trauma System development and sustainability**
 - **Field triage and ambulance destination guidelines**
 - **Designation of trauma centers based on need**
- **Create a broadly representative sub-council of the HTAC that will work in an advisory capacity with the Emergency Medical Services Injury Prevention Systems Branch to review all statutes and regulations pertaining to trauma with a focus on updating, developing, and/or revising sections needing attention**
- **Verify confidentiality and peer review protection for multi-disciplinary EMS/Trauma System Performance Improvement by an Attorney General opinion**

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 state-wide 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 Emergency Medical Services and Injury Prevention Systems Branch (EMSIPSB), the Trauma System lead agency, appears to have a defined organizational process and dedicated full time positions; however, only two full-time equivalent (FTE) positions are dedicated to the Trauma System program (i.e., Trauma Program Coordinator and trauma accountant). The department is responsible for the distribution and oversight of Trauma System funding. These funds support trauma facility designation, Trauma System development, data integration, and system performance. EMSIPSB has an EMSAC and the Hawaii Trauma Advisory Council (HTAC). The HTAC provides the basic committee infrastructure for constituent involvement in the Trauma System functions. The system leadership is comprised of four county-based regional advisory councils (RTACs) and the state-wide HTAC with broad multidisciplinary representation from each region.

The HTAC's responsibilities and authority are not clearly defined, although the council was reported to be advisory to the EMSIPSB. HTAC membership includes all designated trauma centers, trauma support facilities, EMS/aeromedical, University of Hawaii School of Medicine, professional organizations, and EMSIPSB representatives. The Trauma Medical Director and Trauma Program Manager serves as chairpersons. In the absence of a Trauma Medical Director, the EMSIPSB Branch Chief serves in this capacity. The agenda for meetings is established by the EMSIPSB with input from HTAC attendees. No administrative rules define the specific membership, role, and function of the HTAC. The relationship between the HTAC and EMSIPSB should be more clearly defined.

Most states have a formalized trauma advisory committee that has appointed membership (similar to the process used for EMSAC) with a designated number of representatives from trauma centers and professional organizations, including a pediatric-specific representative. Membership may specifically include injury prevention, EMS, air medical services, rehabilitation, a health insurance payer, and/or a hospital administrator. In some cases a consumer or elected official is appointed. The chairperson is usually elected from the membership, and the State Trauma System personnel are ex officio members. Meetings are generally open to allow all interested representatives from trauma centers and other organizations to attend. Subcommittees (or sub-councils) are often formed and chaired by an HTAC member to address specific issues. The sub-councils are open to other members of the trauma community and engage them in Trauma System development. Such a process would enable greater opportunities to develop a shared vision for the Hawaii Trauma System. Opportunities to involve a broader constituency representation on the RTACs could also be considered.

The HTAC has created an executive sub-council focused on individual case review and patient outcome, rather than Trauma System performance. Selection of cases is dependent on a rotating schedule of hospital-specific presentations regardless of case acuity. The EMSIPSB has developed a new form for the capture of documentation to facilitate these case reviews. The membership of this sub-council appropriately includes prehospital and hospital-based providers. Case selection criteria (for discussion at the sub-council) are not codified. This process

demonstrates the continued evolution of the Trauma System, but there is no historical perspective to evaluate the effectiveness of the reviews. A similar process should be considered for the RTAC PI review. A defined process for information about these case reviews from the regions to the HTAC executive sub-council and the Trauma Program Coordinator (TPC) should be developed so that system issues needing attention are identified as soon as possible. Peer review protections also need to be codified and/or define the allowable scope of practice for the executive sub-council.

The HTAC should have specific performance expectations tied to the Trauma System Plan. Sub-councils can be tasked to address specific issues, similar to the executive sub-council's focus on PI. Sub-councils should report progress at HTAC meetings and make recommendations for consideration by the official membership of HTAC. As the primary ad hoc council, HTAC should provide recommendations for consideration to the EMSIPSB for the statutory authority, DOH.

Previously, the Trauma System had a Trauma Medical Director (TMD) paid through a Memorandum of Agreement mechanism. Recently, the Hawaii Office of Attorney General required all memorandums of agreements with financial appropriations be converted to formal contracts. Concurrently, EMSIPSB leadership has proposed an alternate strategy for trauma medical direction, a part-time TMD from each county or health care system with designated trauma centers, a model similar to EMS medical direction. The participants reported concerns with this proposal. Discussions about potential viable strategies for trauma medical direction should take place between EMSIPSB and the HTAC. Discussion with the leadership of the Medical Directors Council of the National Association of State EMS Officials may help identify some alternate models for trauma medical direction.

Opportunities exist that focus on aligning and organizing resources to define function, responsibilities, oversight and outcomes of the Trauma System for the population and geographic challenges of Hawaii. Working to achieve this alignment will foster a shared vision for all individuals participating in Trauma System and set the stage for strategic planning.

Recommendations

- **Develop a process, led by the HTAC, to create a shared vision for the future of trauma care and Trauma System maturation in Hawaii, utilizing input from all stakeholders**
- **Restructure HTAC as a formalized advisory committee to the EMSIPSB of DOH (Emergency Medical Services Advisory Council may serve as a model for drafting this section)**
 - **Chair of HTAC should be elected by the committee, with a fixed term of office, and should not be an employee of the branch**
 - **Consider use of subcommittees to address specific system components and to broaden stakeholder involvement**
- Expand constituency representation on regional advisory councils and HTAC, including pediatric-specific representation, rehabilitation, payors, and consumers
- Charge the HTAC with provision of advisory oversight, including Trauma System Planning, defining system criteria (number of centers, volume), establishing system standards (triage, timelines), and reviewing system performance
- Develop a PI sub-council within each regional advisory council to review prehospital trauma care, hospital trauma care, care during transfer, and other system priorities
 - Determine selection criteria and a format for presentation of individual patient care episodes submitted from each regional PI sub-council to a recurring state-wide PI meeting (currently the Executive Sub-Council)
 - Focus initially on those care episodes with suboptimal clinical outcomes that represent specific challenges facing multiple counties
 - Develop metrics to assess each phase of system care, i.e. EMS response times, Transport times, length of stay, mortality, etc.
 - Use the HTAC to determine the optimal solution for each identified challenge, implement the solution, and monitor for improvement in system function
- Develop a physician-led plan that provides trauma medical oversight
- Clarify the relationship between the State Lead Agency, the HTAC and the regional advisory councils. Define the flow of information from the regional council to the state council to the EMSIPSB

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 State of Hawaii is fortunate to have many engaged participants in its Trauma System. Significant interest was evident from the number of participants who travelled from neighboring islands to attend the ACS TSC in Oahu (sponsored and funded by the DOH) and the willingness of trauma centers to have ACS visitors at each of the designated trauma centers, as well as TAMC, Queen's Medical Center - West O'ahu and Castle Medical Center. Additionally the presence of representatives from non-designated facilities, injury prevention, EMS, air medical services, and emergency management demonstrated the involvement of key stakeholders in the

Trauma System. Of particular note, a state legislator was identified as a Trauma System champion.

The stakeholders of the Trauma System were identified as the participants attending the TSC. As such the range of stakeholders is limited, since other important individuals and groups that could have a significant role in the advancement of the state's Trauma System development are not represented. For example, consumers, health payers, hospitality/tourism, rehabilitation, and official representatives from state chapters of professional organizations were not identified. Native Hawaiian groups did not appear to have representation. The University of Hawaii did not appear to have official representation at the TSC, even though medical school faculty members were present. It was reported that stakeholders wear many hats, and many of the state's professional organizations may well have been informally represented.

Stakeholders attending the TSC reported that individuals attending regional trauma advisory council (RTAC) meetings were more broadly representative, including law enforcement, Ocean Safety, and the non-designated facilities. The Hawaii Injury Prevention Program reported having a more extensive coalition, involving key groups that help plan and implement injury prevention strategies.

The Hawaii Trauma System currently communicates with stakeholders using email. While the EMSIPSB has a website, information about the State Trauma System is not visible (only EMS and injury prevention are programs listed). No method for educating the public, health professionals, visitors, and elected officials about the Trauma System and its value has been developed for dissemination in any form.

Focused Question (1): How can the State of Hawaii best demonstrate the success of a strong program quantitatively and qualitatively to:

- 1. Members of the legislature?***
- 2. Community stakeholders?***
- 3. Provider stakeholders?***

The TSC Review Team did not identify any recent or prior efforts to promote grassroots support for the Trauma System. Consumers and representatives of the media can be valuable partners in promoting awareness of the Trauma System and advocating for its ongoing support. Official representation from state chapters of professional organizations (Emergency Nurses Association, American College of Emergency Physicians, National Association of Emergency Medical Technicians, American College of Surgeon, etc.) can be supportive of a process that encourages information sharing to educate the larger group of health professionals in the state about the Trauma System. For example, if a professional organization has an official representative on the HTAC, this individual has a responsibility to share important information about Trauma System development with his or her organization's membership. Elected officials (local and state) are important stakeholders who can promote communication about and advocacy for the State Trauma System. Their representation on the regional committees and the state HTAC should be considered.

Information about the success and value of the Trauma System should be developed and shared with elected officials, the public, and healthcare providers. Success stories and the annual report of Trauma System activities should be used to develop messages about the Trauma System (e.g., information about the number of patients served by designated facilities, numbers of patients transferred for a higher level of care, number of persons able to receive needed care on their own island, etc.). The Office of Public Affairs within the DOH may be a

resource to guide the development of effective communication and marketing methods. Their representation on the regional committees and the state HTAC should be considered

Because personnel for the state trauma program are limited, additional resources are needed to help develop messages to promote the State Trauma System. A consultant to guide this effort may be appropriate. The two universities may have communications and marketing programs that may welcome the opportunity for student special projects. A task force of trauma stakeholders could be formed to help collect success stories and respond to messages developed by volunteers.

Recommendations

- Identify and engage a more broadly based group of stakeholders for the State Trauma System, such as consumers, the media, and elected officials
- Develop relationships with the state chapters of professional organizations to serve as advisors for Trauma System education and advocacy
- Build grassroots public support for the Trauma System to increase public awareness of trauma as a disease
- Develop a plan to educate and inform the public about the State Trauma System and its value
 - Leverage resources within the Department of Health to promote public awareness of the Trauma System
 - Identify resources within education programs of area universities for development of a marketing program and specific messages promoting the Trauma System
 - Identify strategies to disseminate the messages (e.g. social media, newspapers, billboards) to reach a broad audience, including elected officials
- Develop information that can be used to create messages about the Trauma System
 - Use the annual Trauma System report and injury reports to tell the story about care provided by the Trauma System
 - Collect success stories and personal interest stories about the Trauma System
- Provide information about the Trauma System on the state website

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 Hawaii DOH is identified in Hawaii Revised Statute 321-22.5 as the lead agency for Trauma System development and implementation. The responsibility for carrying out the Statute provisions has been delegated to the EMSIPSB. The Trauma System program is currently under the oversight of the EMSIPSB chief who is a physician. This position appears to serve as the de facto medical director for the Hawaii Trauma System; however, most of the work for the EMSIPSB chief position relates to EMS rather than trauma.

The state Trauma Program Coordinator (TPC) position is 1.0 FTE, and this person is the trauma program point of contact and primary resource committed to the Trauma System program. Fundamental to the mechanisms of a state trauma program is accurate and robust data collection. In order to facilitate this process, a state trauma registrar is essential as a state process improvement (PI) coordinator. A trauma program accountant monitors the expenditures relative to special funds directed to the Trauma System program and supports the TPC. The Injury Epidemiologist was reported to dedicate 0.2 FTE to the Trauma System program. In addition, the EMSIPSB commits small portions of time from other branch employees to support the state TPC with specific technical assistance and focused activities. Some of these employees support the Injury Prevention program and have salaries paid in full by the Special Trauma Fund. Job descriptions for these branch employees were not provided, so it was not possible for the TSC Review Team determine the actual trauma-related activities in which most of these employees are engaged.

The Hawaii Trauma System recently experienced the loss of key lead agency staff members (the chief EMSIPSB two years ago, and the TPC 6 months ago) who were instrumental in initiating and moving Trauma System development forward. Stakeholders reported that this loss of program leadership clouded the lines of communication between the lead agency and the trauma stakeholder group. The communication challenges and the lack of comprehensive administrative code supporting Trauma System infrastructure, planning, and future development have contributed to the recent stagnation of Trauma System development.

The Hawaii Trauma System program is to be commended for its significant growth with additional trauma centers and stakeholder involvement following the 2005 ACS TSC. This growth can be attributed to the collegial culture of the Hawaii people and their high motivation to improve access to trauma care. However, it is unknown if this collegial process will continue to exist without comprehensive administrative code being in place to protect the past achievements and to guide future development.

The current TPC was hired approximately two months prior to the TSC visit. In a very short time, the TPC has reached out to trauma stakeholders to revitalize the struggling State Trauma System. She should be commended for her accomplishments and progress made to revitalize and communicate with all stakeholder groups.

While progress has been made, the TSC Review Team perceived that some recent program activities have been addressed in a reactive rather than proactive manner. It is common for public health programs that have experienced a change in leadership to reframe and redefine the vision for the program. This is most commonly accomplished by developing a shared operational plan with program stakeholders that establishes performance benchmarks and

articulates the functions of the program. The TSC Review Team found no evidence that development of a shared operational plan had been initiated.

Recommendations

- **Create full-time dedicated staff for positions of state Performance Improvement Coordinator and State Trauma Registrar/ Data Manager**
 - Develop comprehensive job descriptions for trauma-related positions within EMSIPSB
- Clearly identify Trauma System administrative infrastructure within the lead agency, with responsibility for operational oversight, data collection and analysis, and coordination of quality assurance functions

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

Hawaii has a Trauma System Plan in draft format, dated fiscal year 2016. It was reported that the EMSIPSB's former TPC wrote the plan in collaboration with the HTAC. Many components of the plan are reported to be outdated. A multidisciplinary ad hoc task group of the HTAC should collaborate with the EMSIPSB TPC to complete the revision of the Trauma System Plan. The task group should ensure that the plan is comprehensive and reflects current standards of trauma care. The plan should be written with objectives that have timelines and outcome measures, as well as the team or individual tasked with leadership and accomplishment. The Trauma System Plan can act as a compass to guide the trauma leadership and stakeholders to stay on course as they move forward in Trauma System development. A regular annual agenda item for HTAC should be a review of progress for each of the plan's objectives. A schedule for updating the Trauma System Plan should also be made, such as every 3 to 5 years. The revision and approval process should occur without delay in order to move Hawaii's Trauma System development forward.

The approval process for the State Trauma System Plan is not defined. The individual stages for review and approval by the DOH should be identified to help establish deadlines for completing the plan. For example, a DOH board review may be part of the approval process, and meeting dates can be identified. Once these review stages are obtained, a detailed work plan can be developed including authors, reviewers, stakeholder input, the comment period, and the approval processes. Each of these stages should be tied with a deadline.

It was reported that no County or regional Trauma System Plans currently exist. Consideration should be made as to whether and how regional plans could be supportive of the state system plan and address specific concerns in the region. If regional Trauma System Plans are of interest after the State Trauma System Plan is finalized, RTACs should be provided with a plan template to guide key elements in their regional Trauma System Plan.

One section of the State Trauma System Plan should include an organizational structure for the Trauma System leadership. This should include an organizational chart at a minimum. It should also include information on the structure of the system and the state's trauma program's interface with other state agencies and departments. Additionally, flow charts could be helpful in identifying processes for operations or operationalizing action items, e.g., approvals, bylaws changes, legislative processes, etc.

Recommendations

- **Assemble a multidisciplinary trauma task force, under the HTAC, to review, and suggest updates to the draft FY 2016 Trauma System Plan**
 - **Ensure the plan is consistent with the current standards of trauma care**
 - **Align the plan with the current statutes and all Trauma System protocols**
 - **Complete the review, update, and attain approval of the report in a timely manner**
 - **Include a grid for goals, objectives, timelines, and responsible person/ lead**
 - **Disseminate the plan to all Trauma System stakeholders**
- Define State Trauma System leadership organizational structure and reporting hierarchy
- Ensure the Trauma System Plan is utilized as a compass (or guide) for all stakeholders to help prioritize and guide the continued development of the Trauma System
- Update the Trauma System Plan every 3-5 years, or sooner, if needed

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 TSC Review Team saw evidence of strong integration and collaborative partnerships between the trauma centers, EMS, air medical services, trauma surgeons, Trauma Program Managers (TPMs), emergency medicine physicians, and injury prevention specialists at all levels in the Trauma System, including the trauma support facilities. Emergency management is integrated into the regional partnerships. TAMC is integrated into the Trauma System and is planning to seek designation as a trauma center. The TAMC pediatric surgeon participates in the trauma call schedule for Kapiolani Medical Center for Women and Children (KMCWC). The products of these collaborations include a draft Trauma System Plan, inter-facility transfer guidelines, Traumatic Brain Injury (TBI) guidelines, and injury prevention efforts. Injury prevention activities are well integrated with the State Trauma System that is supported by injury prevention outreach coordinators based in the EMSIPSB. Important injury prevention programs focus on drowning prevention, ocean safety, senior falls, child passenger safety seats education, traffic safety, suicide prevention, Traumatic Brain Injury prevention, domestic violence prevention, and alcohol-related injuries. The collaborative system integration also promotes professional trauma education for all levels of stakeholders. Additional information is discussed in the Injury Prevention and Outreach section.

Integration between the Trauma System and disaster preparedness/ emergency management was described by emergency management stakeholders as better at the local level and within the RTACs than at the state level. Discussions with stakeholders revealed a need for stronger integration of the Trauma System providers in local response efforts. More information is provided in the Disaster Preparedness section.

Integration of the rehabilitation services was lacking. Neighbor island trauma centers described difficulty accessing rehabilitation beds on Oahu. All trauma center teams described difficulties when trying to access rehabilitation beds on the mainland. The state does not have a facility with rehabilitation beds for ventilator-dependent patients. This creates an inequality for patients with high spinal cord injuries, as they must be flown to a facility in another state, creating an emotional and financial burden for the family.

When an injured patient requires inter-facility transfer for a higher level of care, significant burdens on families result. The patient may have some form of payment for air medical transport. However, the family bears the cost burden for transport to be with a child or adult patient, as well as the cost for both to return home after the patient's treatment and travel for follow up care. This challenge identifies a need for stronger coordination and communication between healthcare facilities and transport services. Strategies for providing family psychosocial support and promoting reunification would be beneficial.

Access to specialty services such as oral-maxillofacial surgery is available only at the Oahu trauma centers. Some injured patients in need of these services are transferred from neighbor islands for acute trauma care only to ensure access to a specialist, even when a higher level of acute trauma care is not essential. Patients must then bear the burden of paying for transport back home and for follow up care. Strategies (e.g., telehealth, or traveling specialty physicians) to ensure patient access to these specialty services on all major islands should be identified.

Recommendations

- **Explore creative options, including tele-medicine and other technologies, to provide consultation, follow-up care, and rehabilitation to enable more patients to remain on their home island**
- Develop systems for coordination of injured families and reunification
- Explore options to strengthen the coordination of care for the special populations

Financing

Purpose and Rationale

Trauma Systems need sufficient funding to plan, implement, and evaluate a state-wide 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

Currently, the Trauma System receives funding through Act 305, §321-322.5, the Trauma System Special Fund. This special fund has enabled significant state-wide Trauma System development, including the designation of 8 trauma centers to address the state's need for trauma care services. The major source of the funding is a 1.5 cent per cigarette tax, assisting the Trauma Special Fund in appropriating the legislatively-enacted funding amount of \$7.4 million in fiscal year (FY) 2016. Additionally, the trauma special fund received \$91,273 in FY 2016 from surcharges on traffic violation fines. Stakeholders reported that the current Trauma System Special Fund is sufficient to support the Trauma System in its current form.

The Trauma System Special Fund is used to subsidize the documented costs for the comprehensive State Trauma System including but not limited to the following:

- The costs of under-compensated and uncompensated trauma care incurred by hospitals providing care to trauma patients,
- Maintenance of on-call physician coverage,
- The costs to EMS/PSB personnel and support the State's injury prevention program,
- The equipment essential for trauma care, overflow, and surge capacity for Mass Casualty Events, and
- All other hospital services and resources essential for providing trauma care within the hospital.

Funds have been distributed to the critical access hospitals (trauma support facilities) and designated trauma centers, with amounts based on designation level. Upon review of the legislative special report with details of Trauma System expenditures, the Trauma System Special Fund covers the following:

- Salary support for the trauma center program personnel, including the TPMs, trauma registrars and some TMDs
- Physician call schedules
- Salary support for State Trauma System personnel
- Equipment necessary for trauma patient care
- TQIP for all trauma centers
- Continuing education and training for the trauma center TPMs, trauma support personnel, trauma center leadership, and Trauma System personnel
- Injury prevention activities

It was reported by the lead agency that other expenditures include trauma registry licensing fees and locum tenens.

Focused Question (9): When the legislation was written for development of the State Trauma System, funding was appropriated from cigarette tax. It now appears that cigarette tax revenue may be declining. What recommendations would the ACS have for obtaining funds to support trauma centers participating in the State Trauma System?

The lead agency personnel and stakeholders expressed concerns about the sustainability of the Trauma System Special Fund. It was reported that the State Legislature has looked more closely at all special funds over the past 3 to 4 years, and especially those funded by the cigarette tax. Based on a recent legislative study, cigarette tax revenue projections were reported to be decreasing at a rate of 3% annually. The EMSIPSB leadership reported that they were being encouraged to support conversion of the special fund to the general fund. It was also suggested to the EMSIPSB leadership that the Trauma System funding would potentially be more secure if it were converted to the general fund. New legislation is required to convert the Trauma System Special Fund to the general fund, because the statute for the special fund also contains the authorizing legislation for the Trauma System.

Potential threats to the current appropriation from the Trauma System Special Fund or funding from the general fund include but are not limited to the following:

- The possibility of designating additional trauma centers, which would redistribute and reduce the funds currently provided to existing trauma centers
- Decreasing revenue from the cigarette tax
- The proposed plan to repeal the Trauma System Special Fund and convert to the general fund, forcing the Trauma System to compete with other program priorities in the state budget

Stakeholders additionally expressed concerns regarding the increasing cost of providing trauma care. It was not clear to the TSC Review Team if any discussions had occurred regarding a need or desire to adjust the allocation of trauma funds to meet these increased costs.

In light of the perceived or real threat to the trauma fund, the Trauma System leadership and stakeholders are encouraged to be proactive in identifying alternative sources for the special fund, e.g., motor vehicle registrations, motorcycle registrations, driver's license fees, tourism tax, gaming tax, airport tax, increasing or expanding the traffic violation surcharges, car rental, e-cigarette tax, etc. The trauma stakeholders are encouraged to mobilize, work closely with their state legislators and community partners to make a plan for a future funding level that initially matches the current Trauma System Special Fund authorization, but could potentially increase to meet future needs identified from a financial needs assessment.

Trauma System Special Fund Accounting

The EMSIPSB is required in statute to submit an annual report to the legislature that summarizes the receipts and expenditures of the Trauma System. The report from FY 2016 was provided for TSC Review Team review. The report contains information about the statute, the amount of funds received for the special trauma fund from the cigarette tax and traffic violation surcharges, and the total amount expended. No detail regarding Trauma System expenditures was required or included in the report.

The lead agency is committed to adhere to the requirements for distributing, monitoring, and reporting expenditures from the Trauma System Special Fund. This includes improving the methodology for budget planning, fund disbursement, and accountability. Recently, the previously used trauma center Memorandum of Agreement (MOA) process for disbursing funds was changed to contracts with the designated trauma centers. No metrics or process was described to rate the contracts, however all are licensed healthcare facilities and fall into the category of designated trauma centers or non-designated trauma support facilities.

It was reported that the EMSIPSB has begun development of administrative rules for management of the Trauma System Special Fund. These draft administrative rules were not available for TSC Review Team review. Administrative rules to strengthen the methodology for fund distribution management, and reporting is encouraged.

To obtain funding the trauma centers are required to submit a written request, a budget, and supporting justification. The EMSIPSB uses a checklist to review funding requests, and requests are approved or denied. When a request is approved the trauma centers submit proof of expenditure to the EMSIPSB for reimbursement. The EMSIPSB retains the original receipts and paid invoices. A comprehensive financial and analytical report, detailing trauma fund expenditures was not available for TSC reviewers at the time of the visit. The healthcare facilities cover any additional cost of providing trauma care that exceeds what is reimbursed from the Trauma System Special Fund.

The Trauma System accountant maintains a tracking form that includes hospital name, fiscal year, and amount of funding awarded. Information from FY 2010 through to 2017 was available for review by the TSC Review Team. The Trauma System Special Fund expenditures are maintained on an Excel worksheet from which reports may be provided upon request. It was reported that an informal review of the fund expenditures is conducted quarterly. The EMSIPSB leadership was invited to present Trauma System Special Fund account documentation to the legislature in August 2015. Information requested consisted of copies of the trauma center MOA's, and a line-by-line budget and expense report of the trauma funding, user ledger entries. The report also included the trauma center verification and designation reports.

Stakeholders reported that they are not well informed about the Trauma System Special Fund budget plan, disbursements, and other expenditures. The HTAC has not routinely had an opportunity to contribute to budget planning or to review special fund expenditures.

Financial Needs Assessment

The Hawaii DOH has not conducted a needs assessment or financial evaluation to determine if the current level of funding is sufficient for its unique challenges (e.g., isolation from other states, counties separated by water, air medical services required for inter-facility transfer, high visitor to resident ratio, and the difficulty recruiting qualified health professionals and specialty surgeons).

A comprehensive needs assessment should be completed. An analysis of the trauma costs incurred by the system, including the trauma centers, has not been performed. It was reported that an attempt was made to determine the cost of trauma care, but some of the designated trauma centers were hesitant to share financial information. Sharing of cost data and payer data is often expected in State Trauma Systems, and it should not be a deterrent for completing this project. The lead agency could potentially assemble the financial officers of the healthcare facilities (e.g., Directors or Vice Presidents of Finance) as an ad hoc work group to review the

payer mix, cost, reimbursements, etc. To be most effective and efficient this ad hoc work group needs carefully selected membership including the financial leadership mentioned, one or two trauma center TPMs and TMDs, as well as the Trauma System TPC.

The financial expertise represented in this work group could be supportive in guiding the full range of data needed to analyze the cost of the Trauma System. The individual work group members might also be able to encourage financial leadership of the remaining healthcare facilities to share financial data. The work group could also be asked to develop a formula for trauma fund disbursement to healthcare facilities that is directly linked to the uninsured, and under-insured, if this methodology is selected for future disbursement of Trauma System funds.

If a formula for fund distribution for the uninsured and under-insured is selected for future disbursement of the Trauma System funds, a standard operating procedure (SOP) for managing this process must be developed. The SOP should include a step-by-step instructional process for both the trauma centers and the EMSIPSB Trauma System accountant to adhere to. The SOP must include measures to ensure that the funds are distributed appropriately. Adherence to the SOP could also be embedded into each trauma hospital's contract to ensure compliance.

Budget Planning

The TSC Review Team looked for evidence that the Trauma System Special Fund budget planning was coordinated with the Trauma System Plan. The most current draft of the Hawaii Trauma System Plan was available for review. It is the TSC Review Team's perspective that the financial planning for the Trauma System is not directly related to the Trauma System Plan outcome measures. This makes it difficult to demonstrate the value of the Trauma System to stakeholders, elected officials, and the public. The EMSIPSB should prepare an annual budget for the Trauma System infrastructure with costs tied to each component of the Trauma System. The HTAC should have the opportunity to review the proposed budget with ample time to analyze it for the purpose of advising the lead agency on potential changes and to seek stakeholder support. Information contained in the Trauma System annual report (yet to be developed) should be used to educate and inform elected officials about the importance of the Trauma System and trauma centers for their constituents.

It was reported that the Trauma System Special Fund supports salaries for six positions within the EMSIPSB. Upon review, most (2 of the 6 1.0 FTEs support the day to day operations: Trauma Program Coordinator (1.0 FTE) and Trauma Accountant (1.0 FTE)) funded positions do not directly support the day-to-day operations of basic and essential components of the Trauma System program. At present the TPC is tasked with most program functions related to the Trauma System, including the state trauma registry and Performance Improvement. The described staffing model with small FTE commitments from a diverse group of EMSIPSB personnel does not support the basic needs of a State Trauma System. To fully support the State Trauma System, dedicated personnel support is important for Trauma System registry, Trauma System Performance Improvement, and patient safety (PIPS) functions. A thoughtful re-organization of staffing is required to ensure that staff support is directly linked and specifically dedicated to supporting the Trauma System. Trauma funds should be used to support positions directly dedicated to the Trauma System program day-to-day activities. Important positions include the State Trauma System Program Manager, a Trauma System registrar, and a Trauma System PIPS coordinator.

Recommendations

- **Evaluate use of trauma funds and allocate as needed to be sure trauma funds are optimally supporting the future goals and direction established by the updated Trauma System Plan**
- **Work with the legislature to ensure that a stable funding source for the Trauma System is secured. Funding should be sufficient to support system operation and future development as outlined in the Trauma System Plan**
- Develop Standard Operating Procedures for the request, review and distribution of funds. in accordance with Act 305
- Create an annual report for the fund including expenditures (in categories, but detail may be in an appendix)
 - Present this annual report to the trauma stakeholders and the legislative representative

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

The EMSIPSB has a long history of excellence in the field of injury prevention that predates the formal inception of a trauma program. Leading the endeavor is an injury epidemiologist who is highly skilled in the use of data to answer important questions related to the burden of injury in Hawaii. The ability to link multiple data sources to develop a comprehensive picture of the injury problem is to be commended. Coalition stakeholders use the generated data to develop programs that address injuries mechanisms of particular concern.

In addition, the EMSIPSB has invested in injury prevention educators to help deliver the key messages to local communities and stakeholders. Of particular note are the prevention education staff members dedicated to elder falls and drowning prevention. The coalitions involved in injury control are extensive and committed to the problem, although some gaps were identified by the TSC Review Team. In particular, given the large number of visitors to the islands, representatives of the tourism and hospitality industry should be recruited as partners in injury prevention. Developing appropriate messaging that emphasizes safety without discouraging visitors will likely require skilled marketing, but it should not be a barrier to the inclusion of this important target group for injury prevention. Ocean safety, falls, and motor vehicle crashes are injury mechanisms of concern for visitors.

While the injury prevention planning and outreach activities of the EMSIPSB are impressive, opportunities do exist to increase collaboration with the local institutions of higher education to further the prevention mission. This relationship has the potential to be mutually beneficial. The university programs can provide the EMSIPSB with an energetic, albeit novice, workforce (in the form of students), and the university programs gain an opportunity to place their students in meaningful internships.

While data from the EMS registry, HHIC's hospital and emergency department billing data, FARS, and other sources have been extensively utilized and linked, the state trauma registry has been under-utilized. This resource contains valuable information regarding mechanism of injury, protective devices used, and the specific type(s) and severity of injury. Information from

the state trauma registry should be utilized to more fully describe the burden of injuries in Hawaii.

While the excellent injury epidemiologic data have guided the development of interventions to prevent injury, many of these interventions are not formally evaluated. For example, the drowning prevention program has specifically identified beaches that are high-risk areas for drowning, and an intervention was developed to strategically place rescue tubes. Evaluation thus far seems to be limited to an assessment of attitudes toward tube placement by public safety stakeholders, number of rescues and secondary drownings. Evaluation of effectiveness of their placement and use by the at-risk population has not been attempted. A plan for future evaluation (metrics, time frame, etc.) should be built into all major prevention programs.

Development of an HTAC injury prevention sub-council may help further enhance the integration of prevention activities into the Trauma System. Additionally, this sub-council could help focus prevention activities on injury mechanisms that have the greatest impact on trauma centers and coordinate evaluation of their effectiveness. Additionally, the RTACS are an ideal clearinghouse for grassroots prevention activities. Designated trauma centers are also interested in addressing important injury mechanisms that affect their communities, however, the Level III trauma centers are often under-resourced in terms of personnel and time to implement prevention activities. The involvement of more stakeholders in the RTACs would increase the resources available for injury prevention program implementation.

Recommendations

- **Involve the tourism/ hospitality industry in prevention initiatives**
- Develop a more formal partnership with public health education programs (University of Hawaii, Manoa and Argosy University—Hawaii) to increase prevention activities, to develop a future workforce in the field of injury prevention, and to improve the ability to evaluate injury prevention programs
- Increase the utilization of the Hawaii Trauma Registry to inform injury prevention activities
- Consider adding a prevention sub-council to Hawaii Trauma Advisory Council
- Increase Regional Trauma Advisory Council involvement in injury prevention activities
- Identify several injury prevention efforts for evaluation and ensure that appropriate data is being collected for determining their effectiveness

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

The EMSIPSB within the DOH has the authority to administer EMS services. The State of Hawaii funds the Hawaii EMS System. This unique model ensures 911 Advanced Life Support (ALS) in the state's four counties. The EMSIPSB contracts with EMS providers in each county. The state has fifty-one ALS ground ambulances, three non-transport ALS response vehicles, and two helicopter providers. In addition, a private ambulance company offers operations in each county to augment the state EMS system.

The location of 911 assets (those under contract) has been determined by the legislature based on a system analysis driven by geographic considerations, EMS call volume, and response time. The location of private ground and air medical assets is determined by those provider agencies, as the legislature and state comprehensive EMS system do not mandate their location.

Hawaii has four counties, and each county has a part-time EMS medical director funded by the State. Each of these medical directors are involved with EMSAC and at times holding membership seats. The committee composition, function, roles and responsibilities are defined in Hawaii Revised Statute 321-225. The EMSAC was established to assist with review and development of standards for the improvement of EMS within the state. EMSAC meets on a regular basis and is advisory to the EMSIPSB. Some stakeholders reported adequate representation across EMSAC and HTAC; however, this relationship is not formalized or preserved. Broader representation at the HTAC is recommended.

The current version of EMS regulations/code (Title 11, Chapter 72) identifies the certification and recertification requirements for emergency medical technician, advanced emergency medical technician, and paramedic levels. Hawaii requires EMS providers have and maintain a

National Registry of EMTs certification at their licensed level. This assures that providers maintain nationally recognized core competencies related to trauma and pediatric management.

Recommended state-wide Mobile Intensive Care Technician standing orders for adult and pediatrics exist, and the most current version was approved in 2013. These standing orders serve as guidelines for treatment.

The state has implemented and continues to support a uniform state-wide electronic patient care report (ePCR) program. The ePCR adheres to a standard data dictionary that is useful in establishing a data repository. The current reporting program is National EMS Information System (NEMSIS) 2.0 compliant. The EMSIPSB plans to develop a request for proposals for a NEMSIS 3.0 compliant vendor in the near future.

Each 911-response agency is responsible for Quality Improvement (QI) activities for its organization. No established standard exists for case review and for the involvement of personnel in the QI process. When QI issues are identified by EMSIPSB, they are communicated to the county regional EMS medical director for further review and action. The EMSIPSB is not producing annual reports or monitoring trauma-related benchmarks, e.g. over- and under-triage of trauma patients.

Individuals expressed the need and desire to conduct an evaluation and Performance Improvement process of the EMS system. The NHTSA EMS Technical Assessment for states measures the effectiveness of a state's existing and proposed EMS program. Effective EMS systems can validate that trauma victims are receiving prompt, high quality prehospital medical care by trained professionals, and that patients are safely and rapidly transported to the most appropriate treatment facility.

Focused Question (5): Please identify recommendations on how private air ambulance providers could be used to triage the transport of the injured trauma patient in coordination with other patients with non-traumatic emergent conditions and how to monitor effectiveness of the process.

Two private aeromedical corporations provide ALS inter-facility transports state-wide. The air medical assets include fixed-wing and rotor-wing, with fixed-wing being the primary mode of transport. Both air medical services were reported to be readily available. The private air medical providers were reported to provide excellent services and to fill a critical role in the transfer of patients in this island state. Unlike other components of the emergency medical response system, private air medical corporations are not under contract to provide services and to sustain services to the residents and visitors of Hawaii. Without contracts, the air medical providers are not bound to provide guaranteed and equitable services.

Medical oversight of air medical services by Hawaii EMS medical directors, including centralized communication does not currently occur. Guidance to participate in the triage of injured patients for transport as well as patients with other time-sensitive conditions has not been addressed because the private air medical providers have no formalized relationship with the EMSIPSB or the EMSAC. The EMS medical directors should establish criteria for triage and transport of all time-sensitive conditions. Then a QI process should be established to monitor triage and transport decisions, using data from the HEMSIS.

Recommendations

- **Amend EMS Statute to integrate aeromedical services as a vital component of the State Comprehensive Emergency Medical Services System**
 - Authorize DOH to contract for air ambulance provider services and bill third-party payers for reimbursement
- Assure that the relationship between EMSAC and HTAC is clearly defined and articulated
- Assume oversight of the medical aspects of air ambulance services including centralized communication
 - Establish a medical director-driven process for triage and transport criteria
 - Perform rigorous and regular utilization review on inter-facility transports to ensure compliance with the established triage process
- Develop and adopt EMS Performance Improvement indicators for Quality Improvement activities that include, but are not limited to, over/ under triage of trauma patients
- Collaborate with the Hawaii Department of Transportation, Highway Safety Section to initiate and conduct a National Highway traffic Safety Administration EMS Technical Assessment

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 state-wide 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

The development of the Hawaii Trauma System has been rapid with an impressive increase in the number of trauma centers and careful geographic distribution. A single ACS verified Level II trauma center (The Queen's Medical Center [QMC]) exists within the system. The facility is scheduled to undergo ACS level I verification review in the near future. The Trauma System has a single burn center (Straub Hospital and Clinic) that is not verified by the American Burn Association (ABA). The pediatric trauma center is state designated as a Level III (KMCWC) after

undergoing Trauma Center Association of America (TCAA) verification review. Additionally, a military facility (TAMC) provides pediatric and adult tertiary care and has a full range of subspecialty care. TAMC sees a limited number of trauma patients and is not verified. It was reported that TAMC plans to seek ACS verification as a Level II trauma center. All of these facilities are located on Oahu.

Six adult Level III trauma centers are verified (three on the Big Island, one on Maui, one on Kauai, and one on Oahu). The current process for Level III adult trauma center designation includes the option of either ACS or TCAA verification. All of the state's trauma centers and TAMC provide data for the state trauma registry. Additionally, a number of smaller and critical access hospitals are dispersed around the state, and they intermittently provide initial trauma care. These hospitals are not formally designated by the Trauma System, and they do not contribute data to the trauma registry.

The QMC provides a full spectrum of adult subspecialty care. KMCWC provides the complete range of pediatric subspecialty care. The Level III trauma centers have consistent general surgery coverage, but lapses occur in subspecialty care, specifically orthopedics. The Level III trauma center on Maui does have a single neurosurgeon. The centralization of subspecialty care on Oahu currently necessitates air medical inter-facility transfer for patients from the neighbor islands, creating great distances and cost for families to travel, as well as greater cost for health payers.

The QMC has a robust trauma nursing continuing education effort, offering the Trauma Nursing Core Course (TNCC), the Trauma Care after Resuscitation (TCAR), and the Advanced Trauma Care for Nurses (ATCN) courses. Efforts are made to include nurses from the neighbor islands. This facility is where the majority of physicians caring for the injured receive their Advanced Trauma Life Support (ATLS) training. The QMC also supports a yearly multidisciplinary conference with attendance from around the state. The QMC and TAMC each have general surgery residency training programs and surgical subspecialty training programs. A significant relationship exists between QMC and the John Burns School of Medicine, University of Hawaii.

The physicians and TPMs from trauma centers reported considerable fragmentation within the Trauma System. The relationship between the neighbor island Level III trauma centers and the Level II trauma center on Oahu is largely dictated by geography and distance. The Trauma System has done a commendable job in trying to address this issue, but the cost remains significant. The over-triage of patients that are transferred to Oahu for subspecialty evaluation probably costs millions of dollars, and the patient volume has the potential to overwhelm the only Level II trauma center in the state. This issue should be addressed as a Performance Improvement priority by the RTACs and HTAC. The State Trauma System has already attempted to decrease over-triage by a number of methods, such as rotating surgical subspecialists and tele-radiology. These efforts should be expanded.

Fragmentation of care also occurs among the tertiary care centers on Oahu. In some cases a clear definitive care destination for patients may involve multiple subspecialists. For instance, a child in a motor vehicle crash with a concomitant burn injury could go to one of three definitive care facilities. According to provider report, typically a 3- or 4-way conference call occurs between the referring physician and potential receiving physicians to determine a destination for such a complex patient. No uniform process for the decision-making exists, and the patient often requires subsequent transfer to another facility. One obvious solution would be to elevate the level of services at any particular trauma center. However, this would be costly and would be dependent on facilities making commitments for this expense. Another possible solution

would be to ensure that all surgical providers who may need to provide consultation at other facilities have the necessary privileges (Straub Hospital burn surgeons occasionally see burned multisystem trauma patients at QMC; pediatric surgeons and pediatric intensivists see injured children at QMC; pediatric surgeons on Oahu cover both KMCWC and TAMC).

Focused Question (12): What recommendations can the ACS offer on integrating civil and military Trauma Systems in Hawaii?

The integration of TAMC into the civilian Trauma System is logical and potentially beneficial to both Hawaii and the armed services. With the overseas military conflicts ebbing, a concern regarding opportunities for military surgeons to maintain skills and expertise in trauma care has surfaced. The addition of TAMC, with its sizable pediatric and adult services, could provide needed relief to their civilian counterparts and be a benefit to the people of Hawaii. Another notable benefit to this collaboration is redundancy of trauma services. QMC is the only high-level trauma center for thousands of miles. Given the historic risk of natural disasters and the modern potential for terrorist events, it seems prudent to have a second high-level trauma center in a state as isolated as Hawaii. With appropriate federal and state support, TAMC could serve not only as a free-standing designated trauma center, but also as the backup facility for QMC and/or KMCWC in case of disaster.

Focused Question (13): What opinion does the ACS have on critical access hospitals verified and designated as level IV trauma centers?

Several states designate Level IV trauma centers. At this time, the ACS has no process for verification review of Level IV trauma centers, so standards for designation would have to be developed by the state. The advantage to a designation process is the ability to write the Level IV trauma centers into the administrative rules and to define the trauma resources, education, equipment and expectations of the Level IV facilities. The disadvantage would be the cost associated with maintaining these standards and whether the volume of patients would make it worthwhile. The care provided by the critical access hospitals should complement the current Trauma System and not compete with the Level III trauma centers. Another option would be to educate the health professionals within the critical access hospitals through a standardized course, such as the Rural Trauma Team Development Course (RTTDC). This education can help prepare the health professional team to provide the initial emergency care for a patient needing inter-facility transfer. Having these facilities provide a minimal set of data to the HTR would help support an analysis of patient volume and inter-facility transfer destination. Additional analyses including the distance to a higher level of care and the facility's resources for trauma care can help guide the decision about designation.

Recommendations

- **Determine the optimal level and number of trauma centers, based on population need and system capacity. Metrics might include anticipated volume, available resources, and geography**
- **Support the development of a Level I or a second Level II trauma center at the facility found to be most appropriate to meet population need as determined by the trauma designation process**
- Provide uniform standards and verification processes for Level 3 trauma centers in order to provide consistency across the Trauma System
- Continue efforts to develop an inclusive trauma care system, by ensuring that all acute care facilities are participating in the system at a level appropriate to the capacity and to system need
 - Consider additional categories such as “Level 4 trauma centers” or “trauma receiving facilities” to codify system participation
 - Consider RTTDC training for non-designated facilities
- Recognize the special needs of injured children by continuing to enhance the availability of pediatric specialty care at the highest level
- Ensure readiness of all acute care facilities to manage special needs populations (children, burns, and Spinal Cord Injury)
- Ensure an adequate state-wide trauma workforce, today and in the future, across all provider types, particularly nurses, orthopedic surgeons, and neurosurgeons
 - Consider rotation of specialists to neighbor islands and other novel approaches to staffing problems
 - Develop a multifaceted approach to successfully recruit and retain additional orthopedic surgeons and neurosurgeons
 - Re-evaluate use of funds for locum tenens to ensure that these funds are being used in the most efficient manner to support the Trauma System
- Ensure that all surgical providers who may need to provide consultation at other hospitals have the necessary privileges
- Continue to build capacity for tele-medical approaches to providing care, including tele-radiology and mechanisms for specialty consultation and follow-up
- **Engage all non-designated acute care facilities in regional and state-wide trauma advisory council activities, including Performance Improvement initiatives**

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

Hawaii has done remarkably well coordinating trauma care across the state under adverse geographical circumstances. Despite the island nature and large tracts of rural and sparsely populated areas, all citizens have access to 911, enhanced 911, and/or wireless 911. The location of prehospital assets, including ambulances, rapid response units, and helicopters, was determined by the legislature after a systems analysis considered geography and call volumes.

Initial prehospital response is dependent on the level of injury severity and the patient location. It may involve an initial response by ground EMS or by helicopter, and it can involve a rendezvous point to transfer from ground EMS to helicopter for patient transport to the initial treating facility. Most prehospital providers have ALS certification. Prehospital triage and destination criteria have been established and correspond to the Centers for Disease Control and Prevention (CDC) Field Triage Guidelines. EMS provider communication with treating facilities is typically

via a bidirectional radio system. In case of malfunction or extenuating circumstances WebEOC, the system used during disasters, provides redundant communication mechanisms.

Hawaii developed seven trauma centers over the past ten years, and now all counties neighboring Oahu have Level III trauma centers. These trauma centers are integrated into the Trauma System through regional and state advisory councils. Both prehospital providers and physicians involved in trauma care throughout the state are enthusiastic and engaged. Non-designated trauma support hospitals (e.g., critical access hospitals) are recognized as important for the provision of stabilizing treatment when needed. The participation of these hospitals has not been standardized, and no designation process for these facilities has been developed. No mechanism currently exists for obtaining trauma patient data from these facilities for the state trauma registry.

The island of Oahu has the state's only Level II trauma center, burn center, pediatric facility, and in-patient rehabilitation center. As a consequence, patients on the neighbor islands requiring these services must be transferred to Oahu. Fixed wing options exist for inter-facility transfer from all neighbor islands, and helicopter availability is also used, primarily for inter-facility transfer between facilities on Oahu and from the Big Island. Communication with the facilities providing this higher level of care is typically by phone. A transfer center at QMC helps facilitate transfers to this Level II trauma center.

Patients being transferred to Oahu who may need specialty trauma care involving two facilities (e.g., pediatric, burn, major trauma) may have their care discussed via a three-way conference call, facilitated by the QMC transfer center. Potential receiving physicians at the two facilities talk to the referring physician to decide the patient's final destination hospital. For example, a child with a severe injury is first transported to QMC for initial management and later transferred to KMCWC. It is not clear to the TSC Review Team that a protocol exists to facilitate the process of final destination for this complicated subset of trauma patients. On Oahu, the prehospital triage protocol has been modified from the state protocol in an effort to get these complicated trauma patients to the appropriate hospital from the field.

The lack of specialty trauma care on neighbor islands is magnified by the distance and cost of travel. It also opens the Trauma System to excessive over- and under-triage and large cost. For example, a patient with a simple mandible fracture may be flown to Oahu to be seen by an oral maxillofacial surgeon, only to receive consultation and no operative care. The patient must then pay for the airfare to return home. In contrast, a patient with a brain injury on a neighboring island who requires immediate evacuation of an intracranial hematoma may need to be cared for at a trauma center without a neurosurgeon. Other examples of these dilemmas involve the limited availability of orthopedic and urological care. Recent improvements in teleradiology have helped improve decision making about the need for inter-facility transfer of some patients with brain injuries. Recent efforts to rotate certain surgical subspecialists to the neighbor islands for specialty clinic visits may be a future strategy to reduce some inter-facility transfers. The Trauma System will need input from all facilities caring for trauma patients to develop additional strategies for decreasing over- and under-triage and reducing cost. The HTR has been under-utilized in the study of issues related to triage.

The Trauma System still struggles with rehabilitation and frequent delays were reported in obtaining trauma patient transfer to the state's only in-patient rehabilitation facility. This facility treats patients with injury, as well as non-trauma patients, often with a lower acuity. Because this facility does not have the ability to care for patients requiring mechanical ventilation, these patients are transferred to the mainland. This illustrates another challenge in the Trauma

System, family unification and repatriation. Many trauma patients require care on distant islands or even the mainland. Hawaii has no formal plan for helping a patient's family to be close to them when they require care in a distant hospital or for getting them home once their in-patient care is complete. While it is important for all trauma patients to have family nearby, pediatric patients have special needs for family to be present.

Focused Question (15): What trends have been seen regarding trauma centers accepting trauma, STEMI, and stroke when they are in divert/ bypass?

For trauma centers verified by the ACS, diversion greater than 5% of the time is defined as a verification criterion deficiency. Trauma centers are expected to monitor diversion status on a monthly basis and develop action plans as needed.

Generally, across the United States, more healthcare facilities are recognized as ST-Elevation Myocardial Infarction (STEMI) and stroke specialty centers than those verified and designated to treat trauma patients. Most trauma centers make a commitment not go on diversion or bypass status for severe injuries, unless another trauma center is nearby to accept a patient. In some cases a hospital near the trauma center is recognized to care for STEMI and stroke patients and could be available if the facility goes on diversion for these time-sensitive conditions while managing an excess volume of trauma patients.

The challenge occurs when the same facility is designated or recognized for some or all time-sensitive conditions (trauma, stroke, and STEMI), and high patient volumes stress the facility's resources. If another facility is not nearby to help spread the patient volume, the facility must develop a plan for surge capacity. The facility has an obligation to provide needed emergency care for all time-sensitive conditions through its contract or recognition status. The state should perform an analysis using system-wide trauma data, trauma center patient volume, and estimated or real trauma center surge capacity, as well as similar metrics for the STEMI and stroke resources and patient volumes. Guidelines should be developed for management of diversion or surge capacity for all time-sensitive conditions. If necessary, resources may need to be allocated to additional centers to manage surge capacity.

Recommendations

- Enhance involvement of non-designated facilities in the Trauma System and ensure submission of a minimal data set to the trauma registry
- Develop guidelines to care for the complex trauma patients that may require multiple subspecialty care, namely pediatrics, burn, and major trauma
- Improve sub-specialty care on neighbor islands to decrease costly transfers to Oahu and delays in care
- Conduct a study linking EMS data and HTR to identify factors which are associated with over and under-triage

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

No representatives for the rehabilitation community attended ACS TSC stakeholder sessions. Surgeons and TPMs provided responses to TSC Review Team member queries regarding rehabilitation concerns. Hawaii's only inpatient rehabilitation facility is located on Oahu, the Rehabilitation Hospital of the Pacific. Seven small outpatient rehabilitation clinics exist on the neighbor islands. It was not readily apparent to the TSC Review Team if physical medicine rehabilitation physicians or physical and occupational therapists staff these clinics.

The Rehabilitation Hospital of the Pacific, previously accredited by the Commission of Accreditation of Rehabilitation Facilities (CARF), has allowed the accreditation to lapse. Stakeholders reported that patients of a lower acuity, such as those recovering from elective surgery or a stroke occupy a majority of the facility's 100 beds rather than trauma patients. The facility does have Physical Medicine and Rehabilitation physicians who lead TBI and SCI programs. However, the facility has no beds for patients who are ventilator-dependent.

It was not possible to determine the percentage of patients who are required to seek inpatient rehabilitation on the mainland United States, but Trauma System stakeholders reported that this is a common occurrence. Trauma System stakeholders also reported that delays in transferring patients to inpatient rehabilitation are common, and they estimated that on average the acute care length of stay was increased by an additional 4-5 days for complicated trauma patients. It was stated that patient insurance status is frequently a determinant in the level and location of rehabilitation care trauma patients receive.

Focused Question (6): Does the ACS believe that the trauma patient suffering from a Spinal Cord Injury or Traumatic Brain Injury has adequate resources for rehabilitation?

The TSC Review Team does not believe that Hawaii has adequate resources for Trauma System rehabilitation. Specific subpopulations of trauma patients that are impacted by a lack of resources, specifically include patients who are ventilator-dependent with TBI and SCI. The TSC Review Team also perceived that children with severe injuries also lack resources for inpatient rehabilitation. Inadequate health insurance also was reported to be an impediment to receiving adequate rehabilitative care. For more information see the Neurosurgery focus section.

Focused Question (7): What recommendations does the ACS have on engaging all rehabilitation services not limited to inpatient rehabilitation?

Rehabilitation for the trauma patient is only briefly mentioned in the comprehensive State Trauma Plan, and no insight was gained from reviewing this document as to how rehabilitation can be better integrated into the overall care of the trauma patient. Rehabilitation has no formal representation on the HTAC or any of the RTACs. No protocol exists at the Trauma System level for the rehabilitative care of the trauma patient. Addressing each of these issues would help to improve the integration of rehabilitation into the overall care of the trauma patient.

Focused Question (8): What recommendations does the ACS have for measuring patient outcomes after discharge from acute care facilities?

Stakeholders reported that the Trauma System does not receive any patient outcome data or process information from the Rehabilitation Hospital of the Pacific or from any of the outpatient rehabilitation clinics on the neighbor islands. One option is to facilitate discussions with

rehabilitation physical medicine about sharing outcome data with the referring trauma center. Aside from the usual outcome measures of mortality and length of stay, limited outcome data are reported to the trauma registry. Outcome measures specific for acute patients with TBI and SCI should also be included in the HTR. These could include American Spinal Injury Association (ASIA) classification for SCI at admission and discharge; the Extended Glasgow Outcome Scale (GOS) performed at discharge, three and six months; the Functional Independence Measure (FIM); and the Pediatric Functional Independence Measure (WeeFIM). These measures would provide a basis to improve care in these sub-populations.

Recommendations

- Construct a plan for the improvement and future direction of the trauma rehabilitative effort and outline this in the State Trauma Plan
- Improve Physical Medicine and Rehabilitative representation in the state trauma advisory council
- Include rehabilitative-level data in the state trauma databases
- Build capacity to care for special rehabilitation patient populations, such as those who are ventilator dependent

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 state-wide 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 Hawaii Emergency Management Agency (HI-EMA) is based in the state’s Department of Defense. Designated by statute the HI-EMA is charged with maintaining a comprehensive, coordinated, and cooperative emergency management program to prevent, prepare for, respond to, mitigate, and recover from emergencies and disasters that threaten or impact the state. Across all phases of emergency management, HI-EMA coordinates its activities with county emergency management agencies, other state departments, federal agencies, and partners from the private sector and nongovernmental organizations (NGOs).

The Hawaii Emergency Operations Plan (HI-EOP) defines the roles of state departments, key private sector, and NGO partners; establishes the conditions under which state resources are mobilized; and describes the organizational concepts and structures used to coordinate actions of state entities and other levels of government. These roles include that of the Hawaii DOH with regard to public health and medical care.

Each county has authority for emergency management within its jurisdiction under the overall direction and control of the mayor. As required by Hawaii Revised Statute (HRS) 127A, each county has a local emergency management agency and Emergency Operations Center (EOC) headed by a county-level director or administrator. Responsibilities of these agencies include: developing and implementing an emergency operation plan consistent with HI-EOP; instituting training, preparedness, and public information programs; and developing mutual aid plans and agreements for emergency management with other counties.

The Hawaii Association of Hospitals (HAH) Emergency Services Division is responsible for coordinating healthcare emergency services state-wide. This division operates a state-wide voice and data communications system for disaster response. HAH Emergency Services provides for inter-hospital communications in collaboration with county and state government agencies during multiple and Mass Casualty Incident (MCI) events. The state-wide voice and data communications system includes a patient tracking system available for hospitals during surge events. HAH reports that a SatCom system is used for hospital communications. All hospital emergency departments can be on the system and communicate with each other. Surge planning and related capabilities are under the auspices delegated to HAH Emergency Services, not to the Trauma System. HAH reports that it uses the Web-based Emergency Operations Center (WebEOC) program to achieve bed tracking when needed.

The HAH Emergency Services Division has little specific contact with the Trauma System. Interaction with hospitals, including trauma centers, occurs through the hospital's emergency management representative. The TSC Review Team perceived that it is the HAH's expectation that the emergency management representative will be the conduit for all relevant information between the hospital and the HAH. Stakeholders reported that this method of communication has not always been effective.

The HAH Emergency Services Division also conducts disaster preparedness exercises at scheduled intervals to assist in the development of essential disaster response capabilities for Hawaii hospitals. An After-Action Report and Improvement Plan (AAR-IP) is developed from each major exercise. The HAH reported that it has conducted a needs assessment and gap analysis of hospitals' abilities (not the Trauma System's abilities) to expand their capacity to respond to MCIs. The results of this assessment led to the provision of more equipment to hospitals. Modifications to policies and procedures relevant to the Trauma System were not addressed.

The last state-wide Trauma System preparedness assessment was conducted state-wide in 2005. The next state-wide assessment is planned for 2018, and it will be part of the federal Department of Defense's Rim of the Pacific (RIMPAC) exercise. RIMPAC is the world's largest international maritime exercise, which includes a mass casualty drill, conducted in and around the Hawaiian Islands and Southern California.

Prehospital care personnel, EMS medical directors, and trauma center personnel voiced concerns about the lack of trauma center integration with disaster planning at both the county and state level. Many stated they did not have a clear understanding of how the Trauma System fits into county and state level disaster plans. During the TSC visit, no organizational chart or diagram was provided to illustrate this relationship. Particular concern was expressed about the ability to track patient flow during a disaster. Concern was also expressed that not enough attention is placed on certain threats (e.g., a tsunami) that could radically alter patient transport patterns as well as integration with HI-EMA resources. Trauma System personnel were also concerned about inconsistencies regarding the depth to which the Trauma System is tested during disaster exercises. They stated that they may not be making appropriate contributions to disaster preparedness planning, and they have not consistently received after-action reports or participated in after-action debriefings. Increasing the Trauma Systems' participation in these two areas would improve HI-EMA's understanding of the importance of the Trauma System integration into county and disaster management plans.

Recommendations

- **Conduct an assessment of the Trauma System's ability to expand its capacity to respond to MCIs using an all-hazards approach**
 - Conduct a gap analysis based on the assessment for trauma emergency preparedness
- Develop an organizational chart identifying relationships among the key emergency management agencies (Trauma System, EMS, Public Health, state and federal emergency management)
- Provide a specific mechanism for the state and regional trauma advisory councils to provide input to local and regional disaster planning
- Provide a specific mechanism for dissemination AARs of MCI/ MCE activities to all Trauma System stakeholders
- Encourage DoD and Trauma System co-operation in MCI/ MCE situations
- Develop a contingency plan for Trauma System function with potential loss of Queen's Hospital or Kapiolani, as may occur with natural or manmade disaster

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

Currently, the optimal elements for Trauma System Performance Improvement and Patient Safety (PIPS) listed above are not being met. Hawaii does not have a Trauma System PI Master Plan. No metrics, audit filters, or core measures are currently identified for monitoring the quality of the Trauma System's performance and patient outcomes. A list of audit filters was suggested for monitoring in the 2005 TSC report; however, none have been implemented.

Discussions have occurred within the HTAC regarding the review of measures such as over- and under-triage and the time to definitive care. Approximately 3 years ago, an informal systemwide review of alcohol and the trauma patient was conducted. The project was linked to the new trauma center criteria for trauma patient screening, brief intervention and referral for alcohol treatment. Another activity was the recent development of a TBI Trauma System guideline. Adherence to this guideline has not been monitored. The Level II trauma center performs PI on the TBI patients that are transported or transferred to their facility. Representatives of the Level II trauma center stated over-triage of TBI patients is common.

At the November 2016 HTAC meeting, Trauma System PI was identified as a priority. Preliminary data on over- and under-triage was presented at a very recent HTAC meeting. It was reported that over- and under-triage can only happen on Oahu, as this is the location of the Level II trauma center. However, over- and under-triage for critical access hospitals to the Level III trauma centers is also important – are all appropriate trauma patients referred to trauma centers from all non-trauma designated facilities? While some answers about this could be identified with the HHIC data that is linked to HEMSIS, Injury Severity Scores are not calculated for patients in the HHIC database. The Trauma System leadership could address this by establishing in administrative rule that all hospitals receiving trauma patients must collect and submit trauma patient data. A minimum data set for the critical access hospitals would also be appropriate. This strategy would provide consistent data to allow the Trauma System to evaluate trauma patient flow throughout the system, including time to definitive care.

The HTR is not being used to provide the foundation for Trauma System PIPS. The HTR needs data to be submitted from all trauma centers in a timely manner, then regular validation must be performed to ensure that data is accurate. No data support personnel (e.g., Trauma System registrar or Trauma System PI coordinator) are dedicated to supporting the Trauma System PI program at the state level. Currently, the EMSIPB has no personnel dedicated to PI activities. At a minimum, a Trauma System registrar to assist in maintenance and validation of data, and a state PI coordinator to focus on state-wide reports, are required. Having these personnel would facilitate the use of the HTR for PI.

The EMSIPSB recently organized an executive sub-council of the HTAC to perform the duties of a Trauma System PI committee. Specific roles and responsibilities of this sub-council are yet to be defined. The membership should be formalized and described in the Trauma System PI Master Plan.

Stakeholders reported that some aspects of system PI take place at the regional level, and the trauma centers in the region are active participants. No consistent structure or process exists to routinely report PI activities and system challenges to the HTAC or the PI sub-council. The structure for local, regional and state PI activity reporting should be defined in the Trauma System PI Master Plan.

The Trauma System participants rely on word of mouth for many case referrals. An objective method for case selection for the HTAC executive sub-council review should be established and described in the Trauma System PI Master Plan. A regional process for PI case submission that will encourage the investigation of system issues that warrant PI attention should be developed. The process should be included in the Trauma System PI Master Plan, and implemented on a regional / county level.

Within the past few months, a trauma-case referral review form was developed by the TPC. It is in draft format, currently being piloted on one case. The form's purpose is to provide a conduit for any trauma care provider (e.g., dispatch, EMS, trauma center TPM, or medical director) to refer a case to the TPC. The TPC will complete a primary review, and then determine if the case needs to go to the HTAC executive sub-council for review. The form will be available on the trauma program website in the future so any trauma care provider in the system can access it. The process for case review, from referral to loop closure is not written into a protocol or procedure, but the TPC stated that a plan exists to develop this protocol or procedure. The case review form is not currently protected from discoverability. Legal counsel is reviewing the form and proposed process.

This form and all Trauma System PIPS processes should be developed in a manner so the PIPS process can be electronically supported. Specifically, the care referral form should be electronic. In addition a software system could be developed in the HTR by the software vendor so PIPS data can be retrieved, tracked, trended, and reported. This will enable quarterly and annual review of trends in PIPS review by the HTAC executive sub-council and summary reports to the HTAC. The HTR can be customized to accommodate PI activity. The state PI coordinator would be responsible for oversight of the PI process.

The HTAC meets on a quarterly basis. It was reported that the HTAC PI executive sub-council would also meet on a quarterly basis. Quarterly meetings will delay how quickly issues and corrective actions can be addressed. The executive sub-council should be encouraged to meet monthly to enable PI loop closure in a timely manner and to have a timely effect on any real or potential patient safety issue(s).

The Level II trauma center is participating in Trauma Quality Improvement Program (TQIP). One Level III trauma center participated in the pilot program. No plans were described to develop a Hawaii TQIP consortium. Discussions have occurred between stakeholders about the challenges and usefulness of the TQIP program for the Hawaii Trauma System. The TSC Review Team encourages the Trauma System leadership to fully investigate the TQIP state collaborative program to gain a full understanding of its potential benefits to the Hawaii Trauma System. For example, applying TQIP process measures, understanding reports, drilling down on areas of opportunity at the trauma center level, and looking at system reports may help

advance Hawaii's PI process. Each TQIP collaborative has the opportunity and flexibility to shape its consortium.

It was stated that a statute exists covering peer review within the trauma hospital environment. However, uncertainty exists pertaining to confidentiality and peer review protection for the multidisciplinary Trauma System Performance Improvement that includes EMS. The Trauma System leadership should work closely with and educate the attorney general to ensure that a full understanding exists regarding the Trauma System PIPS process with all disciplines. An opinion regarding confidentiality and protection from discovery is needed from the Attorney General.

In the interim, the Trauma System PIPS process can begin to move forward. The trauma stakeholders may start by offering system-wide trauma grand rounds (blinded case presentations). Completing the Trauma PI Master Plan and selection of audit filters will also provide important groundwork for the PIPS process.

It was reported that trauma PIPS is performed at all of the trauma centers. Additionally, some Trauma System PIPS activities at the local and regional levels are occurring. For example, some of the trauma center TPM's are attending the EMS PI meetings to provide timely feedback, review, discussions, and action planning for issues identified. An informal process is in place for case referrals, but these are usually limited to inter-facility transfers, or prehospital issues that come from field, to trauma center care.

The TPC is encouraged to reach out to other State Trauma Systems TPMs (e.g., through the National Association of State EMS Officials' trauma manager council) to obtain PI master plans and Trauma System audit filters. Consideration should be given to developing a web-based resource center for the designated trauma centers. Resources should include the PI master plan, audit filters, case review forms, PI educational information, examples of forms, and templates for meeting minutes. This would additionally be beneficial to the trauma center leadership for implementing and or maintaining their trauma center PI processes.

Recommendations

- **Create a Trauma System PI Master Plan, guided by HTAC in its advisory role**
 - Assemble a multidisciplinary ad-hoc workgroup, drawn from the stakeholder community to expedite completion
 - Attain approval within 12 months
 - Disseminate this plan to the Trauma System stakeholders
- Establish the position of Trauma System PI coordinator. This position should be filled by a trauma nurse
 - Ensure that this position is fully dedicated to performing Trauma System PI
- Ensure system PI peer review protection statutes are sufficient
 - In the interim, begin Trauma System PI processes such as educational grand rounds / blinded case reviews
- Operationalize an HTAC Trauma System PI sub-council, and meet on a monthly basis and produce an annual PI report
- Utilize Trauma System registry data to provide the foundation for the Trauma System PI
- Implement a process in which the Regional PI activities are reported up to the HTAC Trauma System PI sub-council
- Schedule routine educational seminars on trauma PI, e.g., Trauma Outcomes Performance Improvement Course (TOPIC)
 - Mandate trauma PI education for Trauma System leadership (center and agency).

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 state-wide 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

EMSIPSB has the authority and oversight of the HTR. The HTR is funded by EMSIPSB through the Trauma System Special Fund. Software by Image Trend, Inc. is used for the state registry, and all state-wide data are stored remotely on servers maintained by the vendor. The Image Trend registry product is used by all trauma centers except for QMC, and each of these trauma centers use a web interface for data entry and data access. The QMC uses Digital Innovations software for their trauma registry and is responsible for data mapping and upload to the state database independent of the Image Trend web-based interface. It was reported that this upload is done on a daily basis. The NTDB data set is the minimum standard for the HTR, and the NTDB data dictionary is the foundation for the HTR data dictionary.

EMS patient care records and dispatch data are collected and stored in the HEMSIS, a NEMSIS 2.0 compliant registry, using software from Intermedix. By report, the HTR can be definitively linked to the EMS data, but this is not done on a routine basis. It was also reported by epidemiology personnel that it would be possible to link HTR data to an HHIC emergency department and hospital billing datasets, but this is not currently done due to the nature of the HHIC data use agreement. Data are not currently available from the state's only inpatient rehabilitation facility.

An injury epidemiologist (a 1.0 FTE) exists within the EMSIPSB, though the agency reported that about 20-25% of this individual's effort is devoted to Trauma System work. The epidemiologist currently functions as the de-facto trauma registrar, and is additionally the only resource available within the EMSIPSB to develop reports from HTR that can support system performance, injury prevention and research efforts.

The trauma centers submit trauma registry data to the NTDB. In addition, the Level II trauma center participates in ACS TQIP program, and one of the Level III trauma centers was a participant in the ACS Level III TQIP pilot. At the time of the TSC visit, no routine use of HTR data for system assessment or system Performance Improvement was reported. Similarly, HTR data are not utilized in state-wide injury reports; rather the HHIC hospital billing dataset is used. The HTR is underutilized at the facility level as well, with very few of the individual trauma centers routinely using reports generated from HTR data. The personnel at the individual trauma centers stated that the user interface for report writing and data queries from the HTR was the primary barrier encountered. Trauma center personnel also reported that they faced significant challenges related to hiring and retaining qualified registrars. A few trauma centers reported the use off-site registrars provided through third-party companies. At the time of the visit, only one TPM from an individual center enters state-wide data.

Processes to ensure data validity and data integrity are not in place. In addition, no process is in place to validate accurate injury severity coding. This challenge is amplified by the fact that many of the registrars at individual trauma centers have no specific training in Abbreviated Injury Scale (AIS) coding.

Recommendations

- **Establish the position of State Trauma Registrar. Responsibilities should include:**
 - **Data validation**
 - **User support for registry use and data entry**
 - **Ability to create reports for individual centers and at the system level**
 - **Management of additional data fields for specific system projects**
- **Consider establishment of a centralized pool of trauma registrars that would be responsible to assist with data entry and report writing at all acute care facilities**
- **Begin using registry data to look at system performance now. Initial focus might include:**
 - **Details on patients transferred to higher level of care to ensure timeliness and appropriateness**
 - **Details on patients kept at Level III centers to compare clinical outcomes to similar patients transferred to higher level centers, either within the state or nationally**
- **Establish processes to validate trauma registry data at hospital and state levels on a monthly basis**
- **Create a minimum data set for trauma support facilities and establish processes to ensure submission, including assistance with data entry and reporting**

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 state-wide 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

The Trauma System has conducted population-based and trauma registry research, as well as research requiring primary data collection. The EMSIPSB director of trauma research, injury epidemiologist, and members of the Trauma System have conducted the research. In 2014 the EMSIPSB hired the director of trauma research, but this position was terminated in the summer of 2016 for administrative reasons.

To retrieve data from the Hawaii Trauma Registry, investigators must submit a written request to the EMSIPSB Branch Chief, including the specific data elements, time period and/or research protocol. The EMSIPSB requires an IRB approval letter for datasets that qualify as protected by Healthcare Information Portability and Accountability Act (HIPAA). Researchers must demonstrate due diligence in protecting patient privacy (e.g., proper data management and storage procedures). Aggregate de-identified data has been available without IRB approval. Due to recent Hawaii Supreme Court legislative protections on patient data, this practice is under review.

A trauma research advisory sub-council of the HTAC had been formed, but it is now inactive. The members of this group were comprised of a representative from each of the trauma centers and the EMSIPBS director of trauma research. The trauma research advisory sub-council along with the Director of Trauma Research had initiated a substantial portfolio of research. These studies included trauma registry and population-based research, research on training and guideline development, and research requiring primary data collection. Individuals engaged in these research projects included faculty from the University of Hawaii School of Medicine and members of various trauma centers within the Trauma System. However, no collaborators were listed from the Office of Public Health Studies at the University of Hawaii. Attempts were also initiated to embrace basic research into Trauma System efforts. The TSC Review Team received no update from EMSIPBS on the current status of projects within the research portfolio.

A considerable body of reports, many of excellent quality, have been produced by the EMSIPSB. These reports have minimal data from the HTR. Several papers were published in

peer review journals, with one highlighting the Trauma System's ability to link data from various injury data sources.

The Hawaii Trauma System has funding for epidemiological research and reporting. Plans were described to hire a fulltime epidemiological researcher and report writer to support such research. The arrival of this individual and reactivation of the trauma research advisory sub-council should facilitate re-establishing the Trauma System's research momentum.

Recommendations

- Reactivate Hawaii Trauma Research Advisory Council
 - Ensure representation from the various Trauma System components, academic institutions, community organizations, and consumers
 - Develop mechanisms to engage the general medical community and other system participants and consumers in their research findings
 - Produce an annual research report
 - Facilitate research collaborations with the Office of Public Health Studies at the University of Hawaii, Manoa and also the John A. Burns School of Medicine at the University of Hawaii, Manoa
- Allocate EMSIPSB epidemiologist time for conducting trauma registry research and population-based Trauma System research
- Identify funding sources to support Trauma System research

AREAS OF FOCUS

Pediatric Focus

Current Status

Hawaii's dedication to the care of children has a long history. In 1890 Queen Kapi'olani raised funds to open the Kapi'olani Maternity Home, which merged with the Kauaikeolani Children's Hospital (founded in 1909) to become the Kapi'olani Medical Center for Women and Children (KMCWC) in 1978. The facility is a 243-bed acute care hospital dedicated to provide "exceptional medical care for all of the women and children throughout Hawaii and the Pacific Rim. In the late 1970's the President of the Hawaii Medical Association, Dr. Calvin Sia, petitioned the American Academy of Pediatrics to address the emergency care issues of children, and in 1983 Hawaii Senator, Daniel Inouye introduced the legislation that created the national Emergency Medical Services for Children (EMSC) Program.

From a trauma standpoint, QMC in Honolulu, Hawaii's only Level II trauma center, and KMCWC (state-designated as a Level III pediatric trauma center since 2013) work together to care for the needs of children with severe injuries. Currently, children who are hemodynamically stable, without evidence of head injury are transported directly to KMCWC, whereas those with possible TBI are transported to QMC. Destination decisions are done as a three-way conference call, facilitated by the QMC transport center, between QMC, KMCWC, and the referring facility. Both hospitals are committed to providing excellent care to injured children, and they demonstrate an impressive level of inter-facility collaboration. For example, pediatric critical care physicians and surgeons travel to QMC to care for children with critical injuries. QMC has extensive resources devoted to the pediatric trauma population, even though the facility rarely provides medical care for children without injuries.

It is the opinion of the TSC Review Team, that one facility should become a Pediatric Trauma Regional Resource Center. This facility should be capable of providing the emergent, urgent, and acute care of all injured children, and serve as the tertiary referral center for injured children in the state. In addition, this facility should serve as the Trauma System leader for issues related to injured children. At this time, neither QMC nor KMCWC is ready to assume this role; however, the best candidate is KMCWC. This facility currently provides tertiary care to all children, except children with head injuries. KMCWC is well resourced in pediatric subspecialty care, with the exception of pediatric neurosurgical care. The facility currently has mechanisms in place to care for patients who require emergent care, such as extracorporeal membrane oxygenation (ECMO), and a pediatric transport team to bring children with critical illnesses to the facility. An operating room team is in house 24 hours a day, 7 days a week, along with in-house attending anesthesiologist, critical care, and emergency medicine physicians. It was the perception of the TSC Review Team that the KMCWC leadership and health professionals are genuinely interested in assuming a greater role in the care of injured children.

A major commitment from KMCWC administration and medical staff will be required to assume the described leadership role in the Hawaii Trauma System. Significant barriers do exist, such as the availability of in-house surgical coverage and neurosurgical availability 24 hours a day, 7 days a week. Both the QMC and KMCWC have identified the issue of neurosurgical coverage as a major limitation for trauma care. The two facilities are exploring the possibility of partnering to hire a neurosurgeon with an appointment at both hospitals. The State of Hawaii may need to provide financial resources, similar to those provided on the neighbor islands, to fully effect this

change. It is unlikely, given the free-standing nature of the KMCWC and the low patient volume, that round-the-clock in-house pediatric surgical coverage is a realistic goal. Timeliness of surgical presence in the KMCWC, however, is absolutely essential. Creative work force solutions such as the use of advance practice providers or increasing the number/level of surgical trainees should be explored. In addition, the trauma program must develop a robust process improvement (PI) system to ensure that the highest-level care is provided (including meeting the metric of a pediatric surgeon at the patient's bedside within 15 minutes of arrival). Participating in pediatric TQIP is another means of benchmarking trauma center performance with other similar centers (e.g., Level II pediatric trauma centers).

As part of the realignment of pediatric trauma services, the collaborative relationship between QMC and KMCWC must continue. Shared access to limited resources (such as neurosurgeons and other subspecialists) will allow both facilities to provide optimal patient care and provide "surge" capacity. Joint appointments, streamlining the emergency credentialing process, and minimizing the barriers between hospital systems, are key components of this collaboration.

As a Pediatric Trauma Regional Resource Center, KMCWC's role in the Trauma System would extend beyond the individual facility. Continued commitment to serve as pediatric medical direction for Oahu EMS and the development of a pediatric transfer center are key components of this role. Enhancing outreach activities on the neighbor islands is also essential. Examples include the utilization of telemedicine and advanced practice providers for initial consultation and follow-up appointments, providing pediatric radiology over-reads, and providing simulation and other educational opportunities for Level III trauma centers.

From a Trauma System standpoint, a focused, state-wide approach to pediatric injury and PI is needed. One approach is for the HTAC to create a pediatric sub-council that could be charged with developing state-wide protocols to address issues such as: pediatric triage, child abuse, and imaging. The pediatric sub-council should also address PI issues using the HTR. Examples of issues to examine include: over- and under-triage, timeliness of triage, imaging (e.g., radiation exposure, errors in reads, etc.), early identification of child abuse, and outcome (mortality, as well as others). If data elements in the HTR are not sufficiently pediatric-specific to perform these analyses, the development of additional fields is encouraged. The pediatric sub-council chairperson should be an appointed member of the HTAC. Other priorities include filling the vacant pediatric representative seat on the EMSAC, and addressing pediatric specific issues within the Disaster Plan (e.g., back-up resources if KMCWC and QMC are unavailable and the reunification of children and families).

While the focus of the ACS TSC visit is the Hawaii Trauma System and its trauma centers, the initial resuscitation of an injured child begins in the emergency department, sometimes in non-designated trauma facilities. In 2013 Hawaii participated in the National EMSC Pediatric Readiness Project that surveyed and assessed the level of preparedness of the state's emergency departments to care for children. Hawaii's score of 64.5 out of 100 was lower than the national median of 69/100, likely reflecting the rural nature of the state and the low volume of pediatric patients seen at many facilities. The Trauma System should partner with the EMSC program and other stakeholders to ensure that adequate resources and staff are available to care for children in all of the state's emergency departments.

Rehabilitation is an area that is significantly under-resourced for both adults and children. KMCWC does have a newly hired physiatrist and a state-of-the-art outpatient physical medicine facility. However, no dedicated pediatric inpatient rehabilitation beds were reported in the state and resources on the neighbor islands are limited, at best.

Finally, TAMC has a full array of pediatric resources including a pediatric residency program, pediatric intensive care unit, and neonatal intensive care unit. One of the four pediatric surgeons in Hawaii practices at TAMC, and this facility is soon to be staffed with a pediatric neurosurgeon. The leadership at TAMC is committed to full participation within the Hawaii Trauma System, and is actively pursuing ACS Level II verification. TAMC certainly appears to be a viable partner in the care of injured children in Hawaii, particularly those who are members of a military family and to provide “surge” capacity in the event of a disaster or loss function of QMC or KMCWC.

Recommendations

- Establish a Pediatric Trauma Regional Resource Center
 - Identify a single hospital to assume leadership for the resuscitation and care of injured children in the state
 - Develop an emergency medical services (EMS) leadership role for prehospital transports and inter-facility transfers of injured children so that care of injured children is systematically coordinated
 - Provide outreach to neighbor islands including education through simulation, direct outreach patient follow-up visits, and telemedicine
 - Provide child maltreatment screening tools and education to all acute care facilities.
 - Explore the feasibility of telemedicine for trauma care to decrease transfers from neighbor islands and to provide high-level follow-up of injured patients
 - Provide pediatric radiology reads of images performed at neighbor island facilities
 - Partner with the State Injury Prevention staff to help disseminate prevention materials
- Appoint a Pediatric Sub-council of the Hawaii Trauma Advisory Council (HTAC) to address specific issues
 - Develop statewide protocols regarding pediatric injury care (e.g., transfer criteria, child abuse screening guidelines, imaging guidelines)
 - Address statewide pediatric trauma Performance Improvement to evaluate rates of under- or over-triage, patient outcomes, including mortality, length-of-stay, and complications
 - Ensure that the Pediatric Sub-council chairperson is a member of the HTAC leadership
- Evaluate the utility of the current Hawaii Trauma Registry regarding injury surveillance in children, and consider adding pediatric specific elements
- Expedite the appointment of a pediatric representative to the Emergency Medical Services Advisory Committee
- Specifically address the special needs of children within the state’s disaster plan
- Address the needs of pediatric rehabilitation both on Oahu and the neighbor islands
- Partner with the Emergency Medical Services for Children Peds Ready project to ensure readiness to care for ill or injured children within all facilities
- Explore adding TAMC as a pediatric trauma facility within the system

Neurosurgery Focus

Current Status

The optimal treatment of patients with TBI and SCI remains an area of concern in Hawaii, particularly on the neighbor islands. Challenges exist across the entire spectrum of care, including injury and prevention, triage, definitive acute care, and rehabilitation.

Falls among Hawaii residents, ages 65 and older, is the reported leading cause of TBI. This mirrors the changing TBI demographics in the United States, where TBI among older adults is increasing more rapidly than in other population age groups. State-wide, from 2011 to 2015, falls among the Hawaiian older adults were responsible for 86% of TBI-associated hospitalizations and 73% of TBI-associated deaths. The Fall Prevention Consortium and the EMSIPSB have initiated multiple strategies to reduce the incidence of falls among older adults, including the engagement of healthcare providers for fall risk assessments, improving access to physical exercise programs (e.g., Tai Chi for balance training), and increasing public awareness through an annual campaign to prevent falls.

Ocean activities are the leading causes of SCI in Hawaii. From 2009 to 2013, 208 cases of SCI occurred due to ocean activities, which accounted for 33% of all SCI. Visitors accounted for the majority (78%) of those injured. Prevention strategies have focused on educating residents and non-residents. Additionally, disseminating information about ocean conditions has occurred through a dedicated website and warning signs at beaches. Given the devastating nature of SCI and the considerable burden these patients place on the healthcare system, more prevention efforts are needed. More innovative methods for creating awareness, such as the use of social media and development of mobile applications, and engaging the tourism hospitality industry to develop appropriate messages to visitors should be considered.

The evaluation and definitive management of the patients with TBI and SCI in Hawaii is hindered by unique geographic challenges and lack of neurosurgery coverage across the islands. The QMC, the Level II trauma center in Oahu, is the primary center for care of patients with traumatic neurological injuries. A single neurosurgeon provides neurosurgery coverage at Maui Memorial Medical Center 24 hours a day, 7 days a week. A single neurosurgeon, who primarily practices at QMC, does have a limited elective practice at North Hawaii Community Hospital, which is an affiliate of the Queens Health System. The Kaiser Health System offers neurosurgical care at its Moanalua Medical Center, but it does not participate in the Trauma System. TAMC in Oahu has two neurosurgeons on staff. While TAMC is currently not part of the Trauma System, this facility may offer support during MCIs.

Since the ACS TSC consultation in 2005, Hawaii has established seven new Level III trauma centers. The *Guidelines for the Triage and Transfer of Patients with Brain Injury to The Queen's Medical Center* was developed to improve the coordination of care for TBI patients among the trauma centers. These guidelines provide specific clinical and radiographic criteria to assist with the triage and the transfer of TBI patients to QMC for definitive neurosurgical care. Since implementation of these changes, the proportion of all patients transferred from neighbor islands to QMC specifically for TBI has decreased from 32% in 2009 to 23% in 2015. Approximately 31% of all patients transferred to QMC had TBI as one of their diagnoses. Data from 2011 - 2013 revealed no significant change in mortality rate for patients who were not transferred when compared to the 2009 - 2010 period. TBI-specific data were not available for review by the TSC Review Team.

Guidelines for the transfer of patients with SCI and spinal fractures do not exist. While patients with SCI are prioritized for transfer and management at QMC, the coordination of care for patients with spinal fractures, in absence of neurological injury, is less than ideal. These patients still require consultation with spine surgeons, but they may not ultimately require surgical intervention, or they may be appropriate for an initial trial of conservative management. The lack of orthotics services to provide brace fitting and adjustment limits the ability of some Level III trauma centers to care for these patients. Also, depending on a patient's insurance status, obtaining an outpatient follow-up with a spine specialist may be difficult. The implementation of the BEAM Medical Image Exchange solution allows providers at QMC to remotely review radiographic studies obtained on neighbor islands. However, this radiologic review is often performed without real-time input from spine surgeons, especially during off-duty hours. Therefore, patients with spinal fractures, even when they are most likely not surgical candidates, are often transferred to QMC for consultation at significant cost to the healthcare system and the patient.

Improving access to specialty care for patients with traumatic neurological injuries remains a priority for the Hawaii. For the benefit of the Trauma System, collaborative efforts to recruit and to share neurosurgeons across trauma centers and health care systems should be discussed. In addition to ongoing neurosurgeon recruitment efforts, more creative solutions for care delivery should be investigated. Currently, neurosurgeons do travel to North Hawaii Community Hospital and Wilcox Hospital to provide non-urgent outpatient neurosurgical consultations. Considerations should be made to expand this model and to establish a regular rotation of neurosurgeons through all of the neighbor islands. Additionally, advanced level practitioners, such as physician assistants or nurse practitioners, with specialized neurosurgical training can participate in such a rotation. Neurosurgeons should lead efforts to develop guidelines and to provide education on the management of non-operative neurological injuries, such as mild to moderate TBI and select SCI and spinal fractures. Orthotic services should be extended to all Level III centers. These initiatives would extend neurosurgical care beyond the borders of QMC.

The disposition of TBI and SCI patients remains a challenge. The Rehabilitation Hospital of the Pacific is the state's only acute care inpatient medical rehabilitation facility. While it does offer specialized TBI and SCI rehabilitation programs, the facility only has 100 beds. It receives patients from the Hawaii and other Pacific Islands. It is unclear how many of the facility's beds are designated for the care of patients with neurotrauma. The rehabilitation system also has outpatient clinics in Oahu and the Big Island with services focused on neurotrauma recovery. The absence of a ventilator-dependent rehabilitation facility poses a special obstacle for patients with high cervical injuries. Overall, the availability of rehabilitation services does not meet the demands of patients with TBI and SCI. In addition to expanding rehabilitation facilities, social services for special populations at risk for repeat injuries, such as those with substance abuse, mental illness, and the homeless should be strengthened.

System-wide evaluation and PI programs for patients with neurotrauma are currently lacking. While some of the data points recommended for collection in the HTR by the 2005 ACS TSC consultation report (e.g., admission Glasgow Coma Score, time and mechanism of injury) are reported, others data elements are not collected (e.g., radiographic diagnoses, time from injury to disposition decision, time of arrival at neurosurgical hospital, time to intervention, and outcome at discharge, at three- and six-month post-injury). The ability to evaluate the TBI transfer guidelines for effectiveness and efficiency is hindered by the lack of these data elements. An appreciation of the number of transferred patients requiring surgical intervention and the number of patients kept at Level III trauma centers (including those who had delayed transfer) is necessary to refine triage decisions. The addition of outcome data, especially at six

months, is needed to understand the performance of both transferred and non-transferred patients. For SCI patients, ASIA scoring for injury severity and functional outcome metrics are also important.

Current debate regarding the need to educate trauma surgeons on the performance of emergency burr holes or craniotomies is occurring. Such an initiative would require significant investment in personnel training (trauma surgeons, anesthesia, surgical technicians and nursing staff), as well as investment in the procurement and maintenance of specialized equipment. Currently no data have been reported to inform the discussion. In order to provide a rapid response to this issue, a retrospective review of past data may help to identify the number of cases that might have benefited from earlier neurosurgical intervention. While the performance of emergent neurosurgical procedures by trauma surgeons may be lifesaving, the limited number of appropriate cases may render the initiative impractical.

Recommendations

- Develop a state-wide mandatory data collection tool for Traumatic Brain Injury, integrated with the Hawaii trauma registry. Based on recommendations from the 2005 review, these should include at a minimum:
 - Time and mechanism of injury
 - Admission Glasgow Coma Score
 - Radiographic diagnoses, especially regarding extra-axial hematomas
 - Time from injury to disposition decision, arrival at neurosurgical hospital, and time to intervention
 - Outcome (at least mortality and Extended Glasgow Outcome Score at discharge, three-month and six-month post-injury)
- Implement a Performance Improvement process based upon the data collection tool, with input from neurosurgeons
- Develop a state-wide transfer protocol for patients with Spinal Cord Injury (SCI) and spinal fractures
 - Consider developing a pathway for non-transferred patients to be evaluated by a spine surgeon (neurosurgeon or orthopedic surgeon with spine expertise) within the protocol
 - Engage spine surgeons in real time remote evaluation of patients with SCI and spinal fractures. This may involve the immediate review of images shared by the BEAM system and the participation in future telemedicine initiatives
 - Incorporate the published evidence-based guidelines for management of SCI patients that may be used for care of SCI patients awaiting transfer
- Expand orthotic services to neighbor islands
- Engage neurosurgeons to develop guidelines and to provide education regarding the management of non-operative neurotrauma
- Consider the rotation of neurosurgeons to neighbor islands
- Partner with The Rehabilitation Hospital of the Pacific to designate neuro-specific beds
- Expand outreach prevention efforts for water safety, especially for visitors. Consider increasing the use of mobile applications and social media for effective dissemination of information, such as real time water conditions.
- Develop a streamlined transfer agreement with the mainland rehabilitation resource for ventilator-dependent patients

Performance Improvement Focus

Focused Question (3): Does the Trauma System Consultation Committee feel the state Performance Improvement program has adequate PI initiatives or methods of loop closure? How important is a post-mortem exam in Performance Improvement?

The trauma centers have trauma PI plans in place to meet trauma center verification criteria, but no evidence was provided that the EMSIPSB or HTAC has developed a State Trauma System PI Master Plan. Such a plan is essential in describing PI initiatives and methods of loop closure. See the System-wide Evaluation and Quality Improvement section of the report for more information.

The post-mortem examination provides important information in several cases, such as identifying the complete injuries for patients who die during resuscitation, are dead on arrival, have non-operative management, or who die unexpectedly in the inpatient setting. Obtaining access to these reports requires the engagement of the medical examiner in Trauma System PI. The medical examiner's complete detailed report should be shared with the trauma center's TPM and Trauma Medical Director (TMD). In many cases the medical examiner completes only external examinations, and these reports are not helpful in the trauma setting. The role of the medical examiner and expectations of the medical examiner's reports needs to be defined in the administrative rules and monitored in the Trauma System Performance Improvement plan. It would be very beneficial to have the medical examiner as a member of the HTAC executive sub-council that focuses on PI.

Focused Question (4): Help us understand how the State of Hawaii could measure outcomes related to the Trauma System without integration of risk-adjusted data and effective registry interfaces. If the State of Hawaii were to form a state-wide Performance Improvement collaboration; please explain potential barriers, benefits, and methods.

The TMDs, TPMs and the Hawaii TPC should attend the Society of Trauma Nurses' Trauma Outcomes Performance Improvement Course (TOPIC), which defines the processes and infrastructure of a PI process. Many issues can be reviewed in the PI process. Morbidity and mortality are the hallmark standards. Trauma center PI programs generally complete the patient mortality reviews. A system level review for mortality may simply compare the trauma mortality rate for Hawaii to that found in the NTDB. This comparison establishes a baseline to determine if the mortality rate is increasing or decreasing with an ongoing development of the Trauma System. This would be a basic first step. The TPC, working collaboratively with the HTAC and trauma center leadership should establish timelines, to eventually form a Hawaii TQIP collaborative.

A state Trauma PI Master Plan should define the roles of EMS, air medical services, trauma centers, the medical examiner, specialty resources, and injury prevention activities in the review process. The chosen review events for the Trauma System PI Master Plan may be related to process measures and specifically linked to mortality. Examples are listed:

- Scene times greater than 20 minutes
- Failed intubations
- Failure to apply tourniquet
- Lack of pediatric resource / equipment
- On backboard greater than 60 minutes

- E-PCR incomplete or missing
- Diversion hours
- Delayed trauma activation
- Missed trauma activation
- Delayed transfers
- Transfers accepted within 30 minutes
- Transfer transportation is available within 45 minutes of request
- Selected pediatric events
- Compliance with transfer guidelines
- Compliance within transfer guidelines
- Compliance with TQIP TBI best practice guidelines
- Compliance with TQIP Orthopedic best practice guidelines
- Compliance with TQIP Geriatric best practice guidelines
- Operating room unavailable in emergency cases
- Stable patient transferred due to need for specialty surgeon evaluation
- Lack of rehabilitation bed
- Blood product wastage
- Timeliness or failure of BEAM images
- Complications selected by PI Sub-council
- Discharge placement problems due to funding issues
- Failure to update WebEOC boards in timely manner
- Failure to complete an after-action report following an MCI or multiple casualty event
- Registry profiles completed within 60 days of patient discharge
- Registry profiles submitted to the HTR are complete
- Registry profiles submitted to the HTR (by defined time)
- TPM attends RTAC / HTAC meetings
- TMD attends RTAC / HTAC meetings
- Trauma registrar attends RTAC meeting
- Minutes of the RTAC meetings are disseminated to the stakeholders within 14 days of the meeting
- Minutes of HTAC are disseminated to the stakeholders within 14 days of the meeting
- Action items identified in the RTAC or HTAC PI sub-council are tracked through to completion
- Trauma administrative rules are revised and updated every four years and disseminated to the stakeholders
- Trauma System Plan is revised and updated every four years and disseminated to the stakeholders

The established Trauma System executive sub-council focused on PI has the opportunity to explore the best practice guidelines from professional organizations (Eastern Association for the Surgery of Trauma [EAST], American Association for the Surgery of Trauma [AAST], Western Trauma Association [WEST]) and the TQIP best practice guidelines (Massive Transfusion in Trauma, TBI, Geriatric, Orthopedic, and Palliative Care) to identify pertinent and relative issues for the Hawaii Trauma System to implement and monitor outcomes. The sub-council may also

review the HRSA 2006 *Model Trauma System Planning and Evaluation* document and the ACS System Consultation benchmarks to identify areas for focused improvement.

Each of the events chosen for review needs to be defined in the Trauma System PI Master Plan with an established process for date of review, tracking, and submission to the TPC (or state trauma PI coordinator) for collating and reporting. These issues may be reviewed at a state level only or the regional level depending on the language in the plan.

In addition, the TMDs may choose to establish a mortality case review in a closed meeting process to discuss difficult cases, unusual cases, or great saves. The membership of this review process needs to be clearly defined in the Trauma System PI Master Plan, along with adherence to discovery protection laws and regulations. The TPMs usually attend these types of meetings.

Implementing a Trauma System PI Master Plan requires statutes that prevent discoverability. In addition, the plan must define the roles, expectations, and timelines for data submission, trauma PI information, and management of that data.

The benefit of State Trauma System PI process is the ability to obtain and evaluate factual information on different phases of trauma care in the system to assist in defining opportunities for Performance Improvement. The sub-council may choose to standardize the terminology, data dictionary, and tools that support the PI process for all trauma centers to ensure consistency and standard language for the review process. Ultimately, the correction of issues and prevention of further issues is the goal.

Focused Question (10): Please help us understand best practices related to goals and objectives for provider performance reporting.

First, is provider referring to EMS, EMS agencies, or the medical staff of the trauma centers? Each agency (EMS, air medical, hospitals and medical staff) typically has performance measures defined for their agency that are monitored.

The Trauma System performance goals and objectives in the State Trauma Plan are linked to defined events or indicators to be reviewed at a system level to define system performance. These issues are usually defined by the stakeholders and integrated into the Trauma System PI Master Plan. This has been reviewed in more detail in the previous text of this PI Focus section.

Focused Question (11): Please help us understand best practices related to goals and objectives for state system performance reporting?

First, the Trauma System leadership should establish data reporting requirements. The trauma data is the foundation for the Trauma System PIPS. Second, the PI processes, audit filters / core measures need to be established. Each of these items must be included in the Trauma System PI Master Plan. Third, routine reporting must be determined, e.g., what data and process measures are reported, and what is the frequency of reporting. It is important to ensure the PIPS processes taking place at the system level are timely. If lengthy delays in data and process measure reporting occur, then the Trauma System has no ability to rapidly move an issue through the loop closure process. This poses a threat to patient safety. Specifically, the issue may continue to repeat itself until definitive and appropriate loop close is attained. Best

practices for clinical care are based on the national standards of trauma care (see Focus Question 4 for examples). Best practices for Trauma System PIPS may be sustained through a robust Trauma System PIPS program as well as interfacing with other Trauma System leadership throughout the country.

Recommendations

- **Create a Trauma System PI Master Plan, guided by the HTAC in its advisory role**
 - Assemble a multidisciplinary ad hoc work group to expedite completion
 - Attain approval within 12 months
 - Disseminate this plan to the Trauma System stakeholders
- Establish the position of Trauma System PI coordinator. This position should be filled by a trauma nurse
 - Ensure that this position is fully dedicated to performing Trauma System PI
- Ensure system PI peer review protection statutes are sufficient
 - In the interim, begin Trauma System PI processes such as educational grand rounds / blinded case reviews
 - Operationalize an HTAC Trauma System PI sub-council, and meet on a monthly basis and produce an annual PI report.
- Utilize Trauma System registry data to provide the foundation for the Trauma System PI
- Implement a process in which the Regional PI activities are reported up to the HTAC Trauma System PI sub-council
- Schedule routine educational seminars on trauma PI, e.g., Trauma Outcomes Performance Improvement Course (TOPIC)
- Mandate trauma PI education for Trauma System leadership (center and agency)

Needs-Based Assessment Focus: Review Regarding Additional Trauma Centers

Focused Question (14): How many trauma centers at each level should Hawaii designate?

According to 2016 data from the US Census Bureau, Hawaii has an estimated population of 1.4 million permanent residents. Including estimates of daily visitor population, the State estimates the de-facto population to be about 1.6 million. The island of Oahu accounts for over half of this total, at an estimated de-facto population of 1.1 million, with a little more than 200,000 people on Hawaii and Maui, and approximately 90,000 on Kauai. The combined landmass of the island group is about 6,400 square miles, with the island of Hawaii comprising over 60%. The state contains urban areas with high population density as well as sparsely populated rural and remote areas. The state presents unique geographic challenges. The state spans nearly 300 miles, and individual counties are separated by miles of open water, leading to a heavy reliance on air-medical transportation. The state is quite isolated, more than 2,000 miles from the mainland.

The State of Hawaii has a total of eight designated trauma centers – six adult Level IIIs, one pediatric Level III, and one adult Level II. Kauai and Maui each have one adult Level III trauma center, Hawaii (Big Island) has three Level III trauma centers, and Oahu has an adult Level II and a Level III trauma center, and a pediatric Level III. In addition, one hospital is seeking limited Level II designation and two hospitals are seeking Level III designation. Intra-island transportation can be challenging due to high traffic, limited roadways and lack of alternate routes. While Hawaii has good availability of inter-island air medical transport, relatively limited resources exist for intra-island air medical transport. The remote location and relatively small population of the State, and especially of the individual counties, presents a significant challenge to the development of additional high-level trauma centers, as the number of severely injured patients is relatively low, and recruitment and retention of personnel, especially surgical specialists, is difficult.

The nature of decisions regarding number and location of trauma centers is different for high-level (Level I or Level II) trauma centers, and low-level (Level III or Level IV) trauma centers. High-level trauma centers are costly, resource-intensive facilities that provide definitive care for the most seriously injured patient populations; whereas, low-level trauma centers primarily treat less severe injuries and serve as entry points to the rest of the Trauma System. This difference is even more pronounced in the unique circumstances of the State of Hawaii. Thus, the question regarding the optimum number and location of centers will be addressed in two separate sections.

High-Level (Level I and Level II) Trauma Centers

Looking across the spectrum, a high-level trauma center on the US mainland typically serves a population of 1 million, though the population basis ranges from about 250,000 in some urban/suburban areas, to several million in others. Using this experience yields a range of somewhere between 1 and perhaps 5 high-level trauma centers, depending on the balance chosen between trauma center volume and Trauma System surge capacity.

Prior to the 2017 ACS TSC visit, the State of Hawaii used a modified version of the 2015 draft Needs Based Assessment of Trauma Systems (NBATS) Tool to estimate the number of trauma centers needed. The State greatly decreased the population base used to assign points, from a

range of 600,000 to 2.4 million in the draft tool to a range of 50,000 to 250,000. This analysis, (Appendix B: Hawaii EMS Agency Completed NBATS Tool) yielded an estimate of roughly four trauma centers, if the State as a whole was considered the trauma service area (TSA), or four trauma centers on each of the four islands (Hawaii/ Big Island, Maui, Oahu and Kauai), if each island was considered a TSA.

If the draft NBATS Tool is applied in unmodified fashion, the estimated need is three trauma centers for the State if it is considered the TSA, or a total of five trauma centers (two on Oahu, and one each on Kauai, Maui, and Big Island), if the islands are considered individually. Experience with the draft NBATS Tool suggests it has a tendency to overestimate the number of trauma centers needed in low population TSAs, such as the State of Hawaii, as the model defaults to assigning at least 1 trauma center to each TSA, in almost all cases, ensuring quality care coverage and timely access to a trauma center by the injured patient.

As current experience through the 2017 ACS TSC visit has shown, only Oahu has the population sufficient to sustainably support even a single high-level trauma center. Given the State of Hawaii's isolated location from the mainland US, reliance on a single high-level trauma center leaves the entire Trauma System at risk of failure should that single center be incapacitated or overwhelmed, even if that sole trauma center provides sufficient capacity. Therefore, at least one additional high-level trauma center is needed within the State. The current Level II trauma center on Oahu sees a relatively low volume of severely injured patients per year (roughly 500 per year), according to State data). This suggests that dividing this low volume between any more than two high-level trauma centers may leave each facility with insufficient total volume to maintain skills. Furthermore, historical difficulties associated with the recruitment and retention of necessary human resources to open a high-level trauma center have shown that opening even a single, additional high-level trauma center will be difficult in Hawaii.

Therefore, balancing the need to provide more system resiliency with the realities of creating a new trauma center in the State of Hawaii, it is the opinion of the ACS Trauma System Consultation Team that two high-level trauma centers would be the best solution, and that the state should seek to identify and designate one additional high-level trauma center.

Looking only at geography, and with the intention to provide maximum security for the Trauma System, it would be desirable to place the new high-level trauma center in a different County than Oahu which has the existing high-level trauma center, and more centrally located within the island chain. This is consistent with the State's plan, and the efforts to develop such a center outside of Honolulu County, as the TSC Review Team noted. This plan has proven difficult in execution, as none of the other counties individually have the sufficient population base to support a facility with the size and capability needed of a robust high-level trauma center. Additionally, these counties do not have sufficient population to support the necessary human resources, especially surgical subspecialties. If it is possible to support a facility outside of Honolulu County to achieve Level or II status, it is likely that such a facility will require long-term ongoing financial support to maintain staffing and operations.

The placement of a second high-level facility in Honolulu County is likely to prove the more sustainable solution, despite the less ideal geographic distribution. Two or three facilities on Oahu have the potential to be developed into high-level trauma centers, including the large military treatment facility. The incorporation of a military treatment facility within the Hawaii State Trauma System offers a number of potential benefits, especially in the area of human resources, specifically surgical subspecialties. The staffing of the military treatment facility is not dependent upon the local healthcare economy, and may prove more easily sustainable at

lower costs. Potential barriers do exist for the inclusion of a military treatment facility in a civilian system, but these have been successfully overcome in other regions of the US mainland, and current Department of Defense policy is more receptive to such solutions.

Low-level (Level III, Level IV, or other similar designations) Trauma Centers

Trauma centers designated at Level III or lower are, by definition, not intended to provide comprehensive care across all specialties. Instead, such trauma centers serve the critical purpose of improving timely access to the Trauma System, and providing needed emergency care for control of immediate threats to life. Such trauma centers may also provide definitive care for patients with less severe injuries who do not require the resources available at a high-level (Level I or Level II) trauma center. Seen in this light, the process for selection and designation of low-level trauma centers should be focused primarily on building capacity to provide these crucial functions. This is in contrast to the process for used for Level I and Level II trauma centers, which is focused on ensuring that specific standards are met and that each trauma center treats a sufficient volume of patients to maintain experience across the spectrum of injury. The commitment of a hospital to achieve and maintain Level III status, which is marked primarily by the availability of general surgical and orthopedic capabilities, has the potential to greatly improve care for the local population, even if the overall number of injured patients treated by the hospital is low. Given the challenges to patient transport across the State of Hawaii, both between islands and within individual islands, these low-level trauma centers play a key role. Furthermore, with the exception of specific areas within Honolulu County, the Level III trauma centers in Hawaii do not pose a financial or volume-based threat to high-level trauma centers.

The ACS TSC Island Site Visit Team felt that all of Hawaii's existing and proposed Level III trauma centers are serving their local communities and add strength to the Trauma System. It is probable that adding new Level III trauma centers in more remote locations could further improve system access, but currently no candidate hospitals are identified to develop in this capacity. Given that Level III designation, even for low volume centers, probably improves patient care, the lead agency should monitor all applications for new Level III trauma centers, but a strict needs-based process or a limit on absolute number of Level III trauma centers is probably not necessary. The exception to this statement is in the immediate catchment area (defined by a reliable transport time likely in the range of 30-60 minutes) of high-level trauma centers. In such areas, the addition of Level III trauma centers is not likely to improve access and may threaten stability of the high-level trauma center, so a careful assessment of the system need should be undertaken before designating new low-level trauma centers. Currently, this situation is only applicable in and around the city of Honolulu.

The State should establish an inclusive Trauma System in which all acute care facilities have a defined role in the care of injured patients, with defined capabilities and mandatory data submission. It is a matter of local choice whether facilities categorized below Level III be termed Level IV or Level V trauma centers, or simply labeled generically as participating facilities. In either case, the State of Hawaii should actively seek to build capacity and provide technical assistance to these facilities to ensure they know their role and are prepared to treat the injured patients they receive.

Recommendations

- Designate one additional Level II trauma center in the state of Hawaii. Analysis of existing hospital capabilities and challenges related to the surgical specialty workforce suggests that Tripler may be the most practical candidate for this designation
- Encourage both proposed new Level III trauma centers in Honolulu County to seek full designation, as it appears likely that they will improve system access
- Encourage facilities to seek Level III designation as a means of building system capacity, except within the immediate catchment area of existing high-level centers. A careful assessment of Trauma System need should be completed prior to designating new Level III trauma centers within the immediate catchment area of existing high-level trauma centers

FOCUSED QUESTIONS

This section is a compilation of all responses to all Focused Questions that were submitted to the TSC Review Team, as part of review and consultation process, and could be answered by the consultation team within the scope of this review and feedback process.

Focused Questions are submitted by the Lead Agency, and give the stakeholders an opportunity to request clarification and assistance on areas of concern within the Trauma System. The TSC Review Team responds to these questions, in addition to providing feedback on the 18 noted components of a Trauma System. Most of the questions submitted by the Hawaii EMSIPSB pertained to noted components of a Trauma System, and thus, many of the Focus Questions are incorporated into the specific sections' commentary and recommendation within the ACS Hawaii TSC Report.

However, in order to ensure ease of accessibility to the feedback on these important inquiries, this section lists all submitted Focused Questions, and the commentate responses from the TSC Review Team members, on each additional query.

- 1. How can the State of Hawaii best demonstrate the success of a strong trauma program quantitatively and qualitatively, to:**
 - 1. Members of Legislature**
 - 2. Community Stakeholders**
 - 3. Provider Stakeholders**

The TSC Review Team did not identify any recent or prior efforts to promote grassroots support for the Trauma System. Consumers and representatives of the media can be valuable partners in promoting awareness of the Trauma System and advocating for its ongoing support. Official representation from state chapters of professional organizations (Emergency Nurses Association, American College of Emergency Physicians, National Association of Emergency Medical Technicians, American College of Surgeon, etc.) can be supportive of a process that encourages information sharing to educate the larger group of health professionals in the state about the Trauma System. For example, if a professional organization has an official representative on the HTAC, this individual has a responsibility to share important information about Trauma System development with his or her organization's membership. Elected officials (local and state) are important stakeholders who can promote communication about and advocacy for the State Trauma System. Their representation on the regional committees and the state HTAC should be considered.

Information about the success and value of the Trauma System should be developed and shared with elected officials, the public, and healthcare providers. Success stories and the annual report of Trauma System activities should be used to develop messages about the Trauma System (e.g., information about the number of patients served by designated facilities, numbers of patients transferred for a higher level of care, number of persons able to receive needed care on their own island, etc.). The Office of Public Affairs within the DOH may be a resource to guide the development of effective communication and marketing methods. Their representation on the regional committees and the state HTAC should be considered

Because personnel for the state trauma program are limited, additional resources are needed to help develop messages to promote the State Trauma System. A consultant to

guide this effort may be appropriate. The two universities may have communications and marketing programs that may welcome the opportunity for student special projects. A task force of trauma stakeholders could be formed to help collect success stories and respond to messages developed by volunteers.

2. How can the State of Hawaii best demonstrate the success of a strong trauma program using metrics other than mortality?

The Trauma System could further demonstrate its effectiveness with some additional non-mortality measures. A comprehensive state Performance Improvement (PI) plan addresses the multiple processes involved in the phases of trauma care, including dispatch, prehospital response, trauma diversion, over and under triage trauma center care, inter-facility transfer, definitive care access, rehabilitation access, trauma registry compliance, disaster management, and injury prevention program outcomes. Data are often collected for each of these components and can be considered additional measures of Trauma System effectiveness.

Various process measures that reflect access to care, timeliness of care, coordination of care, and the Trauma System's response are all Trauma System metrics that can be used to describe success. These measures can be used to demonstrate the Trauma System's response for special populations, counties, or the system as a whole. Reports that reflect a reduction in the burden of injury, improved processes of care, improved systems of care, and system integration reflect the status of Trauma System and can be used to define accomplishments.

Other non-process patient outcome measures that could be used would be various patient outcome measures from the trauma registry, such as the Functional Independence Measure (FIM) score and Length of Stay (LOS). Other measures that may be useful but would require primary data collection are discharge and longitudinal Glasgow Outcome Scores (GOS) and the Short Form (36) Health Survey (SF-36) from the RAND Corporation. Reflecting improvements that are linked to the Trauma System's funding utilization are powerful tools that demonstrate leadership, accountability, transparency and the success of the Trauma System.

3. Does the Trauma System Consultation Committee feel the state Performance Improvement program has adequate PI initiatives or methods of loop closure? How important is a post-mortem exam in Performance Improvement?

The trauma centers have trauma PI plans in place to meet trauma center verification criteria, but no evidence was provided that the EMSIPSB or HTAC has developed a State Trauma System PI Master Plan. Such a plan is essential in describing PI initiatives and methods of loop closure. See the System-wide Evaluation and Quality Improvement section of the report for more information.

The post-mortem examination provides important information in several cases, such as identifying the complete injuries for patients who die during resuscitation, are dead on arrival, have non-operative management, or who die unexpectedly in the inpatient setting. Obtaining access to these reports requires the engagement of the medical examiner in Trauma System PI. The medical examiner's complete detailed report should be shared with the trauma center's TPM and Trauma Medical Director (TMD). In many cases the medical

examiner completes only external examinations, and these reports are not helpful in the trauma setting. The role of the medical examiner and expectations of the medical examiner's reports needs to be defined in the administrative rules and monitored in the Trauma System Performance Improvement plan. It would be very beneficial to have the medical examiner as a member of the HTAC executive sub-council that focuses on PI.

4. Help us understand how the State of Hawaii could measure outcomes related to the Trauma System without integration of risk adjusted data and effective registry interfaces. If the State of Hawaii were to form state-wide Performance Improvement collaboration, please explain potential barriers, benefits, and methods.

The TMDs, TPMs and the Hawaii TPC should attend the Society of Trauma Nurses' Trauma Outcomes Performance Improvement Course (TOPIC), which defines the processes and infrastructure of a PI process. Many issues can be reviewed in the PI process. Morbidity and mortality are the hallmark standards. Trauma center PI programs generally complete the patient mortality reviews. A system level review for mortality may simply compare the trauma mortality rate for Hawaii to that found in the NTDB. This comparison establishes a baseline to determine if the mortality rate is increasing or decreasing with an ongoing development of the Trauma System. This would be a basic first step. The TPC, working collaboratively with the HTAC and trauma center leadership should establish timelines, to eventually form a Hawaii TQIP collaborative.

A state Trauma PI Master Plan should define the roles of EMS, air medical services, trauma centers, the medical examiner, specialty resources, and injury prevention activities in the review process. The chosen review events for the Trauma System PI Master Plan may be related to process measures and specifically linked to mortality. Examples are listed:

- Scene times greater than 20 minutes
- Failed intubations
- Failure to apply tourniquet
- Lack of pediatric resource / equipment
- On backboard greater than 60 minutes
- E-PCR incomplete or missing
- Diversion hours
- Delayed trauma activation
- Missed trauma activation
- Delayed transfers
- Transfers accepted within 30 minutes
- Transfer transportation is available within 45 minutes of request
- Selected pediatric events
- Compliance with transfer guidelines
- Compliance within transfer guidelines
- Compliance with TQIP TBI best practice guidelines
- Compliance with TQIP Orthopedic best practice guidelines
- Compliance with TQIP Geriatric best practice guidelines
- Operating room unavailable in emergency cases
- Stable patient transferred due to need for specialty surgeon evaluation
- Lack of rehabilitation bed
- Blood product wastage

- Timeliness or failure of BEAM images
- Complications selected by PI Sub-council
- Discharge placement problems due to funding issues
- Failure to update WebEOC boards in timely manner
- Failure to complete an after-action report following an MCI or multiple casualty event
- Registry profiles completed within 60 days of patient discharge
- Registry profiles submitted to the HTR are complete
- Registry profiles submitted to the HTR (by defined time)
- TPM attends RTAC / HTAC meetings
- TMD attends RTAC / HTAC meetings
- Trauma registrar attends RTAC meeting
- Minutes of the RTAC meetings are disseminated to the stakeholders within 14 days of the meeting
- Minutes of HTAC are disseminated to the stakeholders within 14 days of the meeting
- Action items identified in the RTAC or HTAC PI sub-council are tracked through to completion
- Trauma administrative rules are revised and updated every four years and disseminated to the stakeholders
- Trauma System Plan is revised and updated every four years and disseminated to the stakeholders

The established Trauma System executive sub-council focused on PI has the opportunity to explore the best practice guidelines from professional organizations (Eastern Association for the Surgery of Trauma [EAST], American Association for the Surgery of Trauma [AAST], Western Trauma Association [WEST]) and the TQIP best practice guidelines (Massive Transfusion in Trauma, TBI, Geriatric, Orthopedic, and Palliative Care) to identify pertinent and relative issues for the Hawaii Trauma System to implement and monitor outcomes. The sub-council may also review the HRSA 2006 *Model Trauma System Planning and Evaluation* document and the ACS System Consultation benchmarks to identify areas for focused improvement.

Each of the events chosen for review needs to be defined in the Trauma System PI Master Plan with an established process for date of review, tracking, and submission to the TPC (or state trauma PI coordinator) for collating and reporting. These issues may be reviewed at a state level only or the regional level depending on the language in the plan.

In addition, the TMDs may choose to establish a mortality case review in a closed meeting process to discuss difficult cases, unusual cases, or great saves. The membership of this review process needs to be clearly defined in the Trauma System PI Master Plan, along with adherence to discovery protection laws and regulations. The TPMs usually attend these types of meetings.

Implementing a Trauma System PI Master Plan requires statutes that prevent discoverability. In addition, the plan must define the roles, expectations, and timelines for data submission, trauma PI information, and management of that data.

The benefit of State Trauma System PI process is the ability to obtain and evaluate factual information on different phases of trauma care in the system to assist in defining opportunities for Performance Improvement. The sub-council may choose to standardize the terminology, data dictionary, and tools that support the PI process for all trauma centers to

ensure consistency and standard language for the review process. Ultimately, the correction of issues and prevention of further issues is the goal.

5. Please identify recommendations on how private air ambulance providers could be used to triage the transport of the injured trauma patient in coordination with other patients with non-traumatic emergent conditions and how to monitor effectiveness of the process.

Two private aeromedical corporations provide ALS inter-facility transports state-wide. The air medical assets include fixed-wing and rotor-wing, with fixed-wing being the primary mode of transport. Both air medical services were reported to be readily available. The private air medical providers were reported to provide excellent services and to fill a critical role in the transfer of patients in this island state. Unlike other components of the emergency medical response system, private air medical corporations are not under contract to provide services and to sustain services to the residents and visitors of Hawaii. Without contracts, the air medical providers are not bound to provide guaranteed and equitable services.

Medical oversight of air medical services by Hawaii EMS medical directors, including centralized communication does not currently occur. Guidance to participate in the triage of injured patients for transport as well as patients with other time-sensitive conditions has not been addressed because the private air medical providers have no formalized relationship with the EMSIPSB or the EMSAC. The EMS medical directors should establish criteria for triage and transport of all time-sensitive conditions. Then a QI process should be established to monitor triage and transport decisions, using data from the HEMSIS.

6. Does the ASC believe that the trauma patient suffering from a spinal cord or traumatic brain injury has adequate resources for rehabilitation?

The TSC Review Team does not believe that Hawaii has adequate resources for Trauma System rehabilitation. Specific subpopulations of trauma patients that are impacted by a lack of resources, specifically include patients who are ventilator-dependent with TBI and SCI. The TSC Review Team also perceived that children with severe injuries also lack resources for in-patient rehabilitation. Inadequate health insurance also was reported to be an impediment to receiving adequate rehabilitative care. For more information see the Neurosurgery focus section.

7. What recommendations does the ACS have on engaging all rehabilitation services not limited to inpatient rehabilitation?

Rehabilitation for the trauma patient is only briefly mentioned in the comprehensive State Trauma Plan, and no insight was gained from reviewing this document as to how rehabilitation can be better integrated into the overall care of the trauma patient. Rehabilitation has no formal representation on the HTAC or any of the RTACs. No protocol exists at the Trauma System level for the rehabilitative care of the trauma patient. Addressing each of these issues would help to improve the integration of rehabilitation into the overall care of the trauma patient.

8. What recommendations does the ACS have measuring patient outcomes after discharge from acute care facilities?

Stakeholders reported that the Trauma System does not receive any patient outcome data or process information from the Rehabilitation Hospital of the Pacific or from any of the outpatient rehabilitation clinics on the neighbor islands. One option is to facilitate discussions with rehabilitation physical medicine about sharing outcome data with the referring trauma center. Aside from the usual outcome measures of mortality and length of stay, limited outcome data are reported to the trauma registry. Outcome measures specific for acute patients with TBI and SCI should also be included in the HTR. These could include American Spinal Injury Association (ASIA) classification for SCI at admission and discharge; the Extended Glasgow Outcome Scale (GOS) performed at discharge, three and six months; the Functional Independence Measure (FIM); and the Pediatric Functional Independence Measure (WeeFIM). These measures would provide a basis to improve care in these sub-populations.

9. When the legislation was written for development of the state trauma system, funding was appropriated from cigarette tax. It now appears that cigarette tax revenue may be declining. What recommendations would the ASC have for obtaining funds to support trauma centers participating in the state trauma system?

The lead agency personnel and stakeholders expressed concerns about the sustainability of the Trauma System Special Fund. It was reported that the State Legislature has looked more closely at all special funds over the past 3 to 4 years, and especially those funded by the cigarette tax. Based on a recent legislative study, cigarette tax revenue projections were reported to be decreasing at a rate of 3% annually. The EMSIPSB leadership reported that they were being encouraged to support conversion of the special fund to the general fund. It was also suggested to the EMSIPSB leadership that the Trauma System funding would potentially be more secure if it were converted to the general fund. New legislation is required to convert the Trauma System Special Fund to the general fund, because the statute for the special fund also contains the authorizing legislation for the Trauma System.

Potential threats to the current appropriation from the Trauma System Special Fund or funding from the general fund include but are not limited to the following:

- The possibility of designating additional trauma centers, which would redistribute and reduce the funds currently provided to existing trauma centers
- Decreasing revenue from the cigarette tax
- The proposed plan to repeal the Trauma System Special Fund and convert to the general fund, forcing the Trauma System to compete with other program priorities in the state budget

Stakeholders additionally expressed concerns regarding the increasing cost of providing trauma care. It was not clear to the TSC Review Team if any discussions had occurred regarding a need or desire to adjust the allocation of trauma funds to meet these increased costs.

In light of the perceived or real threat to the trauma fund, the Trauma System leadership and stakeholders are encouraged to be proactive in identifying alternative sources for the special fund, e.g., motor vehicle registrations, motorcycle registrations, driver's license fees, tourism

tax, gaming tax, airport tax, increasing or expanding the traffic violation surcharges, car rental, e-cigarette tax, etc. The trauma stakeholders are encouraged to mobilize, work closely with their state legislators and community partners to make a plan for a future funding level that initially matches the current Trauma System Special Fund authorization, but could potentially increase to meet future needs identified from a financial needs assessment.

Trauma System Special Fund Accounting

The EMSIPSB is required in statute to submit an annual report to the legislature that summarizes the receipts and expenditures of the Trauma System. The report from FY 2016 was provided for TSC Review Team review. The report contains information about the statute, the amount of funds received for the special trauma fund from the cigarette tax and traffic violation surcharges, and the total amount expended. No detail regarding Trauma System expenditures was required or included in the report.

The lead agency is committed to adhere to the requirements for distributing, monitoring, and reporting expenditures from the Trauma System Special Fund. This includes improving the methodology for budget planning, fund disbursement, and accountability. Recently, the previously used trauma center Memorandum of Agreement (MOA) process for disbursing funds was changed to contracts with the designated trauma centers. No metrics or process was described to rate the contracts, however all are licensed healthcare facilities and fall into the category of designated trauma centers or non-designated trauma support facilities.

It was reported that the EMSIPSB has begun development of administrative rules for management of the Trauma System Special Fund. These draft administrative rules were not available for TSC Review Team review. Administrative rules to strengthen the methodology for fund distribution management, and reporting is encouraged.

To obtain funding the trauma centers are required to submit a written request, a budget, and supporting justification. The EMSIPSB uses a checklist to review funding requests, and requests are approved or denied. When a request is approved the trauma centers submit proof of expenditure to the EMSIPSB for reimbursement. The EMSIPSB retains the original receipts and paid invoices. A comprehensive financial and analytical report, detailing trauma fund expenditures was not available for TSC reviewers at the time of the visit. The healthcare facilities cover any additional cost of providing trauma care that exceeds what is reimbursed from the Trauma System Special Fund.

The Trauma System accountant maintains a tracking form that includes hospital name, fiscal year, and amount of funding awarded. Information from FY 2010 through to 2017 was available for review by the TSC Review Team. The Trauma System Special Fund expenditures are maintained on an Excel worksheet from which reports may be provided upon request. It was reported that an informal review of the fund expenditures is conducted quarterly. The EMSIPSB leadership was invited to present Trauma System Special Fund account documentation to the legislature in August 2015. Information requested consisted of copies of the trauma center MOA's, and a line-by-line budget and expense report of the trauma funding, user ledger entries. The report also included the trauma center verification and designation reports.

Stakeholders reported that they are not well informed about the Trauma System Special Fund budget plan, disbursements, and other expenditures. The HTAC has not routinely had an opportunity to contribute to budget planning or to review special fund expenditures.

Financial Needs Assessment

The Hawaii DOH has not conducted a needs assessment or financial evaluation to determine if the current level of funding is sufficient for its unique challenges (e.g., isolation from other states, counties separated by water, air medical services required for inter-facility transfer, high visitor to resident ratio, and the difficulty recruiting qualified health professionals and specialty surgeons).

A comprehensive needs assessment should be completed. An analysis of the trauma costs incurred by the system, including the trauma centers, has not been performed. It was reported that an attempt was made to determine the cost of trauma care, but some of the designated trauma centers were hesitant to share financial information. Sharing of cost data and payer data is often expected in State Trauma Systems, and it should not be a deterrent for completing this project. The lead agency could potentially assemble the financial officers of the healthcare facilities (e.g., Directors or Vice Presidents of Finance) as an ad hoc work group to review the payer mix, cost, reimbursements, etc. To be most effective and efficient this ad hoc work group needs carefully selected membership including the financial leadership mentioned, one or two trauma center TPMs and TMDs, as well as the Trauma System TPC.

The financial expertise represented in this work group could be supportive in guiding the full range of data needed to analyze the cost of the Trauma System. The individual work group members might also be able to encourage financial leadership of the remaining healthcare facilities to share financial data. The work group could also be asked to develop a formula for trauma fund disbursement to healthcare facilities that is directly linked to the uninsured, and under-insured, if this methodology is selected for future disbursement of Trauma System funds.

If a formula for fund distribution for the uninsured and under-insured is selected for future disbursement of the Trauma System funds, a standard operating procedure (SOP) for managing this process must be developed. The SOP should include a step-by-step instructional process for both the trauma centers and the EMSIPSB Trauma System accountant to adhere to. The SOP must include measures to ensure that the funds are distributed appropriately. Adherence to the SOP could also be embedded into each trauma hospital's contract to ensure compliance.

Budget Planning

The TSC Review Team looked for evidence that the Trauma System Special Fund budget planning was coordinated with the Trauma System Plan. The most current draft of the Hawaii Trauma System Plan was available for review. It is the TSC Review Team's perspective that the financial planning for the Trauma System is not directly related to the Trauma System Plan outcome measures. This makes it difficult to demonstrate the value of the Trauma System to stakeholders, elected officials, and the public. The EMSIPSB should prepare an annual budget for the Trauma System infrastructure with costs tied to each component of the Trauma System. The HTAC should have the opportunity to review the proposed budget with ample time to analyze it for the purpose of advising the lead agency on potential changes and to seek stakeholder support. Information contained in the Trauma System annual report (yet to be developed) should be used to educate and inform elected officials about the importance of the Trauma System and trauma centers for their constituents.

It was reported that the Trauma System Special Fund supports salaries for six positions within the EMSIPSB. Upon review, most (2 of the 6 1.0 FTEs support the day to day operations: Trauma Program Coordinator (1.0 FTE) and Trauma Accountant (1.0 FTE)) funded positions do not directly support the day-to-day operations of basic and essential components of the Trauma System program. At present the TPC is tasked with most program functions related to the Trauma System, including the state trauma registry and Performance Improvement. The described staffing model with small FTE commitments from a diverse group of EMSIPSB personnel does not support the basic needs of a State Trauma System. To fully support the State Trauma System, dedicated personnel support is important for Trauma System registry, Trauma System Performance Improvement, and patient safety (PIPS) functions. A thoughtful re-organization of staffing is required to ensure that staff support is directly linked and specifically dedicated to supporting the Trauma System. Trauma funds should be used to support positions directly dedicated to the Trauma System program day-to-day activities. Important positions include the State Trauma System Program Manager, a Trauma System registrar, and a Trauma System PIPS coordinator.

10. Please help us understand best practices related to goals and objectives for provider performance reporting.

First, is provider referring to EMS, EMS agencies, or the medical staff of the trauma centers? Each agency (EMS, air medical, hospitals and medical staff) typically has performance measures defined for their agency that are monitored.

The Trauma System performance goals and objectives in the State Trauma Plan are linked to defined events or indicators to be reviewed at a system level to define system performance. These issues are usually defined by the stakeholders and integrated into the Trauma System PI Master Plan. This has been reviewed in more detail in the previous text of this PI Focus section.

11. Please help us understand best practices related to goals and objectives for state system performance reporting.

First, the Trauma System leadership should establish data reporting requirements. The trauma data is the foundation for the Trauma System PIPS. Second, the PI processes, audit filters / core measures need to be established. Each of these items must be included in the Trauma System PI Master Plan. Third, routine reporting must be determined, e.g., what data and process measures are reported, and what is the frequency of reporting. It is important to ensure the PIPS processes taking place at the system level are timely. If lengthy delays in data and process measure reporting occur, then the Trauma System has no ability to rapidly move an issue through the loop closure process. This poses a threat to patient safety. Specifically, the issue may continue to repeat itself until definitive and appropriate loop close is attained. Best practices for clinical care are based on the national standards of trauma care (see Focus Question 4 for examples). Best practices for Trauma System PIPS may be sustained through a robust Trauma System PIPS program as well as interfacing with other Trauma System leadership throughout the country.

12. What recommendations can the ACS offer on integrating civil and military Trauma Systems in Hawaii?

The integration of TAMC into the civilian Trauma System is logical and potentially beneficial to both Hawaii and the armed services. With the overseas military conflicts ebbing, a concern regarding opportunities for military surgeons to maintain skills and expertise in trauma care has surfaced. The addition of TAMC, with its sizable pediatric and adult services, could provide needed relief to their civilian counterparts and be a benefit to the people of Hawaii. Another notable benefit to this collaboration is redundancy of trauma services. QMC is the only high-level trauma center for thousands of miles. Given the historic risk of natural disasters and the modern potential for terrorist events, it seems prudent to have a second high-level trauma center in a state as isolated as Hawaii. With appropriate federal and state support, TAMC could serve not only as a free-standing designated trauma center, but also as the backup facility for QMC and/or KMCWC in case of disaster.

13. What opinion does the ACS have on critical access hospitals verified and designated as Level IV trauma centers?

Several states designate Level IV trauma centers. At this time, the ACS has no process for verification review of Level IV trauma centers, so standards for designation would have to be developed by the state. The advantage to a designation process is the ability to write the Level IV trauma centers into the administrative rules and to define the trauma resources, education, equipment and expectations of the Level IV facilities. The disadvantage would be the cost associated with maintaining these standards and whether the volume of patients would make it worthwhile. The care provided by the critical access hospitals should complement the current Trauma System and not compete with the Level III trauma centers. Another option would be to educate the health professionals within the critical access hospitals through a standardized course, such as the Rural Trauma Team Development Course (RTTDC). This education can help prepare the health professional team to provide the initial emergency care for a patient needing inter-facility transfer. Having these facilities provide a minimal set of data to the HTR would help support an analysis of patient volume and inter-facility transfer destination. Additional analyses including the distance to a higher level of care and the facility's resources for trauma care can help guide the decision about designation.

14. How many trauma centers at each level should Hawaii designate?

Please see Needs-based Trauma Center Designation Focus narrative, in that Area of Focus section.

15. What trends have been seen regarding trauma centers accepting trauma, STEMI, and stroke when they are in divert/ bypass?

For trauma centers verified by the ACS, diversion greater than 5% of the time is defined as a verification criterion deficiency. Trauma centers are expected to monitor diversion status on a monthly basis and develop action plans as needed.

Generally, across the United States, more healthcare facilities are recognized as ST-Elevation Myocardial Infarction (STEMI) and stroke specialty centers than those verified and designated to treat trauma patients. Most trauma centers make a commitment not go on

diversion or bypass status for severe injuries, unless another trauma center is nearby to accept a patient. In some cases a hospital near the trauma center is recognized to care for STEMI and stroke patients and could be available if the facility goes on diversion for these time-sensitive conditions while managing an excess volume of trauma patients.

The challenge occurs when the same facility is designated or recognized for some or all time-sensitive conditions (trauma, stroke, and STEMI), and high patient volumes stress the facility's resources. If another facility is not nearby to help spread the patient volume, the facility must develop a plan for surge capacity. The facility has an obligation to provide needed emergency care for all time-sensitive conditions through its contract or recognition status. The state should perform an analysis using system-wide trauma data, trauma center patient volume, and estimated or real trauma center surge capacity, as well as similar metrics for the STEMI and stroke resources and patient volumes. Guidelines should be developed for management of diversion or surge capacity for all time-sensitive conditions. If necessary, resources may need to be allocated to additional centers to manage surge capacity.

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:

$500 \times (\# \text{ of Level I and Level II centers in the TSA}) = \underline{\hspace{2cm}}$

- 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 NBATS 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 ECCCC; 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: Hawaii EMS Agency Completed NBATS Tool



State of Hawaii Department of Health
 Emergency Medical Services and Injury Prevention System Branch
 State Trauma Program
 American College of Surgeons | Committee on Trauma
 Trauma Systems Evaluation and Planning Committee
 TRAUMA SYSTEMS CONSULTATION (TSC) PROGRAM

ACS NBATS Tool
Hawaii – December 2, 2016

1. Population in the Trauma Service Area (TSA) -

- a. total TSA population of less than 50,000 received 2 point
- b. total TSA population of 50,001 to 75,000 received 4 points
- c. total TSA population of 75,001 to 100,000 received 6 points
- d. total TSA population of 100,001 to 250,000 received 8 points
- e. total TSA population of greater than 250,001 received 10 points

Population estimates for 2015

County	Island	Resident	De facto	Points assigned**
Hawaii	Hawaii	196428	220342	8
Honolulu	Honolulu	998714	1054384	8
Kauai	Kauai	71735	92983	6
Maui	All islands	164726	215439	8
Maui	Maui*	148354	-	N/A
Maui	Molokai*	6958	-	N/A
Maui	Lanai*	3526	-	N/A
State total	total	1431603	1583148	N/A

*Estimate from 2014; island-level data from 2015 not available.

** Points assigned based on de facto population when available.

2. Median Transport Times of in the Hawaii Trauma Registry (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

Methods: Sub-set of HTR records from 1/2014 through 6/2016 (n=13,375). Delete 4301 (32.2%) with no data for EMS Transport Time in HTR record, leaving 9,074 records. (About 3% (272) of these records had more than one EMS TT listed: 255 had 2 times, and 17 had 3 times. This may be a result of a patient being transferred



between EMS units. Therefore, the final EMS TT as the sum of these multiple times for these 3% of records.)

County	Number of patients	Median EMS transport time	Points assigned
Hawaii	1489	17	1
Honolulu	5408	14	1
Kauai	508	18.5	1
Maui*	1669	23	2
State	9074	16	N/A

*All islands in Maui County included.

INFORMATIONAL ONLY: Statistics for individual facilities

Trauma center (County)	Number of patients	Median EMS Transport Time
Hilo (Hawaii)	773	16
Kona (Hawaii)	376	15
North Hawaii (Hawaii)	340	20
Kap'iolnai (Honolulu)*	211	25
Pali Momi (Honolulu)	107	14
QMC (Honolulu)**	4756	13
TAMC (Honolulu) ***	334	17
Wilcox (Kauai)	508	18.5
Maui (Maui)	1669	23

*Pediatrics only

**Level II trauma center

***Military only

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.

Hawaii Trauma Advisory Committee (HTAC) 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

County	Lead agency support	HTAC support	Governing body support	Points assigned*
Hawaii	5	5	2	12
Honolulu	5	5	2	12
Kauai	5	5	2	12
Maui	5	5	2	12

*All counties awarded full point potential due to historic support for trauma centers in Hawaii.

4. Injured patients meeting NTDB criteria discharged from acute care facilities not designated as Level I, II, or III trauma centers.

- a. Discharges of 0-50 patients meeting NTDB criteria receives 0 points
- b. Discharges of 51 – 100 patients meeting NTDB criteria receives 1 point
- c. Discharges of 101 – 200 patients meeting NTDB criteria receives 2 points
- d. Discharges of 201- 300 patients meeting NTDB criteria receives 3 points
- e. Discharges of greater than 300 patients meeting NTDB criteria receives 4 points

Annual number of patients meeting NTDB inclusion criteria, who were treated at non-trauma centers, by island of facility, 2011-2015

County	2011	2012	2013	2014	2015	Points assigned*
Hawaii	34	40	35	70	58	1
Honolulu	3443	3342	3234	2888	2669	4
Kauai	84	73	79	80	68	1
Maui**	56	66	103	85	72	1
Lanai (Maui)	16	17	17	10	7	0
Maui (Maui)	3	22	42	35	20	0
Molokai (Maui)	37	27	44	40	45	0
State	3617	3521	3451	3123	2867	N/A

*Points assigned based on 2015 data.

**All islands in Maui County included.

5. Pre-existing Adult 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

County	Level I	Level II	Level III	Points assigned
Hawaii (3 x -0.5)	0	0	-1.5	-1.5
Honolulu (1 x -1; 1 x -0.5)	0	-1	-0.5	-1.5
Kauai (1 x -0.5)	0	0	-0.5	-0.5
Maui (1 x -0.5)*	0	0	-0.5	-0.5
Lanai (Maui)	0	0	0	N/A
Maui (Maui) (1 x -0.5)	0	0	-0.5	N/A
Molokai (Maui)	0	0	0	N/A

*All islands in Maui County included.

6a. ONLY FOR LEVEL I OR II DESIGNATION: Numbers of 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

Level I and II center	Number of patients*	Points assigned
Oahu	524	1

* Average of 44 patients per month, or 524 per year.

INFORMATIONAL ONLY: Annual number of QMC records of patients with ISS >15

CY*	Number of patients
-----	--------------------





2014	559
2015	517
through 6/2016	235

* Average of 44 patients per month, or 524 per year.

6b. ONLY FOR LEVEL III DESIGNATION: Numbers of injured patients (ISS > 9) seen in trauma centers already in the TSA

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

$200 \times (\# \text{ of trauma centers in the TSA}) = \underline{\hspace{2cm}}$

- e. If the TSA has more than 200 severely injured patients above the expected number assign 2 points
- f. If the TSA has 0-200 severely injured patients above the expected number assign 1 point
- g. If the TSA has 0-200 fewer severely injury patients than the expected number assign 1 negative point
- h. If the TSA has more than 200 fewer severely injured patients than the expected number assign 2 negative points

Level III center	Number of patients*	Points assigned
Hawaii (200 x 3)	223	-2
Honolulu (200 x 2)	37	-2
Kauai (200 x 1)	65	-1
Maui (200 x1)	235	1
State	560	N/A

*Annual average including projection of 2016 total

INFORMATIONAL ONLY: Numbers of injured patients (ISS > 9) seen in trauma centers already in the TSA

County	2014	2015	2016 (through June)	annual average*
Hawaii	194	235	120	223
Honolulu (Kap only, not Pali Momi)	34	38	20	37





State of Hawaii Department of Health
Emergency Medical Services and Injury Prevention System Branch
State Trauma Program
American College of Surgeons | Committee on Trauma
Trauma Systems Evaluation and Planning Committee
TRAUMA SYSTEMS CONSULTATION (TSC) PROGRAM

Kauai	42	77	38	65
Maui	207	221	138	235
state	477	571	316	560

*Includes projection of 2016 total





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
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.

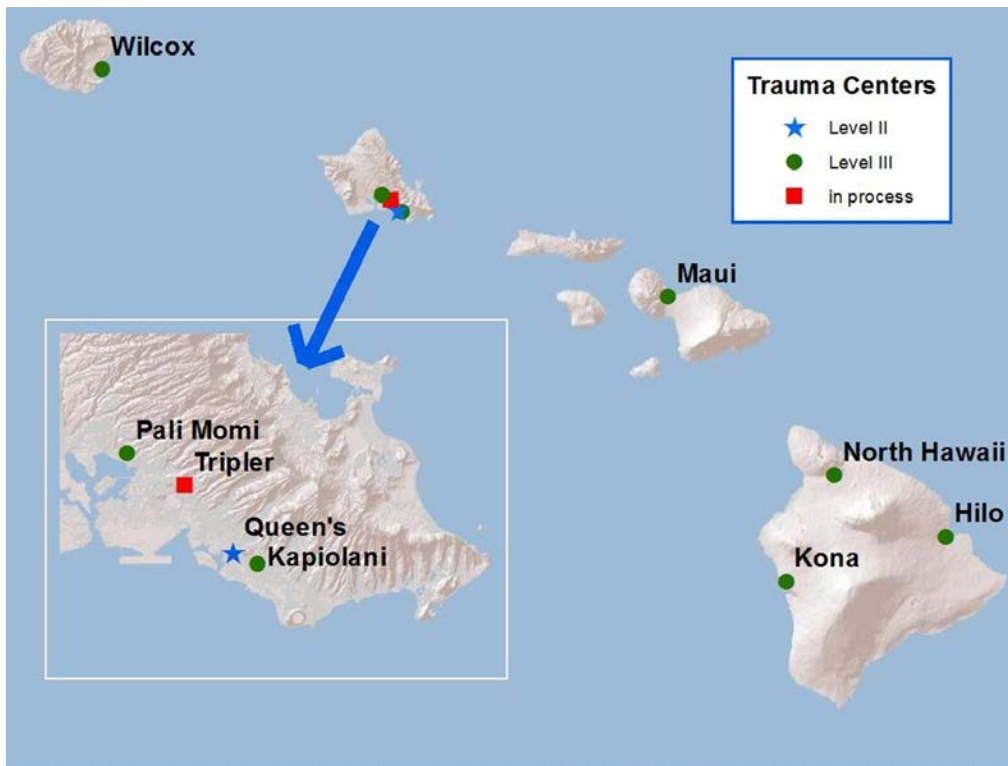
County	1	2	3	4	5	6a	6b	Points assigned
Hawaii	8	1	12	4	-1.5	N/A	-2	21.5
Honolulu (Level I and II)	8	1	12	1	-1.5	1	N/A	21.5
Honolulu (Level III)	8	1	12	1	-1.5	N/A	-2	18.5
Kauai	6	1	12	1	-0.5	N/A	-1	18.5
Maui	8	2	12	1	-0.5	N/A	1	23.5



APPENDIX C: Hawaii Trauma Center Map Data



Above: Map and Data Source: <http://www.traumamaps.org/>



Above: EMSIPB Data and Map provided in submitted PRQ

APPENDIX D: Sample Performance Improvement Tools

Trauma Center PI Tool Sample

EXAMPLE EMS/Trauma System Performance Improvement Plan					
Trauma Center Variance Review Scorecard / Performance Improvement Tool					
Trauma Center Name	<i>Enter Trauma Center Name</i>				
Contact Name	<i>Enter Contact Name</i>	Contact Email	<i>Enter Email</i>		
Reporting Month	<i>Enter Reporting Month</i>	Reporting Year	<i>Enter Year</i>		
Total Number of Trauma Incidents		<i>Enter Total Number of trauma Incidents</i>			
Criteria		Compliance Met = YES Compliance Not Met = NO		Score	
Trauma Center has on file with the RTAC, the name of the Administrator/VP for Trauma, Trauma Medical Director, Trauma Program Director/Manager/Coordinator, Educator, and Trauma Registrar with all contact information.					
EMS representative is included in the hospital Performance Improvement committee.					
Regional field triage protocols are followed.					
Criteria		Number of Trauma Incidents Meeting Criteria	Number of Trauma Incidents Not Meeting Criteria	N/A	Score
Total Number of Trauma Incidents		0			
Patient transferred due to lack of essential trauma center criteria, service capacity		0	0		#DIV/0!

or capability listed in the appropriate trauma center designation criteria are tracked for outcome.				
Patients that are transferred to a higher level of care or to the Pediatric Trauma Center will have their transfer initiated once the injury/injuries are defined and then the transfer will be completed within three hours.	0	0		#DIV/0!
Trauma patient is medically cleared for discharge but cannot be discharged due to funding issues for rehabilitation, skilled facility or other placement opportunities.	0	0		#DIV/0!
Total Number of Trauma Incidents arrived by EMS with GCS ≤ 8	0			
Patient with GCS of 8 or less have an appropriate airway management (intubated, BVM, LMS) by EMS on arrival at the trauma center.	0	0		#DIV/0!
Total Number of Trauma Incidents RSI in the field	0			
Patients who have RSI in the field will have definitive airway on arrival at the trauma center.	0	0		#DIV/0!
Total Number of Pediatric Trauma Incidents arrived by EMS with GCS ≤ 8	0			
Pediatric patients (less than 15) with a GCS of 8 or less will have airway management to ensure oxygenation of 98% in the field.	0	0		#DIV/0!
Total Number of Pediatric Trauma Incidents	0			
Pediatric patients (less than 15) will have successful vascular access established by the third attempt (IV or IO).	0	0		#DIV/0!
Total Number of Incidents arrived by EMS	0			
Total backboard time is 60 minutes or less. (scene through transfer to definitive facility)	0	0		#DIV/0!
Hospital staff receive patients from the EMS providers and move patient off EMS stretcher within ten minutes.	0	0		#DIV/0!
EMS PCR has essential trauma criteria documented and is left at the facility on arrival.	0	0		#DIV/0!
Total Number of Trauma Incidents with GCS ≤ 12	0			
Trauma patients with a GCS of 12 or less will have a head CT scan within 30 minutes of arrival at the trauma center or have initiated the transfer to a higher	0	0		#DIV/0!

level of trauma center.				
Total Number of Trauma Incidents Transferred Out	0			
Transport agency is on scene for transfer of the trauma patient within thirty minutes.	0	0		
Total Number of Trauma Incidents Transferred In	0			
Trauma transfer is discharged from the trauma resuscitation bay.	0	0		#DIV/0!
Transferring facilities will receive feedback and follow up from the receiving facility within thirty days of transfer.	0	0		#DIV/0!
Total Number of alleged criminal assault Trauma Incidents	0			
Alleged criminal assault trauma patients have access to crisis support (PTSD) and clinic follow up.	0	0		#DIV/0!
Total Number of Trauma Incidents with blood alcohol of 0.08 or higher	0			
Trauma patients that have a blood alcohol of 0.08 or higher will have alcohol intervention or be referred to a substance abuse center.	0	0		#DIV/0!

EMS PI Tool Sample

EXAMPLE EMS/Trauma System Performance Improvement Plan					
EMS Variance Review Scorecard / Performance Improvement Tool					
EMS Agency Name		<i>Enter EMS Agency Name</i>			
Contact Name	<i>Enter Contact Name</i>	Contact Email	<i>Enter Email</i>		
Reporting Month	<i>Enter Reporting Month</i>	Reporting Year	<i>Enter Year</i>		
Total Number of EMS Run Incidents		<i>Enter Total Number of EMS Run Incidents</i>			
Criteria		Compliance Met = YES Compliance Not Met = NO		Score	
EMS agency has on file with the RTAC the name of the EMS Medical Director, Program Director, EMS Educator, and Performance Improvement individual with contact information: name, title, email, pager, phone, address					
EMS Agency has adopted and implemented the regional trauma field triage guidelines and the EMS protocols.					
EMS Agency is reporting data to the State Trauma Registry					
Criteria		Number of Trauma Incidents Meeting Criteria	Number of Trauma Incidents Not Meeting Criteria	N/A	Score
Total Number of EMS Run Incidents		0			
EMS Agency will define the number of runs monthly and the subset that meet trauma field triage guidelines and of that population the number of times that the EMS arrives at the scene following dispatch within a regionally defined time.		0	0		#DIV/0!
EMS Agency will define the number of times that air medical services are called		0	0		#DIV/0!

to the scene for assistance and the number of time air medical arrives within thirty minutes.				
EMS Agency defines the number trauma related transports and of this population the number that followed trauma field triage guidelines.	0	0		#DIV/0!
Total Number of EMS Run Incidents Considered Critical	0			
EMS Agency defines the number of trauma runs and of this population those that are considered critical and of this population the number of times that the receiving facility was notified of the critical trauma patient prior to arrival.	0	0		#DIV/0!
Total Number of EMS Run Incidents Considered Trauma Related Transports	0			
EMS Agency will define the number of trauma related transports and of the population the number that have a scene time less than twenty minutes. Scene time is defined as time arrived on scene to the time left the scene.	0	0		#DIV/0!
EMS Agency defines the number of trauma related transports and of this population defines the number of time a complete EMS patient record or record with essential documentation (name, date, injury time, complete vital signs, GCS, RTS, mechanism of injury, ABC assessment, interventions, dispatch time, on scene time, and left scene time) is left at the facility during transport.	0	0		#DIV/0!
Total Number of EMS Run Incidents Considered Trauma with Hypothermia	0			
EMS Agency defines the number of trauma related transports and defines the number of times when hypothermia precaution are initiated when applicable.	0	0		#DIV/0!
Total Number of EMS Trauma Incidents Considered with a GCS of ≤ 8	0			
EMS Agency will define the number of trauma related transports and of this number the population that have a GCS of ≤ 8 or less that have airway management (BVM, LMA, King Tube, intubation) to ensure oxygenation (O2 saturation of 98% or higher).	0	0		#DIV/0!
Total Number of EMS Trauma Incidents with RSI	0			
EMS Agency will define the number of trauma related responses with RSI for airway control and the number that have successful intubation on or before the second attempt.	0	0		#DIV/0!
Total Number of EMS Trauma Incidents defined as Pediatric Trauma with	0			

GCS of ≤ 8				
EMS Agencies will define the number of trauma related responses to the pediatric population (age less than 15) with a GCS of ≤ 8 and of this population, the number that have airway management to ensure oxygenation (O2 saturation of 98% or higher).	0	0		#DIV/0!
Total Number of EMS Trauma Incidents Considered Pediatric with IV or IO	0			
EMS Agency will define the pediatric trauma responses (age less than 15) that have successful vascular access established on or before the third attempt (IV or IO).	0	0		#DIV/0!
Total Number of EMS Trauma Incidents with Continual Bleeding	0			
EMS Agency will define the number of trauma related responses and of this population the number that have continual bleeding and require bleeding control mechanisms initiated (pressure dressing, tourniquet, packing).	0	0		
Total Number of EMS Trauma Incidents Requiring Spinal Precautions	0			
EMS Agency defines the number of trauma related responses that have mechanism warranting spinal precautions and then define the number in this population that have immobilization initiated.	0	0		#DIV/0!
Total Number of EMS Trauma Incidents Considered Trauma	0			
EMS Agency will define the number of trauma related responses and then define the number in this population that demonstrated the regional trauma pre-hospital protocols were followed.	0	0		#DIV/0!
EMS Agency will define when a trauma receiving facility did not accept the patient and move the patient to a facility bed within ten minutes of EMS arrival.	0	0		#REF!

RAC PI Tool Sample

EXAMPLE EMS/Trauma System Performance Improvement Plan Trauma Regional Variance Review Scorecard / Performance Improvement Tool					
Regional Advisory Council Name		<i>Enter Regional Advisory Councils Name</i>			
Trauma Service Area		<i>Enter Trauma Service Area Letter</i>			
Contact Name	<i>Enter Contact Name</i>	Contact Email	<i>Enter Email</i>		
Reporting Month	<i>Enter Reporting Month</i>	Reporting Year	<i>Enter Year</i>		
Total Number of Trauma Incidents		<i>Enter Total Number of Trauma Incidents</i>			
Total Number of EMS Run Incidents		<i>Enter Total Number of EMS Run Incidents</i>			
Criteria		Compliance Met = YES Compliance Not Met = NO		Score	
RATC maintains a current list that is easily accessible of all EMS and Trauma Center Medical Directors, Program Directors/Managers, Educators, Performance Improvement Individuals and Registry Coordinator. List has contact information.					
Criteria		Number of Trauma Incidents Meeting Criteria	Number of Trauma Incidents Not Meeting Criteria	N/A	Score
Total Number of EMS Run Incidents		0			
Quarterly review of EMS dispatch time to scene time for the trauma patient population is reviewed and analyzed. Data reviews the total number of trauma EMS responses		0	0		#DIV/0!

and of this population the number that meet the regional standard for scene response times.				
RTAC reviews the total number of trauma EMS responses that requested air medical scene response and of this population the member of events where the air medical helicopter arrives within the defined regional scene response time.	0	0		#DIV/0!
RTAC reviews the total time that trauma centers are on trauma diversion to define the regional trauma diverts time for adults, pediatric and any specialty services.	0	0		#DIV/0!
Trauma Transfers	0			
RTAC reviews the total number of request for trauma transfers processed through the RTAC transfer coordination process/center to define the number of trauma transfers that are accepted within the established regional time frame.	0	0		#DIV/0!
RTAC reviews the total number of trauma transfers and defines of that number the number that are transferred within the ??? hours of defining the need for transfer.	0	0		#DIV/0!
Trauma Registry	0			
RTAC defines the number of trauma centers with a signed trauma registry agreement and of that number, the number of trauma centers that are completing quarterly/monthly submissions to the registry.	0	0		#DIV/0!
RTAC defines the number of EMS and Air Medical Agencies that have a trauma registry agreement and of that number, defines the number of agencies that complete a quarterly/monthly data submission to the regional registry.	0	0		#DIV/0!
Performance Review	0			

RTAC reviews the number of trauma patients that have mechanism that warrant spinal precautions and of that number the number of trauma patients that remain on a backboard greater than one hour.	0	0		#DIV/0!
Region reviews the trauma mortality by field deaths and trauma center deaths by ISS, age, and mechanism of injury quarterly.	0	0		#DIV/0!
Region reviews the trauma disability outcomes by ISS, age and mechanism of injury quarterly.	0	0		#DIV/0!
Selected Review	0			
RTAC selected two EMS and two trauma center related variances or complications to review each quarter.	0	0		#DIV/0!
Region produces an EMS / Trauma dashboard published that reflects the incidence of trauma, mechanism of injury, number of trauma transports to trauma centers broken down by level of trauma center, and transport mode - ground or air medical.	0	0		#DIV/0!
Region selected two injury prevention needs identified by the regional registry and develop a regional plan to decrease the incidence of the injury and increase awareness of the injury and provide quarterly updates to the RAC members.	0	0		#DIV/0!
Region provides one trauma educational program identified through the regional registry review to present each quarter.	0	0		#DIV/0!
Regional Trauma Advisory Council Meetings	0			
Regional trauma advisory council meets a minimum of ten times annually.	0	0		#DIV/0!
Trauma System Performance Improvement Committee Number of Meetings	0			
The RTAC Trauma System Performance Improvement Committee meets a minimum of ten times annually.	0	0		#DIV/0!

APPENDIX E: Acronyms

AAR-IP – After Action Report and Improvement Plan
AAST – American Association for the Surgery of Trauma
ABA – American Burn Association
ACS – American College of Surgeons
AIS – Abbreviated Injury Scale
ALS – Advanced Life Support
ASIA – American Spinal Injury Association
ATCN – Advanced Trauma Care for Nurses
ATLS – Advanced Trauma Life Support

BIS – Benchmarks, Indicators and Scoring Tool

CARF – Commission on Accreditation of Rehabilitation Facilities
CDC – Centers for Disease Control and Prevention

DOH – Department of Health

EAST – Eastern Association for the Surgery of Trauma
ECMO – extracorporeal membrane oxygenation
EMS – emergency medical services
EMSAC – Emergency Medical Services Advisory Council
EMSC – Emergency Medical Services for Children program
EMSIPSB – Emergency Medical Services and Injury Prevention System Branch
EOC – Emergency Operations Center
ePCR – electronic patient care record

FARS – Fatality Analysis Reporting System
FIM – Functional Independence Measure
FTE – full-time equivalent
FY – fiscal year

GOS – Glasgow Coma Outcome Score

HAH – Hawaii Association of Hospitals
HEMSIS – Hawaii Emergency Medical Services Information System
HHIC – Hawaii Health Information Corporation
HI-EMA – Hawaii Emergency Management Agency
HI-EOP – Hawaii Emergency Operations Plan
HIPAA – Health Insurance Portability and Accountability Act
HRS – Hawaii Revised Statute
HRSA – Health Services and Resources Administration
HTAC – Hawaii Trauma Advisory Council
HTR – Hawaii Trauma Registry

ICD – International Classification of Diseases
IRB – Institutional Review Board
ISS – Injury Severity Score

KMCWC – Kapi'olani Medical Center for Women and Children

LOS – length of stay

MCE – Mass Casualty Event

MCI – Mass Casualty Incident

MOA – Memorandum of Agreement

NEMSIS – National EMS Information System

NGO – Non-governmental Organization

NHTSA – National Highway Traffic Safety Administration

NTDB – National Trauma Data Bank

PI – Performance Improvement

PIPS – Performance Improvement and Patient Safety

QI – Quality Improvement

QMC – Queen’s Medical Center

RIMPAC – Department of Defense’s Rim of the Pacific Exercise

RTTDC – Rural Trauma Team Development Course

SCI – Spinal Cord Injury

SF-36 – Short Form (36) Health Survey

SOP – Standard Operating Procedures

STEMI – ST-Elevation Myocardial Infarction

TAMC – Tripler Army Medical Center

TBI – Traumatic Brain Injury

TCAA – Trauma Centers of America Association

TCAR – Trauma Care after Resuscitation

TMD – Trauma Medical Director

TNCC – Trauma Nursing Core Course

TOPIC – Trauma Outcomes Performance Improvement Course

TPC – Trauma Program Coordinator

TPM – Trauma Program Manager

TQIP – Trauma Quality Improvement Program

TSC – Trauma System Consultation

WebEOC – Web-based Emergency Operations Center

WEST – Western Trauma Association

APPENDIX F: Methodology

The State of Hawaii Department of Health 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 G 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 the State of Hawaii. 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 Review Team reviewed the ACS Pre-Review Questionnaire (PRQ) submitted by the State of Hawaii DOH, along with a number of additional supporting documents. Information available on government websites was also viewed.

The TSC Review Team convened in Honolulu, HI, on January 8 – 13, 2017, to review the State of Hawaii Trauma System. The meetings during the four-day visit consisted of plenary sessions during which the TSC Review 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 Review 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 the State of Hawaii. This report was developed independently of any other Trauma System consultations or assessments.

APPENDIX G: Reviewer Biographies

CHRISTOPH R. KAUFMANN, MD, MPH, FACS

Role: Surgeon, Team Leader

Dr. Kaufmann is currently the Trauma Medical Director at Forbes Hospital and Vice Chair, Department of Surgery, Allegheny Health Network in Pittsburgh. He is Professor of Surgery at the Uniformed Services University of the Health Sciences (USUHS) and Professor of Surgery (Adjunct) at Temple University. He served as the Trauma Medical Director of the Level 1 trauma center in Johnson City, TN and Associate Trauma Medical Director at Legacy Emanuel Hospital in Portland, OR. He attended medical school at USUHS, completed his general surgery residency at Tripler Army Medical Center, Honolulu, and then completed his Trauma/Critical Care Fellowship at UW/Harborview Medical Center in Seattle, earning a Master of Public Health. He is board certified in general surgery and surgical critical care.

Dr. Kaufmann was deployed with the 47th Combat Support Hospital to Saudi Arabia and Iraq in 1990 and was awarded the Bronze Star for casualty planning. In 1993, he was assigned as trauma consultant to the U.S. Public Health Service and served as Director, Division of Trauma and Emergency Medical Systems, Health Resources and Services Administration, administering the federal grant program developing trauma care systems across the U.S. He also helped write the Model Trauma Care System Plan (1992). He returned to USUHS in 1996 as Chief, Division of Trauma and Combat Surgery and served as COT Region Chief, Military Committee on Trauma. Colonel Kaufmann was the Surgical Director of the National Capital Area Medical Simulation Center at the time of his retirement from the U.S. Army in 2002. He served as Chair, Advanced Trauma Life Support (ATLS) for the American College of Surgeons Committee on Trauma (ACS COT) from 2003-2006 and then as International Chair of ATLS.

Dr. Kaufmann is an author of the 2006 HRSA Model Trauma System Planning and Evaluation document. He has given over 180 presentations in 20 different countries. He is or has been a member of numerous local, state, national and international organizations, both military and civilian, relating to Trauma Systems, trauma care and emergency medical services, including:

- Chair, Systems Committee, Trauma Center Association of America
- Member/Team Leader, Trauma Systems Consultation Committee, ACS COT (9 system reviews including Hawaii; team leader for 6 of these, including Denmark and Qatar)
- Site Surveyor, NHTSA State EMS Assessment Team (9 states)
- Lead Reviewer and Editor, Verification Review Committee, ACS COT
- Member, Pacific Region Emergency Medical Response Team (Johnston Atoll & Christmas Island)
- State Trauma Center Site Surveyor for VA, PA, IL, WA, and OR
- Institute of Medicine Committee: "Safe Passage: Astronaut Care for Exploration Missions"
- Level 1 Representative, Oregon State Trauma Advisory Board
- Reviewer for Injury, Journal of Trauma, and Critical Ultrasound Journal
- President, Ambroise Paré International Military Surgical Forum of ISS-SIC
- Editorial Board, NATO Emergency War Surgery Handbook, 3rd U.S. Revision
- Examiner, Society of Apothecaries of London, Diploma in the Medical Care of Catastrophes
- Member, Standards Committee, Pennsylvania Trauma Systems Foundation

ROBERT J. WINCHELL, MD, FACS

Role: Surgeon, Site Visits

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.

JOHN P. HUNT, MD, MPH, FACS

Role: Surgeon

Dr. Hunt received his undergraduate degree from Rensselaer Polytechnic Institute, his M.D. from Albany Medical College, and did his internship and General Surgery residency at Louisiana State University Health Sciences Center at New Orleans. He completed a Trauma & Critical Care fellowship at University of North Carolina at Chapel Hill and while there did basic science research in burns and hemorrhagic shock on a National Institutes of Health T-32 trauma training grant. He also completed a Master's degree in Public Health in Epidemiology during this time. He has been on the faculty of the Louisiana State University Health Sciences Center at New Orleans, Department of Surgery, since 1997. He is currently a Professor of Surgery and the Chief of the Trauma and Critical Care Division. He started the Trauma/Critical Care fellowship there in 2004 and has been the Program Director for that program since

its inception. He has also served as the Program Director for the General Surgery Residency since 2006. He was the Associate Trauma Director for the Level I Trauma Center at Charity Hospital New Orleans, from 2002 to 2015 and is now the acting Trauma Director at the Level I Trauma Center at University Medical Center New Orleans. During this time he also served as the Director of the Surgical Intensive Care Unit.

Dr. Hunt has been interested and involved in the development of trauma centers and Trauma Systems for approximately ten years. He has been a member of the Louisiana Committee on Trauma since 2002, serving as the Chairman from 2006 to 2012. He has been an Associate Member or Member of the American College of Surgeons Committee on Trauma since 2006. He has served on the Committee on Trauma - Trauma Systems subcommittee for ten years. Through his tenure at Louisiana State University he has helped guide and shape the Trauma System in New Orleans. This includes the time surrounding Hurricane Katrina. In 2011, Dr. Hunt was appointed by the Governor to the Louisiana Emergency Response Network (LERN), a committee tasked with improving the care in the state for all time-sensitive illness including trauma, myocardial infarction, and stroke. During his time with LERN, the state saw the opening of two new verified trauma centers with the addition of another three trauma programs poised for verification. In 2015, the LERN call center routed nearly 15,000 patients, from the field to appropriate hospitals, in the state. Dr Hunt was elected as the Vice-Chair of the LERN board in 2012 and was elected as the Chair of the board in 2014.

BARBARA A. GAINES, MD, FACS

Role: Pediatric Surgeon

Dr. Gaines is a Professor of Surgery at the University of Pittsburgh School of Medicine and an attending surgeon at the Children's Hospital of Pittsburgh of UPMC, a level 1 pediatric trauma center. She serves as the Director of the Benedum Pediatric Trauma and Injury Prevention Programs, Clinical Director of Pediatric General and Thoracic Surgery, and the Program Director of the Pediatric Surgery Training Program. She is triple board certified in pediatric surgery, general surgery and surgical critical care.

Dr. Gaines is currently serving as the Chair of the American Association for the Surgery of Trauma (AAST) Pediatric Committee, a member of the American College of Surgeons Committee on Trauma (ACS-COT), and the Secretary/Treasurer of the Association of Pediatric Surgery Training Directors (APSTD). She is a past president and founding member of the Pediatric Trauma Society (PTS) and a past board president of the Injury Free Coalition for Kids. Her current research interests include the role of post-traumatic coagulopathy in pediatric trauma, as well as outcomes and quality of life after pediatric injury and the prevention of childhood injury.

MICHAEL C. HUANG, MD, FAANS

Role: Neurosurgeon

Dr. Huang received his undergraduate degree from Yale University and his M.D. from Weill Cornell Medical College. He completed his internship and Neurosurgery residency at Georgetown University Hospital, followed by a Skull Base / Cerebrovascular fellowship at University of South Florida.

Dr. Huang joined the faculty of the University of California, San Francisco in 2010. He is currently the Chief of Neurosurgery Clinical Services at the Zuckerberg San Francisco General Hospital and Trauma Center, the only level I trauma center in the city and the county of San Francisco. Dr. Huang has special interests in the surgical and neurocritical care management of traumatic brain injuries and is a co-author on the ACS TQIP best practice guidelines for the management of Traumatic Brain Injury. He is also the co-director of the Neurotrauma and Neurocritical Care fellowship at UCSF.

RONALD F. MAIO, DO, MS, FACEP

Role: ED Physician

Dr. Maio is a Professor Emeritus of Emergency Medicine at the University of Michigan Medical School (UMMS). He received his DO degree, in 1976, from Michigan State University's College of Osteopathic Medicine (MSUCOM). After completing his internship and serving in the US Army in Germany as a

general medical officer, he did an Emergency Medicine Residency at MSU affiliated hospitals in Lansing, Michigan, and is board certified in Emergency Medicine. In 1988, he received an MS in Clinical Research Design and Statistical Analysis from the University of Michigan School of Public Health (UMSOPH). Dr. Maio was an assistant medical director for two EMS systems in Michigan, and served on the board of the Huron Valley Ambulance Association based in Ann Arbor, Michigan. He has also served on numerous state and federal committees and panels involving EMS and Emergency Medicine and has served as the chair for the National Association of EMS Physicians' (NAEMSP) Research Committee.

Dr. Maio was the Associate Chair for Research in the UM Department of EM, the Assistant Dean for Research Regulatory Affairs of the UMMS and Director of the Office of Human Compliance Review within the Office of the Vice President for Research (OVPR), University of Michigan. He was the founder of the UM Injury Research Center, Principal Investigator (PI) for the National Highway Safety Administration's (NHTSA) Emergency Medical Services Outcomes Project (EMSOP), and, a founding PI of the Pediatric Emergency Care Applied Research Network (PECARN): a federally funded multi-site research network focused on pediatric emergency care. Dr. Maio's research interests include the effectiveness of EMS systems and the treatment and prevention of traumatic injury. He has special interest in the areas of motor vehicle crash injury and alcohol /other drugs and injury. His current work includes conducting injury related research and clinical research training in Africa as part of the UM Department of Emergency Medicine's Ghana Collaborative Project.

Dr. Maio has served as an Emergency Medicine Reviewer on ACS Trauma Center Verification teams and has participated in 6 state and regional ACS Trauma System consultations.

FERGUS LAUGHRIDGE, Captain, ASM, CPM, CACO

Role: State EMS Director

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

Mr. Laughridge has a diverse professional background as a police officer, firefighter, paramedic, disaster response coordinator, 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 out of hospital emergency medical and trauma services throughout Nevada. As State Director, he was involved with numerous federal, state, and community activities relating to emergency preparedness and response.

Mr. Laughridge is continually engaged on various committees and workgroups centered on quality patient care, Trauma Systems, public health preparedness, and credentialing of EMS systems.

HEIDI A. HOTZ, RN

Role: Trauma Program Manager

Ms. Hotz is the Trauma Program Manager at Cedars-Sinai Medical Center, a Department of Health designated and ACS verified Level I Trauma Center. She is also the President of the Los Angeles Association of Trauma Program Managers as well as the Immediate Past President of the American Trauma Society (ATS), Past President of the Society of Trauma Nurses (STN), and Past President of the Trauma Managers Association of California (TMAC).

Ms. Hotz has extensive experience in all aspects of trauma including clinical care, program management, trauma data, trauma Performance Improvement and Patient Safety, Trauma Systems, injury prevention, consultation for trauma centers and systems, educational curriculum development, conference and event planning and all trauma related issues across the continuum of care.

Additionally, Ms. Hotz is the recipient of the STN's Trauma Leadership Award. She has been a survey team member for the ACS Trauma Systems and Evaluation Program. She has been an invited expert

panel member for many national trauma initiatives and projects such as the ATS Leadership Forums, the screening & brief intervention for alcohol in trauma initiatives, the Model Trauma System Plan work group, to name a few. She has lectured on a wide variety of trauma related topics throughout the United States and internationally. She has extensive participation at the member and Chair levels for local, regional, state and national committees. She was the Chair of the Advanced Trauma Care for Nurses® (ATCN) Committee in Arizona for 6 years. She was then appointed the first Chair of the STN's ATCN National-International Committee and spearheaded the special projects team to attain the ACS COT approval of the program as a collaborative effort with the ATLS Subcommittee. She was a member of the STN Board of Directors for over 8 years in the positions of Director at Large, Treasurer, President Elect and President. She is an author and Faculty Member for the STN's Trauma Outcomes Performance Improvement Course (TOPIC).

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 the 1999 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.

JORIE KLEIN, BSN, RN

Role: Observer - Trauma Program Manager/Technical Advisor

Ms. Klein is the current director of nursing for the trauma program at the Rees-Jones Trauma Center at Parkland. In this role she is responsible for the oversight and authority for the trauma nurse clinician program, trauma registry, trauma Performance Improvement process, injury prevention and outreach education in conjunction with the Trauma Medical Director.

She is the past director of disaster management at Parkland. Ms. Klein is the current chair of the Governor's EMS, Trauma Advisory Council's Trauma System Committee. In addition, Ms. Klein is the vice-chair of the North Central Texas Trauma Advisory Council. Ms. Klein is a past president of the Society of Trauma Nurses and is a current member of the STN TOPIC committee and ATCN committee.

Ms. Klein is also an instructor for the TOPIC Course and the ATCN course and regional VI chair for STN. In addition, she is an instructor for the Disaster Management Emergency Preparedness Course sponsored by the American College of Surgeons. Additionally, Ms. Klein is the course director for the Trauma Center Leadership Course and the Trauma System Leadership Course, which she developed. She is the founding member of the Texas Trauma Coordinators Forum.

Ms. Klein was recently appointed to the ACS Committee on Trauma's Performance Improvement Patient Safety Committee as a STN Nurse Liaison. In this capacity she is working in collaboration with the Best Practice Workgroup.

JIMM DODD, MS, MA

Role: ACS Staff – Facilitator (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 – Facilitator, Site Visits (Program Manager, Trauma 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 (Program Manager, Trauma Systems 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 H: State Participants List

#	Name	Position	Program	Category
1	Speedy Bailey	General Manager	AMR	Ground & Air
2	Andy Ancheta	Oahu Ops Mgr	AMR	Ground & Air
3	Karlson Pung	Air Program Dir	AMR	Ground & Air
4	Libby Char	Medical Director	AMR	Ground & Air
5		Hawaii County Ops Mgr	AMR	Ground & Air
6		Hawaii County Ops Supv	AMR	Ground & Air
7		Hawaii County Field Medic	AMR	Ground & Air
8	Tito Villanueva	Kauai County Ops Mgr	AMR	Ground & Air
9	Curt Morimoto	Maui County Ops Mgr	AMR	Ground & Air
10	Candace Lamb	Maui County Rotorwing Supv	AMR	Ground & Air
11	Mark Leggett	Medical Flight Chief	Hawaii Life Flight	Air
12	Dean Nakano	EMS Chief	City & County of Honolulu	Ambulance
13	Christopher Sloman	EMS Asst Chief of Operations	City & County of Honolulu	Ambulance
14	Joe Lewis	EMS Med Dir	City & County of Honolulu	Ambulance
15	Darrin Rosario	Fire Chief	Hawaii County Fire Dept	Ambulance
16	Lance Uchida	EMS Battalion Chief	Hawaii County Fire Dept	Ambulance
17	Jesse Ebersol	EMS Captain	Hawaii County Fire Dept	Ambulance
18	Chris Honda	EMS Captain	Hawaii County Fire Dept	Ambulance
19	Vern Hara	EMS Captain	Hawaii County Fire Dept	Ambulance
20	Judith Fitzgerald	EMS Medical Director	Hawaii County Fire Dept	Ambulance
21	Greg Moriguchi	Regional Fire Chief	Hawaii Joint Base Pearl Harbor Hickam	Ambulance
22	Dennis Yurong	Regional EMS Chief	Hawaii Joint Base Pearl Harbor Hickam	Ambulance

#	Name	Position	Program	Category
23	Douglas Asano	EMS Battalion Chief	Hawaii Joint Base Pearl Harbor Hickam	Ambulance
24	Michael Hayashi	State Trauma Med Dir		Queen's Health Sys
25	Andrew Tan			HI Health Sys Corp
26	James Kakuda			HI Pacific Health
27	Dan Brinkman	CEO/ President	Hilo Medical Center	Trauma Center
28	Victor Bochkarev	Med Director	Hilo Medical Center	Trauma Center
29	Louise Fincher	Program Manager	Hilo Medical Center	Trauma Center
30	Martha Smith	CEO/ President	Kapiolani Medical Center	Trauma Center
31	Devin Puapong	Med Director	Kapiolani Medical Center	Trauma Center
32	Alissa Marchais	Program Manager	Kapiolani Medical Center	Trauma Center
33	Jay Kreuzer	CEO/ President	Kona Hospital	Trauma Center
34	Andrew Fedder	Med Director	Kona Hospital	Trauma Center
35	Wendi Wagner	Program Manager	Kona Hospital	Trauma Center
36	Barry Shitamoto	CEO/ President	Maui Memorial Med Ctr	Trauma Center
37	Andrew Tan	Med Director	Maui Memorial Med Ctr	Trauma Center
38	Anna Marie Later	Program Manager	Maui Memorial Med Ctr	Trauma Center
39	Cynthia Kamikawa	CEO/ President	North Hawaii Comm Ctr	Trauma Center
40	Howard Wong	Med Director	North Hawaii Comm Ctr	Trauma Center
41	Kimberly Bastien	Program Manager	North Hawaii Comm Ctr	Trauma Center
42	Gidget Ruscetta	CEO/ President	Pali Momi Med Ctr	Trauma Center
43	Maria Ver	Med Director	Pali Momi Med Ctr	Trauma Center
44	Matthew Wells	Program Manager	Pali Momi Med Ctr	Trauma Center
45	Kathleen Green	VP	The Queen's Med Ctr	Trauma Center

#	Name	Position	Program	Category
46	Jason Chang	VP	The Queen's Med Ctr	Trauma Center
47	Michael Hayashi	Med Director	The Queen's Med Ctr	Trauma Center
48	Doris Wagner	Program Manager	The Queen's Med Ctr	Trauma Center
49		Commander	Tripler Army Med Ctr	Trauma Center
50		Med Director	Tripler Army Med Ctr	Trauma Center
51	Liz Zimmerman	Program Manager	Tripler Army Med Ctr	Trauma Center
52	Jen Chahanovich	CEO/ President	Wilcox Memorial Hospital	Trauma Center
53	Juliette Zelada	Med Director	Wilcox Memorial Hospital	Trauma Center
54	Marty Collins	Program Manager	Wilcox Memorial Hospital	Trauma Center
55	Kerry Picher	Administrator	Hale Hoola Hamakua	Critical Access Hosp
56	Faith Olivera	Nurse Manager	Hale Hoola Hamakua	Critical Access Hosp
57	Stephany Violeti	Administrator	Kahuku Med Ctr	Critical Access Hosp
58	Diane Hale	Nurse Manager	Kahuku Med Ctr	Critical Access Hosp
59	Dr. Oakley Davis	Chief of Staff	Kahuku Med Ctr	Critical Access Hosp
60	Marilyn Harris	Administrator	Kau Hospital	Critical Access Hosp
61	Sherrie Bazin	Nurse Manager	Kau Hospital	Critical Access Hosp
62	Peter Klune	Administrator	Kauai Veterans Mem Hosp	Critical Access Hosp
63	Cheryl Tennberg	Dir of Nursing	Kauai Veterans Mem Hosp	Critical Access Hosp
64	Myra Elliott	Nurse Manager	Kauai Veterans Mem Hosp	Critical Access Hosp
65	Gino Amar	Administrator	Kohala Hospital	Critical Access Hosp
66	Carmela Rice	Nurse Manager	Kohala Hospital	Critical Access Hosp
67	Paul Harper-O'Conner	Administrator	Kula Hospital	Critical Access Hosp
68	Nell Mitchell	Nurse Manager	Kula Hospital	Critical Access Hosp

#	Name	Position	Program	Category
69	Paul Harper-O'Conner	Administrator	Lanai Comm Hospital	Critical Access Hosp
70	Carole Starbird	Nurse Manager	Lanai Comm Hospital	Critical Access Hosp
71	Janice Kalanihuia	Administrator	Molokai General Hosp	Critical Access Hosp
72	Dino Akai	Nurse Manager	Molokai General Hosp	Critical Access Hosp
73	Liza Trinidad	Administrator	Samuel Mahelona	Critical Access Hosp
74		Nurse Manager	Samuel Mahelona	Critical Access Hosp
75	R. Don Olden	Administrator	Wahiawa Gen Hospital	Critical Access Hosp
76	Tammy Kohrer	Nurse Manager	Wahiawa Gen Hospital	Critical Access Hosp
77	Joyce O'Brien	Administrator	Waianae Coast Comp	Critical Access Hosp
78	Edward Ho	Nurse Manager	Waianae Coast Comp	Critical Access Hosp
79	Virginia Pressler	Director of Health	DOH	Government
80	Danette Wong Tomiyasu	Dep Dir of HRAdmin	DOH	Government
81	Terrence Jones	Hawaii EMS Med Dir	DOH	Government
82	James Scamahorn	Kauai EMS Med Dir	DOH	Government
83	David Nelson	Maui EMS Med Dir	DOH	Government
84	George "Rick" Bruno	Oahu EMS Med Dir	DOH	Government
85	Alvin Bronstien	State EMS Med Dir	DOH	Government
86	Clayton Chan	State EMS Systems Mgmt	DOH	Government
87	Dwayne Lopes	State EMS Standards	DOH	Government
88	Paulette Tamashiro	State EMS Statistician	DOH	Government
89	Dan Galanis	State Trauma Epidemiologist	DOH	Government
90	Kari Benes	State Highway Safety Rep	DOH	Government
91	Bridgette Velasco	State Ocean Safety Rep	DOH	Government

#	Name	Position	Program	Category
92	Therese Argoud	Injury Prevention System	DOH	Government
93	Scott Daniels	Rural Health	DOH	Government
94	Jill Tokuda	Ways and Means Chair	Senate	Legislators
95		Health Chair	Senate	Legislators
96	Sylvia Luke	Finance Chair	House	Legislators
97		Health Chair	House	Legislators
98	Patiricia O'Hagan	Dean of EMS, Health Sc & Nursing	Kapiolani Comm College	EMS Training
99	Jeff Zuckernick	EMS Dept Chair	Kapiolani Comm College	EMS Training
10		EMS Faculty	Kapiolani Comm College	EMS Training
10		Medical Director	Kapiolani Comm College	EMS Training
10	Chris Crabtree	Director	Healthcare Assoc of HI	Disaster Prep
10	Timothy Roe	Director	Rehab Hosp of the Pac	Rehabilitation
10		Medical Director	Rehab Hosp of the Pac	Rehabilitation
10	Louise Iwaishi	Injury Prevention Physician	Kapiolani Med Ctr	Injury Prevention

APPENDIX I: State of Hawaii – Facilities Visit by County

Island (County)	Facility Name	Address	State Designation Level	ACS Designation Level	Pursuing Future State Designation Level	Pursuing Future ACS Designation Level	In TQIP?	Trauma Medical Director	Trauma Program Manager
Big Island (Hawaii County #1)	Hilo Medical Center	1190 Waiuanue Ave, Hilo, HI 96720	III	N/A	III	N/A	Pending	N/A	Louise Fincher, RN
Big Island (Hawaii County #1)	North Hawaii Community Hospital	67-1125 Mamalahoa Hwy, Kamuela, HI 96743	III	N/A	III	N/A	No	Dr. Howard Wong	Kimberly Bastien, RN
Big Island (Hawaii County #1)	Kona Community Hospital	79-1019 Haukapila St, Kealahou, HI 96750	III	N/A	III	N/A	No	Dr. Andrew Fedder and Dr. Rich McDowell	Wendi Wagner, RN
Maui (Maui County #2)	Maui Memorial Medical Center	221 Mahalani St, Wailuku, HI 96793	III	N/A	II	II	No	Dr. Andrew Tan	Anna Maire Later, RN
Kauai (Kauai County #3)	Wilcox Memorial Hospital	3-3420 Kuhio Hwy Ste B, Lihue, HI 96766	III	N/A	III	N/A	Pending	Dr. Juliette Zelada	Marty Collins, RN
Oahu (Honolulu County #4)	The Queen's Medical Center - Punchbowl	1301 Punchbowl St, Honolulu, HI 96813	II	II	I	I	Yes	Dr. Michael Hayashi	Doris Warner, RN
Oahu (Honolulu County #4)	Kapiolani Medical Center for Women and Children	1319 Punahou St, Honolulu, HI 96826	III Pediatric	N/A	II	II	No	Dr. Devin Puapong	Alissa Marchais, RN
Oahu (Honolulu County #4)	Tripler Army Medical Center	1 Jarrett White Rd, Tripler Army	N/A	N/A	II Military	II Military	No	Dr. Dwight Kellicut	Liz Zimmerman

		Medical Center, HI 96859							, RN
Oahu (Honolulu County #4)	Pali Momi Medical Center	98-1079 Moanalua Rd, Aiea, HI 96701	III	N/A	III	III	Pending	Dr. Maria Ver	Matt Wells, RN
Oahu (Honolulu County #4)	The Queen's Medical Center – West Oahu	91-2141 Fort Weaver Rd, Ewa Beach, HI 96706	N/A	N/A	III	N/A	No	N/A	N/A
Oahu (Honolulu County #4)	Castle Medical Center	640 Ulukahiki St, Kailua, HI 96734	N/A	N/A	III	N/A	No	N/A	N/A

