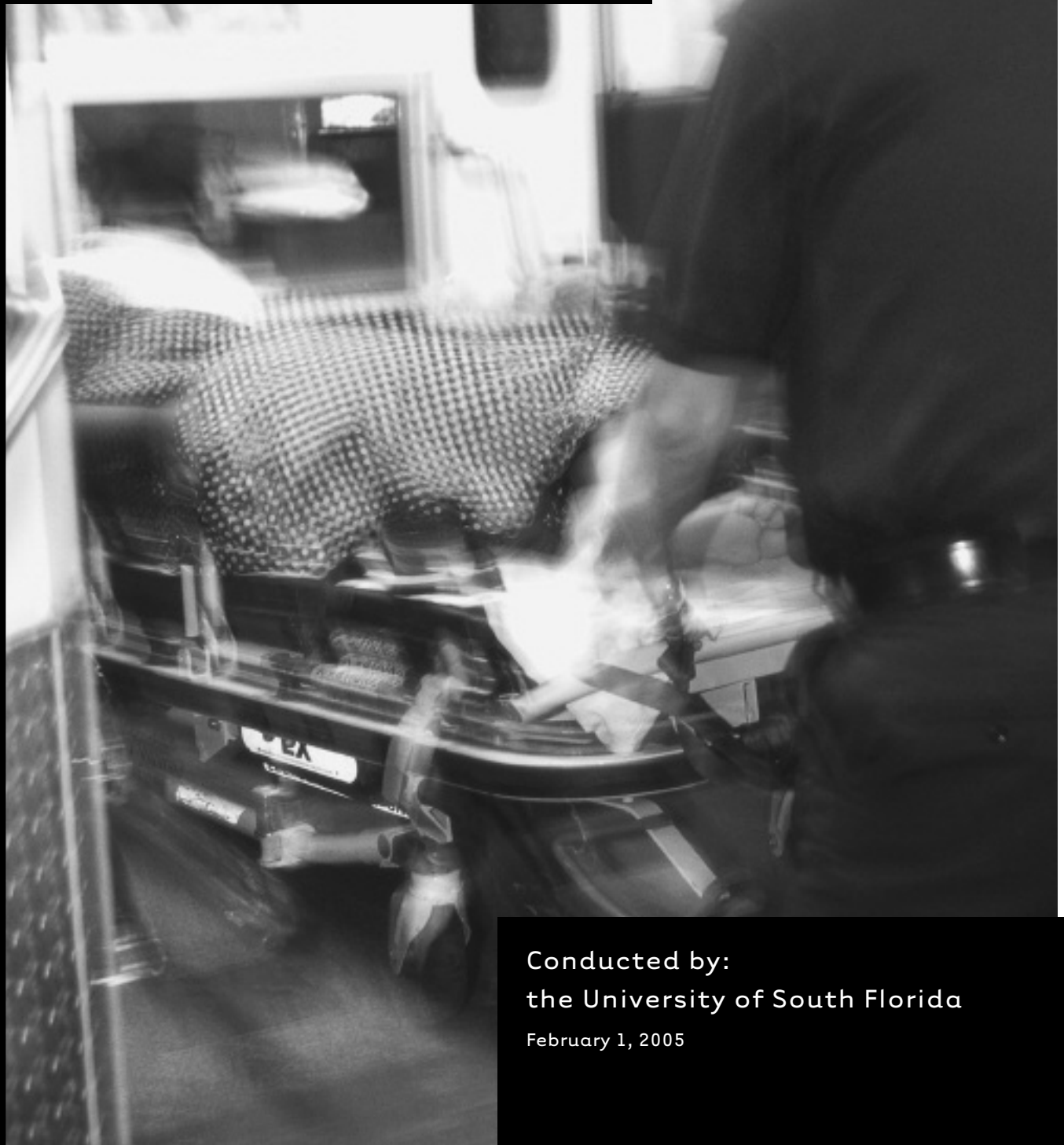


# A Comprehensive Assessment of the Florida Trauma System



Conducted by:  
the University of South Florida  
February 1, 2005

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# EXECUTIVE SUMMARY

A comprehensive assessment of the Florida Trauma system was prepared pursuant to section 395.402(2), Florida Statutes,

which required the Department of Health (DOH) to contract with a state university to conduct the assessment. The assessment was conducted under contract by a group of investigators from the University of South Florida and the University of Florida.

The data gathered and analyzed during the course of this study, and the recommendations generated from the data analysis, are presented in six sections: 1) Status of Trauma Systems in the United States; 2) Current Status of the Florida Trauma System; 3) Trauma Outcomes in Florida; 4) Regional Planning for Trauma Care in Florida; 5) Funding of Florida Trauma Centers; and 6) Conclusions. The assessment includes recommendations regarding a continued revenue source for trauma centers, the responsibility of local governments to fund trauma care, recommendations regarding the number and level of trauma centers needed to provide a statewide, integrated trauma system, and a review of the survival rate of trauma victims at trauma centers versus non-trauma centers.

## **Status of Trauma Systems in the United States**

The scientific foundation supporting establishment of regional trauma systems was formed from a series of empiric observations made repeatedly over the past 20 years. These observations have documented a decline in mortality related to trauma after a trauma system is established. The majority of the studies report a reduction in injury related mortality of 15-19 percent resulting from the implementation of the trauma system.

The rapid delivery of a seriously injured victim to a trauma center by advanced pre-hospital care services is recognized as a critical component of the trauma system. Appropriate pre-hospital triage occurs in 33-71 percent of cases in trauma systems overall. Higher appropriate triage rates are observed in more mature trauma systems and in geographic areas that are in close proximity to trauma centers. Shortened emergency medical service response and evacuation times result in delivery of trauma victims to definitive care sites within the "golden hour." Improved medical control of pre-hospital care is linked to improved clinical outcomes.

Patients delivered to trauma centers are more likely to be young, male, and victims of multiple injuries such as those that occur in motor vehicle crashes. Comparisons of overall outcome for injured patients treated in trauma centers and non-trauma centers have been difficult. In mature trauma systems with adequate triage methods, delivery of seriously injured patients to trauma centers means that the patients with the largest risk of dying will be clustered in the trauma centers. Thus, an increased or unchanged mortality risk observed in trauma centers is expected since the most severely injured patients are triaged to trauma centers.

Financing crises have led to national scrutiny of trauma systems because of threatened closure of trauma center hospitals and reductions in access to trauma care in many areas of the country. The 2002 Health Resources and Services Administration (HRSA) report regarding the development of state trauma systems cited finance and human resource availability as the two greatest threats facing states as they developed their trauma systems.

## **Status of the Florida Trauma System**

The Florida trauma system is a mature, statewide, government-led system, which is more than 20 years old and has served as a model for trauma systems in other states. The development of the Florida trauma system was evaluated along with other states in a 2002 HRSA study. In this study, the Florida system was noted to have accomplished more than 50 percent of the major criteria for trauma system development. Moreover, advanced life support, pre-hospital care was noted to be available for more than 80 percent of the citizens of the state.

Challenges noted for the Florida trauma system included availability of human resources and durable financing. These two continuing obstacles to progress have resulted in tensions within the trauma system during 2003–2004 and have almost led to the closures of two centers, one of which is one of the six Level I centers for the state and the only center serving a city with a population of nearly one million. The necessity to cancel or postpone revenue producing patient services to cover trauma center patient care obligations and the pressures of the malpractice insurance crisis were cited by specialists as the main drivers of these decisions. These crises were solved, at least temporarily, by a coalition of government and hospital leaders who were able to arrange funding for the support of trauma care.

## **Trauma Outcomes in Florida**

The Agency for Health Care Administration (AHCA) inpatient discharge database for 2003 was queried to identify all trauma patients with potentially life threatening injuries. There were 37,842 patients in the study group. Of these patients, 38 percent received treatment at a trauma center with the remainder of patients being treated at non-trauma centers. An average of 22 counties was served by the six level-one centers.

The International Classification Injury Severity Score (ICISS) was used to classify patients according to their probability of survival. The data support the conclusion that the presence of a trauma center is associated with a reduced motor vehicle injury fatality rate. In a separate analysis, motor vehicle injury fatality rates were strongly associated with the distance from a trauma center to the site of the injury event. The data further demonstrates that the percentage of trauma center patients in the more severely injured categories is higher than in non-trauma centers. This analysis clearly demonstrates the many positive returns produced by a fully functional trauma care system.

- **Trauma centers are regional resources and serve patients from surrounding counties (Map 16, Appendix 7).**
- **A county's overall mortality rate is higher if a trauma center is not present in that county.**
- **The percentage of trauma center patients in the most severely injured category is 3.4 times higher compared to non-trauma centers.**
- **The age distribution is skewed toward the elderly with relatively minor injuries in the non-trauma centers and concentrated in the 21-44 age group with more severe injuries for trauma centers.**
- **Trauma center patients are more likely to have multiple injuries and require more procedures.**
- **Trauma center patients are more likely to be admitted as a transfer from another acute care facility, suggesting some degree of intra-trauma system transport and triage.**
- **Evaluation of length of stay and charges illustrate the increased cost of care associated with the increased severity of injury of patients treated in trauma centers**
- **Most trauma victims have some commercial insurance coverage.**
- **The uninsured consist of 5.8 percent and 11.2 percent of trauma victims in non-trauma centers and trauma centers respectively.**

## **Regional Planning for Trauma Care in Florida**

1. There is a need for additional trauma centers in the state to improve access to trauma centers for Florida residents with serious injuries. Additional trauma centers are recommended in:
  - a. **Region 1—Pensacola in Bay County (high priority)**
  - b. **Region 2—Tallahassee in Leon County (high priority)**
  - c. **Region 3—Jacksonville in Duval and Flagler Counties**
  - d. **Region 5—Orlando in Orange and Martin Counties**

2. It is feasible for the existing trauma service areas to be modified to follow the seven Domestic Security Task Force (DSTF) regions to facilitate regional planning. Each region could integrate planning for trauma and pre-hospital resources and the Office of Trauma could then assist the trauma regions with planning efforts. This change would require careful thought and deliberation. Concerns expressed by members of the State Steering Committee include the fact that some DSTF regions are composed of areas which have highly developed trauma agencies adjacent to areas where there has been no trauma agency. Some trauma centers in the state serve two and three DSTF regions respectively. If trauma service areas are reorganized by DSTF regions, the overriding principle of trauma care that the patient be taken to the nearest trauma center regardless of region should still be observed. Methods of reimbursement for non-insured patients should be addressed between regions.
3. Currently, the trauma agencies are operating at a local level and only five trauma service areas have this structure. It is recommended that further discussion regarding the role of the trauma agency and its reporting structure to a local, regional, or state agency occur.
4. An annual regional assessment is recommended to analyze pre-hospital resources, intensive care unit (ICU) beds and capacity, and other medical resources based on per population estimates to plan for disaster response and improvements to the existing system.

### **Funding of Florida Trauma Centers**

On aggregate, all trauma centers in Florida are incurring operational losses associated with the provision of trauma care. The net loss to each hospital is the sum of losses due to uncompensated care and preparedness costs (see Table 12). The figures labeled “preparedness costs” are costs designated by each hospital to maintain such things as operating rooms, radiology suites, ICU beds, emergency room facilities and personnel available 24 hours a day for trauma services. These figures indicate the magnitude of the problem from the perspective of trauma center hospitals in Florida and can be contrasted with data from South Carolina, which indicated a \$102.4 million loss for the seven Level 1 and Level 2 trauma centers in that state.

**Table 12 Hospital Costs (millions of dollars, 2003)**

	LEVEL I	LEVEL II	TOTAL
<b>Cases</b>	<b>15,530</b>	<b>14,184</b>	<b>29,714</b>
<b>Net Loss</b>	<b>(\$46,624)</b>	<b>(\$46,018)</b>	<b>(\$92,643)</b>
<b>Preparedness Costs</b>	<b>\$45,889</b>	<b>\$48,718</b>	<b>\$94,607</b>
<b>State Funds Received</b>	<b>\$6,450</b>	<b>\$7,840</b>	<b>\$14,290</b>

Despite the establishment of an organized trauma system over 20 years ago, Florida has not provided for a stable recurring source of funding for trauma. Florida law permits local governments (both municipal and county) to levy certain taxes in support of specific uses. These uses include both health care generally and trauma care in particular. Florida has 18 taxing districts as summarized in Table 4 of Appendix 7. Other states have used many alternatives to fund trauma or indigent care (Tables 1 and 2, Appendix 8). Funding sources include traffic fines, vehicle and driver’s license surcharges, alcohol, sales or property taxes, telecommunication fees, and tobacco settlement funds. Estimates of the amount of funding that would be provided in the state of Florida if some of the alternatives were adopted are listed in Table 13 below and later in the report.

The available evidence supports the conclusions that taxation strategies are used in many states to support trauma care; that partnerships between state and local tax initiatives are feasible and that the taxes

directed for health care are associated with improved outcomes. Decisions for specific formulas may best be determined by consensus with consideration given to local healthcare initiatives, cost, effort, and the population served by a particular trauma center.

## **Findings**

### **1. Status of Trauma systems in the United States**

- **The majority of the studies report a 15-19 percent reduction in injury-related mortality resulting from the implementation of the trauma system.**
- **The most severely injured patients with the greatest risk of dying are triaged to trauma centers. Thus, an increased or unchanged mortality risk is observed in trauma centers compared to other hospitals.**
- **Financial crises have led to closures of trauma center hospitals and reductions in access to trauma care in many areas of the country. The 2002 HRSA report regarding the development of state trauma systems cited finance and human resource availability as the two greatest threats facing states as they developed their trauma systems.**

### **2. Status of the Florida Trauma System**

- **There were 20 trauma centers and 221 acute care hospitals in the state of Florida in 2003.**
- **In 2003, 37,147 true trauma patients were treated in Florida. Of these patients, 38 percent were treated in trauma centers.**
- **Challenges noted for the Florida trauma system included the availability of human resources and durable financing.**
- **These two problems have almost led to the closures of two trauma centers, one of which is the only center serving a city with a population of nearly one million.**

### **3. Trauma Outcomes in Florida**

- **Trauma centers are regional resources and serve patients from surrounding counties. Level I trauma centers each serve on average 20 counties.**
- **A county's overall mortality rate is higher if a trauma center is not present in that county.**
- **The percentage of trauma center patients in the most severely injured category is 3.4 times higher than in non-trauma centers.**
- **The age distribution in non-trauma centers is skewed toward the elderly with relatively minor injuries, and in trauma centers, is concentrated in the 21-44 age group with more severe injuries.**
- **Trauma center patients are more likely to have multiple injuries and require more procedures.**
- **Trauma center patients are more likely to be admitted as a transfer from another acute care facility, suggesting some degree of intra-trauma system transport and triage.**
- **An evaluation of the length of stay and charges illustrate the increased cost of care associated with the increased severity of injuries found in patients treated in trauma centers.**
- **The uninsured consist of 5.8 percent and 11.2 percent of trauma victims in non-trauma centers and trauma centers, respectively.**

### **4. Regional Planning for Trauma Care in Florida**

- **Florida has 19 trauma service areas, four trauma agencies, and seven trauma regions. Six areas lack a trauma center.**
- **Section 943.0312, Florida Statutes, provides "[a]s part of the state trauma system plan, the department shall establish trauma regions that cover all geographical areas of the state and have boundaries that are coterminous with the boundaries of the regional domestic security task forces established under s. 943.0312."**
- **There is a need for additional trauma centers in the state to improve the access to trauma centers for Florida residents with serious injuries.**
- **Overall, the triage rate of injured patients to trauma centers is lower than the national average at 38 percent.**

■ **Acceptable access to the trauma system by ground or air evacuation is currently available for about 95 percent of the citizens of Florida.**

## 5. Funding of Florida Trauma Centers

■ **An analysis of finances at 18 of the 21 trauma centers in Florida for 2003-2004 demonstrates an aggregate loss of \$92 million dollars.**

■ **The net loss to each hospital is the sum of losses due to uncompensated care and preparedness costs.**

■ **Despite the establishment of an organized trauma system more than 20 years ago, Florida has not provided for a stable recurring source of funding for trauma.**

■ **Florida has 18 taxing districts (Table 4, Appendix 7) that may provide funds for both health care, in general, and trauma care, in particular.**

■ **Other states have used many alternatives to fund trauma or indigent care (Tables 1 and 2, Appendix 8) including traffic fines; vehicle and driver's license surcharges; alcohol, sales or property taxes; telecommunication fees; and tobacco settlement funds.**

■ **Public funding of healthcare initiatives in these states have been associated with improved patient outcomes.**

## Conclusions

1. Compared to national norms and to results in non-trauma centers in Florida, clinical outcomes are excellent for the severely injured patients that the trauma system was designed to serve. Although, the existing Florida trauma system works well, it is limited by the fact that some areas do not have trauma centers. Trauma centers serve a wide geographic area and Level I centers each serve more than 20 counties. Overall, the rate of triage of injured patients to trauma centers is lower than the national average at 38 percent. It is reasonable to set, as a system goal, an appropriate triage rate of 65 percent. The addition of new trauma centers in Tallahassee and in Bay County would increase the triage rate to nearly 50 percent.
2. Of concern is the observation that distance from a trauma center increases the motor vehicle injury fatality rate. Acceptable access to the trauma system by ground or air evacuation is currently available for more than 90 percent of the citizens of Florida. Deployment of trauma centers in Tallahassee and in Bay County would increase access to the system to 99 percent.
3. Trauma center hospitals face significant financial pressure. Losses can be ascribed to expenses needed to support up-to-date trauma care and to provide for medical specialist coverage. Since reimbursement for professional medical services has been reduced and malpractice insurance costs have increased, this problem has become more severe and threatens the trauma system in Florida as well as in other states. Several avenues for productive local-state partnerships are available for tax support of the trauma system. Data indicate that these healthcare initiatives are associated with improved outcomes.
4. The data support the feasibility of transforming the Florida Trauma Service Areas so that these coincide with the Domestic Security Task Force Regions. Trauma agencies need to be developed in each region and these agencies should coordinate performance improvement efforts for all segments of the trauma care continuum. The agencies should have community outreach and service goals so that the value of the trauma system is emphasized and local financial support of the system is realized.
5. Florida trauma centers are not recording performance in a consistent manner. The state trauma registry has not reached its full potential because of weaknesses in the data submitted to the registry. The data suggest that an annual performance review would be a useful addition to the state designation process and that injury prevention activities for each trauma center should be evaluated.

## Recommendations

1. Trauma centers should be placed in Tallahassee and in Bay County, which do not currently have a trauma center. Orlando and Jacksonville need additional trauma centers to meet the needs of the growing populations. The suggested addition of these trauma centers would provide access to a trauma center for 99 percent of the people in Florida.
2. It is reasonable to set, as a system goal, that 65 percent of trauma patients will be treated at a trauma center. The addition of new trauma centers as recommended would raise triage to a trauma center to 50 percent of injured patients.
3. Designation of additional trauma centers should be based on the need as determined by trauma region. Deployment of additional trauma centers should take place based, not only on the number of patients served per trauma center, but according to a concept of “trauma center capacity,” which would be determined by the staffing levels of medical specialists and other healthcare professionals. An annual regional assessment is also recommended to analyze pre-hospital resources, ICU beds, capacity, trauma center performance including trauma registry data, and other medical resources based on per population estimates to plan for response and improvements.
4. The data support the feasibility of transforming the Florida Trauma Service Areas so that these would coincide with the Domestic Security Task Force Regions (DTSF). Trauma agencies need to be developed in each region, and these agencies should coordinate performance improvement efforts for all segments of the trauma care continuum. The agencies should have community outreach and service goals, so that the value of the trauma system is emphasized and local financial support of the system is realized. These changes would require careful thought and deliberation. Concerns expressed by members of the State Steering Committee include the fact that some DSTF regions are composed of areas, which have highly developed trauma agencies adjacent to areas where there has been no trauma agency. Some trauma centers in the state (Tampa Bay and the trauma center at Shands Hospital in Gainesville) serve two and three DSTF regions, respectively. If trauma service areas are reorganized by DSTF regions, the overriding principle of trauma care—that the patient be taken to the nearest trauma center regardless of region—should still be observed.
5. It is reasonable to fund trauma centers with public funds, based on the unrecoverable financial burden incurred by trauma centers. This would best occur through a methodology that recognizes the level of effort by the institution and the population served. The available evidence supports the conclusions that taxation strategies are used in many states to support trauma care; that partnerships between state and local tax initiatives are feasible; and that the taxes directed for health care are associated with improved outcomes. Decisions for specific formulas may best be determined by consensus with consideration given to local healthcare initiatives, cost, effort, and the population served by a particular trauma center.

# INTRODUCTION

This report was prepared to satisfy the requirements of a grant awarded to a group of investigators from the University of

South Florida and the University of Florida by the Department of Health, Division of Emergency Medical Operations, Office of Trauma (Appendix 1).

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The investigators conducted a comprehensive assessment of the Florida Trauma system, and the data recorded in this report has been used to support a series of recommendations. These recommendations will, we hope, assist in guiding the future development of our trauma system and lead to improved outcomes for patients injured in the state of Florida. The grant award from the state mandated a group of goals and objective, which are listed below:

## Goals

1. Conduct a comprehensive assessment of the Florida trauma system.
2. Evaluate the number and distribution of trauma centers.
3. Determine the responsibility of local government to fund trauma care and any local responsibility for trauma care.
4. Develop of outcomes-based performance measurements to determine if the inclusive trauma system delivers results.
5. Establish methodologies for the objectives listed.
6. Perform and document a comparative analysis that demonstrates the effectiveness of Florida's trauma system relative to systems in place in other states.
7. Include recommendations submitted by regional trauma agencies and stakeholders.
8. Define the geographical composition of an area that ensures rapid access to trauma care.
9. Include historical patterns of patient referral and transfer within a specified area.
10. Provide an inventory of trauma care resources.
11. Assess population growth characteristics.

12. Define medically appropriate ground and air travel times.
13. Obtain the recommendations of the Regional Domestic Security Task Force.
14. Document the actual number of trauma victims being served by each trauma center.

## **Objectives**

The following objectives are to be achieved by the successful conclusion of this study:

1. Develop a definition of a “Trauma Alert Victim.”
2. Develop recommendations about aligning trauma service areas within the trauma region boundaries (July 2004) or other methods of regional trauma planning.
3. Identify any duplication of effort in current regional trauma planning.
4. Review the Regional Domestic Security Task Force structure and determine if integrating trauma system planning with interagency regional and emergency disaster planning efforts is feasible, and identify any duplication of efforts between the two entities.
5. Make recommendations on the number and level of trauma centers needed in each trauma service area to provide a statewide, integrated trauma system.
6. Identify the number of trauma patients currently treated in state-approved trauma centers.
7. Make recommendations on the minimum/maximum number of trauma patients that can be treated at a trauma center.
8. Establish criteria and define the methodology for determining the number and level of trauma centers needed to serve the population in a defined trauma service area or region.
9. Review the current boundaries of the trauma service areas and make recommendations to retain or modify current trauma service areas.
10. Provide an inventory of healthcare resources such as trauma surgeons, neurosurgeons, nurses, and other healthcare practitioners to support trauma centers.
11. Develop a map of the existing trauma centers and identify the area served within 30 minutes of the existing trauma centers by ground or air transport and within 50 miles of the existing trauma centers by air transport.
12. Identify existing emergency medical services transportation capabilities.
13. Identify existing emergency medical services that transport patients to trauma centers and the distance and time they travel.
14. Identify Florida’s population growth characteristics and establish a methodology for mechanism of trauma trending.
15. Make recommendations regarding a continued revenue source, which will include a local participation requirement.
16. Make recommendations regarding a formula for the distribution of funds identified for trauma centers, which will address incentives for new centers where needed and the need to maintain effective trauma care in areas served by existing trauma centers, with consideration for the volume of trauma patients served and the amount of charity care provided.
17. Identify potential public funding sources available for trauma care.
18. Identify the current incentives for hospitals to become trauma centers.
19. Identify the current volume of trauma patients at trauma centers and non-trauma centers.
20. Identify the amount of charity and uncompensated care provided by trauma centers.
21. Identify reimbursement to trauma centers from local governments, taxes/taxing districts, and the state for the previous five years.

The data gathered and analyzed during the course of this study and the recommendations generated from the data analysis will be presented in sections pertaining to 1) Status of Trauma Systems in the United States; 2) Current Status of the Florida Trauma System; 3) Trauma Outcomes in Florida; 4) Regional Planning for Trauma Care in Florida; 5) Funding of Florida Trauma Centers; and 6) Conclusions.

# STATUS OF TRAUMA SYSTEMS IN THE UNITED STATES

Trauma system development in this country was stimulated by the 1966 National Research Council report, "Accidental Death and Disability—the Neglected

Disease of Modern Society." A sequence of national and state legislative decisions led to the development of emergency medical systems, which provided resources to supply communities with modern ambulances and trained pre-hospital care personnel.

The need for on-line medical control of pre-hospital care stimulated the development of sophisticated emergency departments in hospitals. The emergence of a highly mobile population within the United States, many of whom did not have health insurance but required immediate access to health facilities, produced an exponential growth in visits to hospital emergency departments. These events were important in the growth of Emergency Medicine as a specialty. Trauma centers had traditionally been associated with urban, inner city teaching hospitals that had strong traditional commitments to the care of the indigent. With the development of government-sponsored insurance programs; the increased understanding of the importance of rapid transport to definitive care as a means of preventing early death from injury; and the realization that most injuries sustained by Americans occurred away from the inner city, led to the identification of trauma care units in tertiary care hospitals across the country.

As these systems grew and proliferated, organized visions for the future of trauma systems were required and organizations such as the American Trauma Society partnered with government agencies to articulate this vision.<sup>i</sup> In this report, entitled Trauma System: Agenda for the Future, the need to have an inclusive trauma system with effective regionalization and an integrated, multidisciplinary approach was recognized. The authors also emphasized the increased hospital costs associated with trauma care and the need for a role for government at all levels to assist in providing funding. These increased costs, necessary to provide the acute and rehabilitation services for injured patients cared for by the integrated trauma system, are associated with lower overall costs because of the reduced mortality and increased return to productive activity for these patients.

The fundamental components of an inclusive trauma system are prevention, pre-hospital care, acute care facilities, and post-hospital care. The key infrastructure elements are leadership, professional resources, education, advocacy, information management, finances, research, technology, and disaster preparedness. In the next section, the status of the Florida Trauma System in achieving this organizational structure is summarized. According to a report authored by MacKenzie and colleagues<sup>ii</sup> in 2003, there were 190 Level I and 263 Level II trauma centers in the United States in 2002. Recent data from the Coalition for Trauma Care indicate that, as of 2004, there were 747 trauma centers in the United States divided into 214 Level I, 406 Level II, 97 Level III, and 30 unclassified.

A phase of rapid growth of trauma systems occurred during the late 1980s and the early 1990s. Most trauma centers were self-designated. Many subsequently chose to seek verification of trauma capability through the American College of Surgeons. There were a few states, such as Florida, where government supervised system development was undertaken, and state-level rules for center designation were used.

Reductions in the rates of reimbursement have occurred related, at least in part, to efforts to control healthcare costs through managed care approaches and the inability of managed care organizations to react to the unique hospital and professional cost structures associated with trauma care. These reductions have been coupled with increases in fixed costs for trauma centers due to advances in technology and medical knowledge, as well as to increased costs to provide consistent medical specialist availability and liability protection. These developments have led to the contraction of trauma systems in many areas nationwide, including Florida, accompanied by the loss of participation by acute care providers. Dailey and associates<sup>iii</sup> assessed trauma center closures by analyzing information from 44 trauma centers, which ceased participation in trauma systems in 14 states. They documented medical staff opposition to trauma center status and inadequate financing as the two most important challenges for trauma center hospitals. The 2002 HRSA report about the development of state trauma systems cited finance and human

resource availability as the two greatest threats facing states as they developed their trauma systems.<sup>iv</sup> Financing crises have led to national scrutiny of trauma systems because of threatened closure of trauma center hospitals and reductions in access to trauma care in Los Angeles County, California<sup>v</sup>, and Las Vegas, Nevada.<sup>vi</sup>

The scientific foundation supporting establishment of regional trauma systems was formed from a series of empiric observations made repeatedly over the past 20 years documenting a decline in injury-related mortality when results after a trauma system is established are compared to mortality rates prior to establishment of the system.<sup>vii, viii, ix</sup> The majority of the studies which employ this type of historical control methodology report an expected reduction in injury-related mortality of 15–19 percent resulting from the implementation of the trauma system.

Recent assessments of system efficacy have focused on the appropriateness of triage criteria and studies that compare trauma center outcomes to those observed in non-trauma centers. The rapid delivery of a seriously injured victim to a trauma center by advanced pre-hospital care services is recognized as a critical component of the trauma system. Recent reports from mature regional trauma systems report appropriate pre-hospital triage in 33–71 percent of cases. Higher appropriate triage rates are observed in more mature trauma systems and in geographic areas that are in close proximity to trauma centers.<sup>x, xi</sup> Patients delivered to trauma centers are more likely young, male, and victims of multiple injury events such as motor vehicle crashes. Evidence is available that elderly patients are more likely to be inappropriately triaged. Phillips and associates<sup>xii</sup> studied the Florida trauma system and confirmed that pre-hospital triage criteria did not reliably identify seriously injured elderly patients. Similar findings have been reported by others.<sup>xiii</sup>

<sup>xiv, xv</sup>

Comparisons of overall outcome for similarly injured patients treated in trauma centers and non-trauma centers have been difficult because of confounding variables preventing adequate case matching. Some of these hazards include variances of case mix, maturity of the trauma system, and characteristics of the database examined. For example, Reilly and colleagues<sup>xvi</sup> reported equivalent risk-adjusted mortalities in patients treated in trauma centers and acute care hospitals in New York City. This study was questioned because of the significant variability in hospital death rates particularly deaths within 24 hours of injury among the hospitals examined. Nearly twice as many patients died within 24 hours in trauma centers as compared to non-trauma center hospitals.

Examination of trauma death statistics suggested that emergency department deaths of non-admitted trauma patients were not recorded in the database examined. Kane and co-authors<sup>xvii</sup> reported data from the Los Angeles County trauma system two years after implementation and found a trend toward improved survival in patients triaged to trauma centers that did not reach statistical significance. Clark and associates<sup>xviii</sup> reported equal frequencies of mortality in trauma centers and non-trauma centers in Maine. The failure of the available research to document a reduction in mortality for patients treated in trauma centers versus non-trauma centers is not surprising. In mature trauma systems with adequate triage methods, delivery of seriously injured patients to trauma centers means that the patients with the largest risk of dying will be clustered in the trauma centers. Thus, an increased or unchanged mortality risk observed in trauma centers would not be unexpected given the distribution of risk groups triaged in mature systems.

In fact, the phenomenon of increased mortality risk in patients delivered to trauma centers has been observed in at least one state system.<sup>xix</sup> There are additional reasons for the overall improvement of trauma outcomes in a geographic area following implementation of a trauma system. Improvement in access to sophisticated pre-hospital care services is a major force for improvement in outcomes. Shortened emergency medical service response times and overall evacuation times result in delivery of trauma victims to definitive care sites within the “golden hour.” Improved medical control of pre-hospital care permits the performance of airway and resuscitation interventions, which improve the outcomes for certain time-urgency injuries such a traumatic brain injury where limitation of secondary injury due to hypoxia and hypotension is clearly linked to improved clinical outcomes. Finally, a halo effect of the trauma system extends to non-trauma hospitals. Barquist and colleagues<sup>xx</sup> documented this effect in their study of trauma care in the Finger Lakes region of New York.

The cost effectiveness of trauma systems is thought to occur through the return of recovered trauma victims to productive life. Documentation of this requires longitudinal follow-up research in large groups of patients, and the data available to date suggest, but do not prove, this effect. The effectiveness of any regional trauma system, therefore, will be established definitively through research in the future dealing with long-term survival and quality of life.

# STATUS OF THE FLORIDA TRAUMA SYSTEM

The Florida trauma system is a mature, statewide, government-led system, which is more than 20-years-old. A continuum of trauma care, which provides modern injury control

coordinated from prevention to pre-hospital care to acute care to rehabilitation and return to productive life, is the central goal of the system.

The Florida Department of Health is working toward the establishment of an inclusive statewide system to meet the needs of trauma victims with the objective to supply access to a trauma center via an integrated pre-hospital delivery system within 60 minutes of the injury event for 90 percent of Floridians.

The 1982 Florida Legislature passed Florida's first trauma legislation, which required the Department of Health and Rehabilitative Service (HRS) to verify any hospital desiring to become a trauma center meets trauma center guidelines established in state rules and based on the nationally recognized American College of Surgeons' standards. The Legislature expanded this law in 1987 to require HRS to develop a statewide trauma system that included numerous components other than trauma centers. The 1987 law recognized the financial problems facing Florida's trauma care providers by directing the state's Health Care Cost Containment Board (HCCB) to determine the financial magnitude of the problem and provide the Legislature with recommended solutions. The HCCB study showed that 66 hospitals in the study lost approximately \$41 million treating trauma patients. The HCCB recommended several general actions—including increasing motor vehicle registration fees—to alleviate the trauma care financial problems. The 1989 Florida Legislature felt the need for more implementation specifics before it could provide the substantial funding required by the recommendation.

The Roy E. Campbell Trauma Act of 1990 established the specific steps for an individual, general, acute care hospital in Florida to follow when seeking state approval to provide trauma care services. Included in the steps are the requirements that the hospital provide a written application to the Department of Health's Bureau of Emergency Medical Services for review and approval, and the hospital accept an on-site survey by department staff and contracted out-of-state surveyors with expertise in trauma patient care.

In 1995, the Joint Commission of Health Care identified the need to study the efficacy of establishing a pre-hospital triage plan to ensure that trauma patients are being served in the closest appropriate trauma facility. The Department of Health completed a study and reviewed all existing rule language for adult and pediatric trauma scorecard methodology.

The Department of Health's Bureau of Emergency Medical Services provided a report on the study, "Timely Access to Trauma Care," to legislature in 1998. Based on the recommendation of this report, legislation passed during the 1999 Legislative Session, which directed the department to plan, coordinate, and establish an inclusive trauma system plan, "State Trauma System Plan December 2000 — December 2005," designed to meet the needs of all trauma victims. In addition, \$4.8 million was appropriated to the 20 state approved trauma centers for fiscal year 2000. Key projects for the State Trauma System Planning Committee included transfer and consultation criteria development, hospital partnership concept development, trauma service area review, trauma region development, injury severity review, and promotional strategies for trauma agency development.

September 11, 2001 (9/11), brought tremendous change to the EMS and trauma centers across the country. Not only did we change our thinking in terms of the numbers of disaster-related casualties from hundreds to thousands, we also realized the importance of maintaining and rebuilding the EMS and trauma systems within our major metropolitan areas should they suffer personnel and infrastructure losses.

As December 2001 closed, much had changed from the previous year. The Governor established state and regional domestic preparedness task forces. Drugs and supplies were stockpiled in regional EMS and trauma centers for rapid deployment of antidote and personal protective equipment to incidents, while public and private organizations with a stake in domestic preparedness were brought together to combat

terrorism, and communicate with each other. The attack also helped the public recognize emergency medical technicians (EMTs), paramedics, trauma physicians, nurses, firefighters, and law enforcement officers as heroes. Legislative proclamations and numerous community ceremonies since the 9/11 terrorist attack also have declared those who served under the “Star of Life” as heroes.

The 2004 hurricane season from August 13 to September 26, 2004, resulted in four major disasters and widespread devastation in our state. Our Florida trauma and EMS system provided services through a program of mitigation, preparedness, response, and recovery whenever and wherever the situation required reducing injuries and the loss of life. With the hurricanes’ disruption of essential services, the trauma system was an essential part of the continuum of care with links to the EMS system, dispatch centers, educators, fire service, police, and home-health and other healthcare providers. Throughout the disasters, the Office of Trauma staff served to maintain a foundation of sound trauma and emergency medical practices while further growing and expanding our community partnerships and collaborative efforts.

Significant progress has been made in evaluating trauma care and meeting the needs of trauma patients since the trauma plan’s inception. Improvements to the inclusive trauma system to date include:

- **Completing the Trauma Service Area Study in January 2001.**
- **Conducting a six-year evaluation on state-approved trauma center and state-approved pediatric trauma referral center approval standards as listed in DOH Pamphlet 150-9, in February 2001, which resulted in revising Florida’s trauma center standards.**
- **Establishing a rule in 2001 governing the inclusive trauma system in several areas including the establishment of an electronic registry.**
- **Receiving a \$45,000 supplement through the United States Department of Health and Human Services “EMSC Federal Partnership Grant” in September 2001, which included special emphasis on trauma in rural areas and trauma registry training.**
- **Amending rules in 2002 governing trauma transport protocols, trauma agencies, trauma triage, and the security of medications.**
- **Partnering with Brain and Spinal Cord Injury Program (BSCIP) to draft the HRSA grant, “Reaching Florida’s Providers Concerning Traumatic Brain Injury,” and submitted it in December 2002. The first \$100,000 of the \$500,000, five-year grant award was disbursed in March 2002.**
- **Completing the “Cost of Trauma Center Preparedness Report” in May 2002.**
- **Revising Florida’s trauma center standards.**
- **Implementing improved trauma center, site survey tools and decreasing associated cost.**
- **Revising adult trauma triage criteria and developing pediatric trauma triage criteria to address the anatomy and mechanism of injury criteria.**
- **Creating proclamations, signed by the Governor, to proclaim Trauma Awareness Day May 22, 2003 and May 21, 2004.**
- **Accepting the first complete electronic data submission in July 2002 from Florida’s 20 trauma centers.**
- **Collaborating with the BSCIP to implement site survey integration in June 2003. The integration of site surveys has saved Florida taxpayers \$1.5 million.**
- **Awarding of the \$3.8 million HRSA “Hospital Preparedness Bioterrorism Grant for Trauma and Burn Care.” In August 2003, Florida’s trauma system became the national leader in the burn care field with the adoption of a new, American Burn Association-approved, curriculum that promises to serve as the model for the rest of the nation.**
- **Issuing of the Florida Senate’s two interim reports about Florida’s trauma system in November and December 2003. The first report, “Review of Trauma Care Planning and Funding in Florida,” was prepared by the Committee on Appropriations, which reviewed the status of Florida’s trauma system to determine the effectiveness of trauma planning, the adequacy of the current network and the impact of alternative funding strategies. The second report, “Hospital Response Capacity,” was prepared by the Committee on Home Defense, Public Security, and Ports, which investigated the adequacy of surge capacity at Florida hospitals.**
- **Receiving the \$40,000 HRSA “Over Triage Grant” (2003–2005).**
- **Completing the Trauma Annual Report and trauma registry 2002 and 2003.**

- **Establishing the Division of Emergency Medical Operations to include the following: Bureau of Emergency Medical Services (EMS), Office of Trauma, Office of Public Health Preparedness, Office of Emergency Operations.**
- **Completing this \$300,000 comprehensive assessment of the existing trauma system, mandated by Senate Bill 1762, due to the Governor and Legislature by no later than February 1, 2005. The final report to the legislature includes recommendations regarding the realignment of trauma services areas and the number of trauma centers needed in each trauma service area to provide a statewide, integrated trauma center, and identification of a continued revenue source.**
- **Awarding the \$11.5 million HRSA “Hospital Preparedness Bioterrorism Grant for Trauma/ Burn Care,” in September 2004 by the Office of Trauma.**
- **Receiving various honors such as the Davis Productivity Award for the 1999-2002 trauma center site survey process and the Department of Health’s 2001 Quality Management Showcase Award. Both awards were given to the Trauma/Compliance section.**
- **Integrating trauma with disaster preparedness efforts.**

The Florida trauma system was evaluated along with other states’ systems in a 2002 HRSA study.<sup>xxi</sup> In this study, the Florida system had accomplished more than 50 percent of the major criteria for trauma system development. Moreover, advanced life support pre-hospital care was available for more than 80 percent of the citizens of the state. Challenges noted for the Florida trauma system included the availability of human resources and durable financing. These two continuing obstacles to progress for the system have occupied the attention of the leaders of the system and have stimulated much thought and effort to produce a satisfactory set of solutions.

Documentation of cost issues has been plentiful. In addition to the cost-of-care study referred to above, Taheri and co-authors<sup>xxii</sup> reported a study readiness costs for Florida trauma centers and documented an average cost of almost \$3 million per trauma center.

Cost and manpower concerns have resulted in tensions within the trauma system during the 2003-2004 interval, which have taken the form of threatened closures of two centers, one of which is one of the six Level I centers for the state and the only center serving a city with a population of nearly one million. The proximate cause of the threatened closure in each instance was the necessary medical specialists’ decisions to discontinue support of the center. As the main drivers of these decisions, in each instance, the specialists cited the necessity to cancel or postpone revenue producing patient services to cover trauma center patient care obligations and the pressures of the malpractice insurance crisis. These crises were resolved, at least temporarily, by a coalition of government and hospital leaders who were able to arrange funding for stipends to be paid to specialists for support of trauma patient care.

State government support of the Florida trauma system has taken the form of an annual appropriation to each trauma center, as well as favorable payment methodologies for trauma centers via the Medicaid insurance system. In May 2004, the Governor vetoed the funding bill that would have continued the annual award of grants in similar amounts of money to each trauma center. In the veto message, the Governor cited the potential inequities of a funding method that awards a set amount to each trauma center; the absence of a clear plan for the future deployment of trauma system resources; an absence of a clearly articulated plan for consistent local participation in the financial support of the trauma system; and, the need to document the effectiveness of the trauma system. It is in this context that the subsequent data reporting, analysis, and recommendations are offered.

A National Steering Committee composed of recognized experts in the fields of trauma care and trauma system analysis assisted in the completion of this report. The membership of this group is found in Appendix 2. A State Steering Committee composed of leaders from various healthcare fields in Florida, as well as knowledgeable members drawn from stakeholders in the trauma system (Appendix 3), met on two occasions and provided strong and valuable input to the process leading to the conclusions and recommendations found in this report. To these individuals we owe a debt of gratitude.

Leaders of trauma agencies, EMS providers, trauma center executives, and executives of non-trauma center hospitals were surveyed to gauge opinions regarding the system. The data from these surveys (found in Appendices 4-6) provided valuable contextual perspective for our conclusions and recommendations.

# TRAUMA CENTER OUTCOMES—NATIONAL AND STATEWIDE

This portion of the study satisfies goals 4 and 6, as well as objectives 6 and 19 listed in the Introduction.

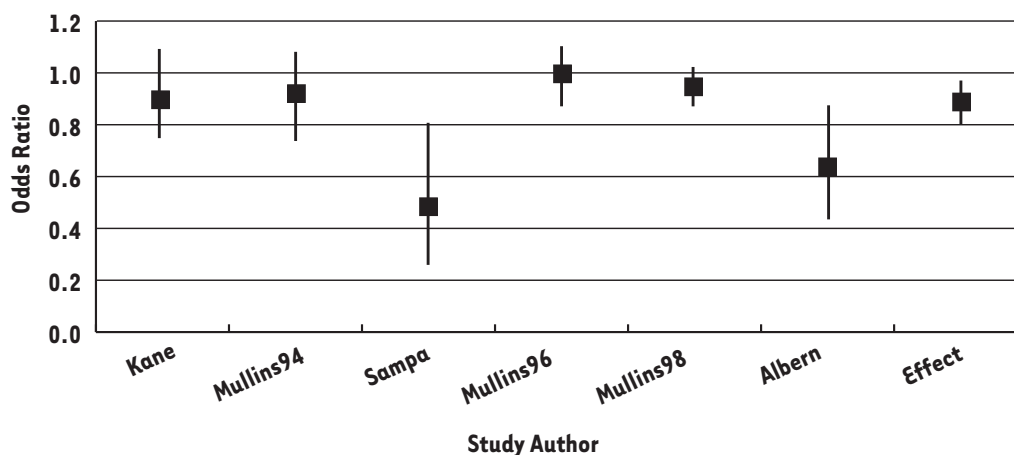
This analysis addresses if patient outcomes are better as a result of the

existence of a state trauma system and how outcomes from Florida trauma centers (TC) compare to non-trauma centers (NTC).

## Evaluation of National Experience

A meta-analysis of the existing literature published in English evaluates previous methods used to compare trauma system effectiveness. The primary objective was to review and identify common methodologies that were used in these studies with the intent of applying similar approaches in comparing patient outcome in Florida TC versus NTC. The criteria for entry into the meta-analysis included that the study was population-based, that it compared pre-trauma system development to post-trauma system development, that there was sufficient data to calculate odds ratios, and that the study had been published in peer-reviewed scientific literature.

Figure 1: Odds Ratio Mortality at Trauma Centers versus Non-Trauma Centers



This process identified 14 reports that qualified for analysis. Figure 1 presents the results of this evaluation, the box figures below the unity line (odds ratio line 1) indicate a survival advantage for a trauma system, and the total effect recorded in all studies is indicated by the rightmost box figure. The overall data demonstrate significantly lower odds of mortality following a trauma center designation. Overall, instituting a trauma system results in a 15-percent reduction in mortality from all mechanisms of injury. Of interest is that this outcome advantage required, on average, five years to achieve this degree of difference in outcome.

Most investigators cited in the meta-analysis used commercially available ICDMAP-90® software (Trianalytics, Inc., Baltimore, MD) for risk stratification. This product converts International Classification of Disease (ICD) discharge diagnoses to injury severity scores to allow standardized outcome comparison. Among other methods used for risk stratification were the International Classification Injury Severity Score (ICISS). This can be more precisely population-based and requires no additional software manipulation of available data. One report used in the meta-analysis included a rigorous comparison of the accuracy

of risk adjustment of the ICISS method to all other available severity adjustment systems, and validated that ICISS was most accurate. We therefore elected to employ ICISS as a more relevant and valid method of converting discharge diagnoses to risk of mortality. Two other relevant observations emerged from this meta-analysis.

Numerous investigators used specific ICD codes to define patients considered truly at risk from injury. Similar ICD ranges were used for this analysis, and are listed in Table 1.

**Table 1: ICD-9 Code Range and Description**

<b>ICD-9 Code Range</b>	<b>Description</b>
<b>800-829</b>	<b>Fractures (see exclusion 1)</b>
<b>800-809, 850-854, 952</b>	<b>Skull and spinal cord injury</b>
<b>860-869</b>	<b>Internal injury of thorax, abdomen, and pelvis</b>
<b>900-904</b>	<b>Injury of blood vessels</b>
<b>940-949</b>	<b>Burns</b>

Also of interest were citations of specific ICD codes outside of injury classification ranges that were used as indicators of common pre-existing patient co-morbidity. These were especially relevant to evaluation of elderly trauma victims, because of the implied additional physiologic fragility these diagnoses produce. Many investigators feel that outcome assessment of the more vulnerable elderly population is the most accurate indicator of true trauma system performance. Because of the high volume of elderly living in Florida, the population of trauma victims aged greater than 64 years was analyzed in detail, and is discussed below.

# FLORIDA TRAUMA SYSTEM PERFORMANCE

## Patient Selection

Because of the findings of our meta-analysis, the Agency for Health Care Administration

inpatient discharge database for 2003 was queried to identify all patients whose discharge diagnosis fell within the ICD-9 code ranges 800 through 959, amounting to 142,311 cases. From these cases, codes involving acute poisoning or non-acute injury related diagnoses were excluded, therefore, yielding an initial dataset including patients who (a) were admitted to Florida hospitals, (b) had at least one recorded injury diagnosis, and (c) who were coded as an emergency admission.

Some diagnoses included injury cases that were minor or within the scope of non-trauma center services, and excluded from analysis to allow comparisons with existing peer-reviewed studies of trauma systems in other states that focus on similar populations. This subgroup is defined under "Exclusions." The final cohort, referred to as "true trauma victims," are defined as those with at least one diagnosis from one of the categories shown in Table 1, and the admission was coded as an emergency. There were 75,147 patient discharges that fell within this group.

## Exclusions

Because the intent of this analysis was to compare performance of TC to NTC in managing trauma victims with injuries that may cause fatality, two subgroups within the above population were excluded. First, elderly patients with a specific type of femoral fracture that commonly results from falls are not considered acute trauma victims, and were excluded from comparative analysis of the outcome between TC and NTC. Second, patients with a single injury associated with no potential for mortality are not the patients for which trauma systems are designed, and therefore, were excluded from TC/NTC comparison. Regardless of trauma center designation, these "mildly injured" cases do add to the volume of patients to be processed and compete for resources dedicated to salvage of high-risk patients. Their presence in the TC population may therefore exert some effect on the outcome of system performance.

As such, the final study group included patients with at least one ICD listed in Table 1, excluding patients whose ages were greater than 65 whose only injury consisted of ICD code 820.XX, and patients with a single injury that had a computed probability of survival (Ps) of 100 percent.

This stratification eliminated 37,842 patients from the study group, diminishing the population of "true trauma victims" from the original 75,147 cohort of patients with any injury diagnosis to a study group of 37,442 patients with potentially life-threatening injury. The proportion of these patients who received care at a designated trauma center was 38 percent.

## Risk Adjustment

To stratify patients by risk of mortality, the ICD diagnoses were used to calculate a probability of survival for each patient. The method used was the International Classification Injury Severity Score (ICISS); this computes a probability of survival for an individual patient by multiplying the single survival risk ratios (SRR) of each of the patient's injury diagnoses. The product of these SRR's is the probability of patient survival (PS). Survival risk ratios are determined by analysis of a large trauma population to determine the ratio of fatalities for each ICD code divided by the number of patients with that specific ICD code. For example, if a population of 1,000 patients with femoral fractures included 100 patients who died, then the single SRR for that particular diagnosis would be .9 or  $[1 - (100/1000)]$ . A patient with two injuries, one having a SRR of .9 and the other having a SRR of .5, would have a total probability of survival of .9 multiplied by .5, yielding a PS of .45.

This system does not take into direct account presenting physiology, but rather relies on the common physiologic abnormality associated with specific injuries to derive the computation of SRRs for those specific injuries. In this way, the ICISS indirectly reflects the effect of the physiologic abnormalities of acutely injured

patients. This methodology has been validated in multiple studies and has been demonstrated to be a robust indicator of the probability of survival, as well as utilization of critical care resources. For the purposes of this study, the Florida AHCA databases from 1998 to 2002 were used to calculate individual ICD code SRRs, which were then applied to calculate the probability of survival for each patient in the 2003 study group. The use of data from the prior five years to derive the ICISS eliminates statistical problems associated with collinearity.

Outcome was then assessed in terms of mortality and patient charges. The latter is recorded in the AHCA dataset, and is subcategorized by various patient care units. We used ICU charges as a surrogate for levels of care associated with high resource consumption and total charges as a surrogate for total system function.

## Results

### DISPERSION OF PATIENTS AMONG TRAUMA CENTERS AND NON-TRAUMA CENTERS

During calendar year 2003, 2,422,655 discharges took place from Florida hospitals. State-designated TCs provided care for 22 percent (n=533,720) of all patients, trauma and non-trauma. When considering the true trauma patient population, the proportion of cases managed by state-designated TCs increases significantly to 38.3 percent (n= 14,240). Table 2 on the next page illustrates the distribution of trauma cases among the 21 designated trauma centers. A disproportionate volume of trauma victims (45 percent) received care from the statutory teaching hospitals that are designated as trauma centers. Moreover, it is clear from our analysis that the existing trauma centers in the state serve patients from large geographic areas within the state of Florida. In 2003, the designated trauma centers, on average, served 10 counties each. On average, the (then) six Level I centers served 22 counties.

The data revealed an important difference concerning the location of care received by patients residing in counties without a TC. A consistently higher percentage of this group of patients received care at TCs located outside their home county rather than at an NTC. This difference was similar for every strata of risk of survival as determined by ICISS. This wider geographic patient dispersal clearly demonstrates the regional function of TCs. The observation that this difference between trauma centers and non-trauma centers is similar for all four categories of risk suggests that the process of triage is not adequately sensitive to identifying patients in most need of transport to a designated trauma center. The data support the conclusion that the presence of a trauma center is associated with a reduced motor vehicle injury fatality rate. In a separate analysis, motor vehicle injury fatality rates were strongly associated with the distance from a trauma center to the injury event site (Appendix 6).

**Table 2: Geographic distribution of true trauma patients**

TRAUMA CENTER CASE VOLUME HOSPITAL NUMBER AND NAME	TRAUMA CATEGORY					
	ALL	FRACTURES	TORSO	VASCULAR	BURNS	SPINAL
10022 Jackson Memorial Hospital	1,818	692	340	10	93	823
100006 Orlando Regional Medical Center	1,356	578	206	14	51	616
100001 Shands Jacksonville Medical Center	1,295	584	220	19	6	658
100128 Tampa General Hospital	1,238	476	187	5	121	577
100032 Bayfront Medical Center	1,084	490	159	9	3	620
100017 Halifax Medical Center	953	367	119	4	9	470
100019 Holmes Regional Medical Center	826	323	85	5	0	409
100075 St Josephs Hospital, Inc.	824	331	128	11	4	351
100039 Broward General Medical Center	775	296	118	6	15	303
100157 Lakeland Regional Medical Center	743	313	89	10	7	289
100113 Shands Hospital at the Univ. Of Florida	640	215	78	4	110	259
100038 Memorial Regional Hospital	604	251	90	2	4	283
100086 North Broward Medical Center	589	264	63	4	2	282
100025 Sacred Heart Hospital	368	165	60	0	4	137
100093 Baptist Hospital	306	142	34	0	1	138
100010 Saint Mary's Medical Center	247	94	18	0	0	121
100231 West Florida Hospital	202	88	23	1	1	89
110199 Miami Children's Hospital	151	68	11	0	3	36
100258 Delray Medical Center	94	39	5	0	2	60
100250 All Children's Hospital	80	30	16	0	1	46
100012 Lee Memorial Hospital	47	19	10	0	0	24

Table 3 on the next page lists the number of true trauma patients and the mortality rate by decreasing incidence for every county in the Florida, as well as an “unknown” category for patients for whom county data was not available. The 20 counties with the highest crude mortality do not have trauma centers located within the county lines.

A logistic regression analysis was performed to evaluate the differential effect of trauma centers while controlling for the influence of demographic characteristics such as age, gender, race, risk of mortality, location, and class of injury. The results indicate a statistically significantly better outcome for patients who presented with injuries in trauma centers. An analysis of Fatality Analysis Reporting System (FARS) data further validated this, which demonstrated a 3.2 fold increase in mortality potential from motor vehicle injuries sustained in a county without a trauma center.

**Table 3: Mortality rate by county, sorted in descending order by the overall mortality rate of non-burn trauma cases.**

R	COUNTY	N	M*	R	COUNTY	N	M*	R	COUNTY	N	M*
1	Hardee	49	14.29	23	St. Johns	673	5.79	46	Jackson	69	4.35
2	Jefferson	17	11.76	24	ORANGE	1660	5.72	47	Hernando	438	4.34
3	Wakulla	40	10.00	25	Hendry	35	5.71	48	LEE	490	4.29
4	Gadsden	51	9.80	26	Alachua	425	5.65	49	DADE	4549	4.11
5	Calhoun	25	8.00	27	Nassau	124	5.65	50	Bay	318	4.09
6	Leon	243	7.82	28	Charlotte	393	5.60	51	VOLUSIA	1356	4.06
7	Lafayette	13	7.69	29	HILLSBOROUGH	2209	5.52	52	BROWARD	3781	3.60
	Unknown	2049	7.52	30	DUVAL	1555	5.40	53	Collier	611	3.44
8	Suwannee	84	7.14	31	Marion	474	5.27	54	Martin	314	3.18
9	Highlands	244	6.97	32	Flagler	116	5.17	55	DeSoto	64	3.13
10	Hamilton	29	6.90	33	Okaloosa	272	5.15	56	Levy	96	3.13
11	Osceola	366	6.83	34	PINELLAS	2579	5.00	57	Washington	32	3.13
12	Manatee	672	6.70	35	Columbia	140	5.00	58	Putnam	176	2.84
13	Liberty	15	6.67	36	Monroe	180	5.00	59	PALM BEACH	2121	2.64
14	Indian River	286	6.64	37	Brevard	1185	4.81	60	Okeechobee	93	2.15
15	Seminole	229	6.55	38	Sarasota	397	4.79	61	Union	50	2.00
16	Gilchrist	46	6.52	39	Pasco	869	4.72	62	Bradford	62	0.00
17	Clay	233	6.44	40	Baker	43	4.65	63	Glades	11	0.00
18	Sumter	110	6.36	41	Dixie	22	4.55	64	Gulf	35	0.00
19	Franklin	16	6.25	42	Lake	618	4.53	65	Holmes	12	0.00
20	Walton	68	5.88	43	ESCAMBIA	552	4.53	66	Madison	25	0.00
21	POLK	1111	5.85	44	St. Lucie	584	4.45	67	Taylor	34	0.00
22	Citrus	275	5.82	45	Santa Rosa	294	4.42		Unknown		

All capitalized counties that have TCs.

The data show that the age distribution of patients treated in trauma centers versus non-trauma centers is very different. The trauma center population reflects the traditional bell-shaped curve peaking for ages 21–45. This is consistent with established epidemiologic principles of injury and re-emphasizes that injury is, in fact, a disease that disrupts the most productive component of society. The non-trauma center population, on the other hand, skews toward the elderly, reflecting the population demographics of the state and reiterating the high rate of utilization of healthcare resources by the sizeable elderly population

residing in Florida. There is a secondary spike in the frequency of elderly patients treated in TCs. Because of the risk of under-triage of injured elderly patients, there is a need to continue to analyze this population subgroup to make certain that triage by the system is appropriate to optimize system performance and outcome.

## Mortality risk

Table 4 on the next page stratifies the number and proportion of patients treated in trauma centers and non-trauma centers by four categories of risk of survival as computed by the ICISS method. This data demonstrates that the percentage of trauma center patients in the more severely injured categories is higher than that seen in non-trauma centers. The ratios of trauma center to non-trauma center proportions of each of the four categories indicate there are 4.2, 6.7, and 9.0 times higher percentages of patients in trauma centers with most severe, severe, and intermediate injury, respectively. In a separate analysis, the selected patients were stratified using the All-Patient DRG® methodology (DRG) available from the 3M Company. These findings indicated that the proportion of most severely ill patients (“extreme category”) was 2.5 times larger in TCs as compared to NTCs.

**Table 4: Probability of survival or ICISS categories**

PS CATEGORIES ICISS CATEGORY	NTCs		TCs	
	COUNT	PERCENT	COUNT	PERCENT
<b>All trauma discharges, excluding burns</b>				
<b>Not expected to survive (most severe)</b> ICISS ≤ 0.125	159	0.7	414	3.0
<b>Not expected to survive (severe)</b> 0.125 < ICISS ≤ 0.25	77	0.3	271	2.0
<b>Intermediate</b> 0.25 < ICISS ≤ 0.50	25	0.1	127	0.9
<b>Expected to survive</b> ICISS > 0.50	22,492	98.9	12,842	94.1

## Diagnoses and procedures

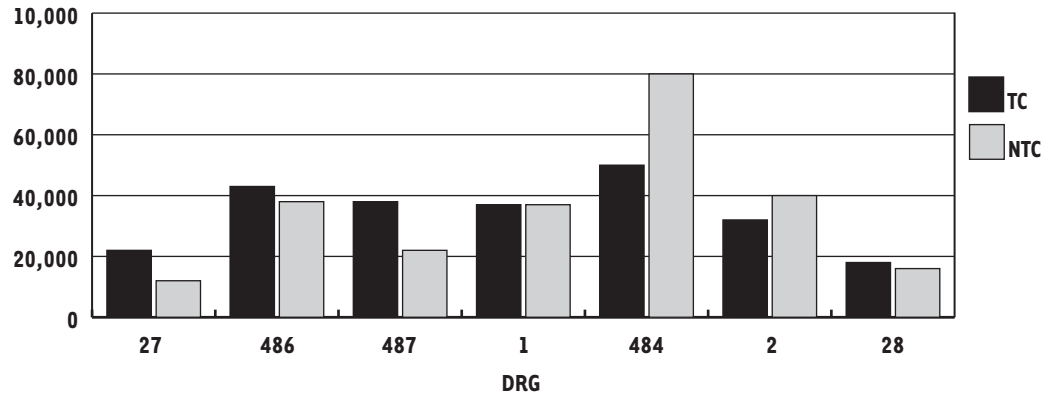
The risk of mortality data in Table 4 demonstrates that patients treated in trauma centers have more acute, life-threatening injuries. A more specific definition of these patients’ acuity was determined by analyzing the number of diagnoses and procedures that these patients received during their acute hospitalization. On average, counting both true trauma and non-trauma diagnoses, non-trauma center patients were assigned more diagnoses; however, trauma center patients required more procedures. When only true trauma diagnoses were considered, the percentage of patients with more than one injury diagnosis in non-trauma centers was 19.1 percent; whereas, almost half of the patients (46.7 percent) transported to trauma centers had more than one injury diagnosis to be evaluated and managed. When the analysis of the numbers of diagnoses and procedures was further stratified by surviving and non-surviving patients, it was apparent that the number of procedures associated with non-surviving patients was significantly higher in trauma centers, which suggests increased efforts to resuscitate and salvage these patients.

## Length of stay

Although only 38 percent of true trauma patients were treated in TCs, these patients required 47 percent more hospital bed days. A disproportionate number of trauma center patients also had lengths of stay of less than one day. Because mortality within 24 hours of injury suggests maximum threat to survival,

fatalities with lengths of stay of less than 24 hours were analyzed in detail to compare the nature of injuries encountered in TCs versus NTCs. Figure 2 on the next page illustrates the per-case charge of the most frequent DRGs treated in both TCs and NTCs. These patients' DRGs demonstrated that TCs treated a disproportionately higher volume of life-threatening central nervous system injuries and poly-system trauma that required urgent operative intervention.

**Figure 2: Per-Case Charge—Fatality Within 24 Hours**



The excessive costs at NTCs for care of DRGs 484 and 2 probably reflects the absence of an organized trauma service to provide the cost-effective, comprehensive care required by patients with these diagnoses. Table 5 below lists the DRGs and the per-case charge for TCs and NTCs. As stated previously, the total patient charges are used as the available surrogate for resource consumption and intensity of care.

**Table 5: Per Case Charge**

DRG	DESCRIPTION	TC	NTC	DIFFERENCE
27	MED TRAUMATIC STUPOR & COMA, COMA >1 HR	\$21,488	\$12,034	\$9,453
486	SURG OTHER O.R. PROCEDURES FOR MULTIPLE SIGNIFICANT TRAUMA	\$42,845	\$33,829	\$9,017
487	MED OTHER MULTIPLE SIGNIFICANT TRAUMA	\$34,100	\$22,643	\$11,457
1	CRANIOTOMY AGE>17, EXCEPT FOR TRAUMA	\$33,746	\$33,150	\$596
484	SURG CRANIOTOMY FOR MULTIPLE SIGNIFICANT TRAUMA	\$49,980	\$79,378	(\$29,397)
2	SURG CRANIOTOMY FOR TRAUMA AGE >17	\$31,610	\$39,082	(\$7,472)
28	MED TRAUMATIC STUPOR & COMA, COMA <1 HR AGE >17 W CC	\$16,239	\$12,933	\$3,306

Analysis of the other end of the length of stay spectrum indicated that 8.1 percent of trauma patients required a length of stay greater than 20 days compared to only 2.4 percent of non-trauma center patients. When this data was further stratified to just non-surviving patients, the percentage of expired patients with a length of stay of one day in the trauma center was, in fact, double that of the non-trauma center, reiterating the point mentioned immediately above.

## Discharge disposition

Analysis of outcomes as determined by discharge disposition indicated the trauma center patients were more likely to have a "normal" discharge to home, whereas non-trauma patients were more likely to be discharged to another acute or chronic care facility. This may be the effect of the age distribution skew. The mortality rate in trauma centers is significantly higher, which reflects the significantly higher acuity of these patients. Trauma center patients are more likely to be admitted as a transfer from another acute care facility, suggesting some degree of intra-trauma system transport and triage. Evaluation of the length of stay and charges, again, illustrates the increased acuity and cost of care associated with the patients treated in trauma centers (Table 6).

**Table 6: Lengths of Stay (LOS) and Charges**

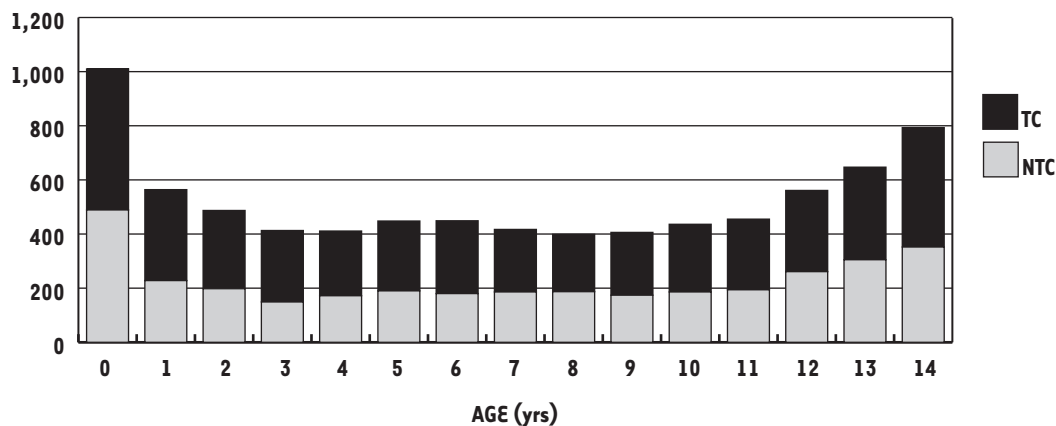
	NTC	TC	% INCREASE TC
LOS (days)	6.1235	9.002	47%
Charges, overall	\$30,081	\$57,198	90%
Charges, emergency	\$917	\$1,712	87%
Charges, intensive care	\$2,323	\$6,918	198%
Percentage intensive care charges	7.7%	12.1%	57%

Charges were significantly higher in trauma centers, both for total charges, as well as mean intensive care unit and emergency room charges. Analysis of the primary payer, as reported to the Agency for Health Care Administration, suggests that most trauma victims have some commercial insurance coverage, and that the uninsured represent 5.8 percent and 11.2 percent of trauma victims, respectively, in non-trauma centers and trauma centers.

## Special Populations

As noted by previous investigators of trauma system performance and as is especially apparent in the Florida data, patients at either end of the age spectrum present unique challenges and special needs. For this reason, data for children (aged less than 15 years) and elderly (aged greater than 64 years) were analyzed in more detail.

**Figure 3: Age Distribution of Children**



## Children

During 2003, Florida hospitals admitted 7,896 children for treatment of at least one injury diagnosis. Figure 3 demonstrates the age distribution by year of life and illustrates no significant differences between TCs and NTCs. A slight majority of these injured children (56 percent) were treated in TCs. Mortality was lower

than the general population, averaging 1.1 percent across all ages through 14–years–old. Analysis of injury severity as measured by probability of survival demonstrates an overwhelming skew toward minor injury with minimal potential for mortality. This is consistent with established epidemiologic reports and is part of the reason that pediatric trauma systems require so much planning emphasis regarding aggressive initial life support and accurate field triage. Table 7 lists the 20 most common causes of injury as recorded in E-codes.

**Table 7: Most Common Injury Mechanisms in Children**

CODE	RANK	INJURY	CODE	RANK	INJURY
E8849	1	Fall from object	E9170	11	Kicked in sports
E8840	2	Fall playground equipment	E9289	12	NOS
E8889	3	Fall NOS*	E9179	13	Struck accident, NOS
E8121	4	MVC** passenger	E8852	14	Fall, skateboard
E8859	5	Fall, stumble	E916	15	Struck by object
E8261	6	Bike passenger	E9248	16	Burn, NOS
E8147	7	MVC pedestrian	E8210	17	ATV*** crash driver
E8844	8	Fall bed	E8136	18	MVC bike
E9240	9	Scald injury	E927	19	Over exertion
E8191	10	MVC passenger	E8842	20	Fall chair

\*NOS = Not otherwise specified.

\*\* MVC = Motor vehicle crash.

\*\*\*ATV = All-terrain vehicle.

These represent 62 percent of injures and demonstrate that falls remain the most common cause of injury for Florida’s children. Table 8 lists the 20 most frequent diagnoses, which also reflect the low lethality of the most common reasons children required inpatient care for injury. In summary, analysis of Florida’s injured children demonstrated that more were treated at TCs, that minor injuries were predominant, and that the most common mechanisms underscore the importance of prevention and education as critical elements in systems of effective injury control.

**Table 8: Most frequent pediatric diagnoses**

DX	#	DIAGNOSIS	DX	#	DIAGNOSIS
81241	1	Supercondylar humeral Fx*	8248	11	Fx ankle
8211	2	Fx femoral shaft	8501	12	Cerebral concussion, brief unconsciousness
49390	3	Asthma	8505	13	Cerebral concussion, unspecified unconsciousness
9480	4	Minor burn	8001	14	Skull Fx, no lost consciousness
8500	5	Cerebral concussion, no lost consciousness	81323	15	Fx radius and ulna
81344	6	Fx distal radius and ulna	2859	16	Anemia NOS** (blood loss)
9100	7	Skin abrasion	9190	17	Abrasion, multiple
86121	8	Lung contusion	8730	18	Head laceration
920.	9	Face contusion	81342	19	Fx radius
78039	10	Seizures	9160	20	Hip abrasion

\* Fx = broken

\*\*NOS = Not otherwise specified.

## The Elderly

Because of Florida's reputation as the ideal retirement state, the elderly represent an unusually large proportion of the population. This demographic characteristic also is reflected in an analysis of victims of severe injury. Somewhat unexpected, however, was the bell-shaped age distribution curve, peaking at the age 80-85 group. Of these patients, 80 percent were hospitalized in non-trauma centers. Risk stratification by probability of survival demonstrated that the vast majority sustained minor injury, although the distribution of severe injury (PS less than .75) was slightly higher at TCs (5 percent) versus NTCs (1 percent).

The fragility of these patients can be appreciated by a review of Table 9, which lists the most common diagnoses recorded in this population. The first injury diagnosis (pubic fracture) is tenth on the list. Of interest is the fact that this supposedly minor injury, when complicated by any of the factors listed above it, will almost certainly result in a less-than-optimal outcome. As it continues to evolve, Florida's trauma care system must address the unique challenges that its elderly citizens present, and must develop better methods to minimize the effects of pre-existing morbidity while maximizing patient potential for return to full functionality.

**Table 9: Most Common Elderly Population Diagnoses**

ICD	#	DIAGNOSIS	ICD	#	DIAGNOSIS
4019	1	Hypertension NOS	2859	11	Anemia NOS
42731	2	Atrial fibrillation	2765	12	Hypovolemia
4280	3	Congestive heart failure	2724	13	Hyperlipidemia
5990	4	Urinary tract infection	8054	14	Lumbar fracture
73300	5	Osteoporosis	7802	15	Syncope
41401	6	Coronary artery disease	2948	16	Organic brain syndrome
496	7	Chronic obstructive pulmonary disease	2761	17	Hyponatremia
25000	8	Adult-onset diabetes (Type II)	71590	18	Osteoarthritis
2449	9	Hypothyroid NOS	53081	19	Gastroesophageal reflux
8082	10	Pubic fracture	8052	20	Thoracic-spine fracture

## Summary

This analysis clearly demonstrates many of the positive returns produced by a fully functional trauma care system. Specific relevant points include:

- Trauma centers serve patients who are geographically more dispersed.
- A county's overall mortality rate is statistically, significantly higher if a trauma center is not present in that county.
- Most trauma victims have some commercial insurance coverage.
- The uninsured consist of 5.8 percent and 11.2 percent of trauma victims in non-trauma centers and trauma centers, respectively.
- The age distribution is skewed toward the elderly in the non-trauma centers and concentrated in the 21-44 age group for trauma centers.
- Trauma center patients require more procedures.
- The percentage of patients with multiple injuries is statistically, significantly higher in trauma centers versus non-trauma centers.
- The percentage of trauma center patients in the most severely injured category is 3.4 times higher than in non-trauma centers.

- **The elderly are very old, very fragile, and present with common co-morbidities that must be considered in risk stratification.**
- **Relatively more injured children received care in TCs (56 percent) than in NTCs, yet their injuries appeared to be of significantly less severity and may represent a different type of abnormality in the pediatric population.**

Although clinical effectiveness and good outcomes are obvious from the data, cost effectiveness requires longitudinal prospective research of long-term outcomes. It is known that older patients have significant risk of mortality within the first two years after a severe injury even though the patient survives to hospital discharge.<sup>xxiii</sup> In a recent survey of 100 trauma patients queried by telephone about employment status, we found that more than half of those severely injured, who were employed prior to injury, had returned to full-time employment in the same job situation. An additional, small proportion of this group was employed in other fields. Those who were unemployed prior to injury were unlikely to be employed two years after injury. Because of these findings, and because of the availability of a wealth of clinical material in Florida, the trauma system should conduct prospective research into long-term outcomes. Each trauma center could, as a component of the re-designation process, perform an annual acute care performance assessment and participate in system-wide prospective research into long-term outcomes.

# REGIONAL PLANNING AND CONTROL IN THE FLORIDA TRAUMA SYSTEM

## Trauma Centers, Regions, Crash Fatalities, and Pre-Hospital Care Resources

### FLORIDA TRAUMA CENTERS

The Legislature recognizes the need for a statewide, cohesive, uniform, and integrated trauma system. Within the trauma service areas, Level I and Level II trauma centers shall each be capable of annually treating a minimum of 1,000 and 500 patients, respectively, with an injury severity score (ISS) of 9 or greater. Level II trauma centers in counties with a population of more than 500,000 shall have the capacity to care for 1,000 patients per year.—Section 395.402, Florida Statutes—Trauma service areas; number and location of trauma centers.

Florida has 21 trauma centers (Map 1, Appendix 7). On average, trauma center (TC) hospitals are larger in overall bed size, with an average 590 hospital beds compared to 210 beds at non-trauma center hospitals. More than half of Florida's trauma centers have private, not-for-profit ownership. Six trauma centers have public/government ownership (29 percent) and three are investor-owned (14 percent). Thirteen of Florida's 67 counties have a trauma center, and six counties have more than one TC. Florida has three types of trauma center verification (Level I, Level II, and Pediatric Trauma Center). All Level I trauma centers are also Pediatric Trauma Centers. Table 10 on the next page profiles Florida's 21 trauma centers.

**Table 10: Florida Trauma Centers by County, Hospital Bed Size, Verification Level, and Ownership**

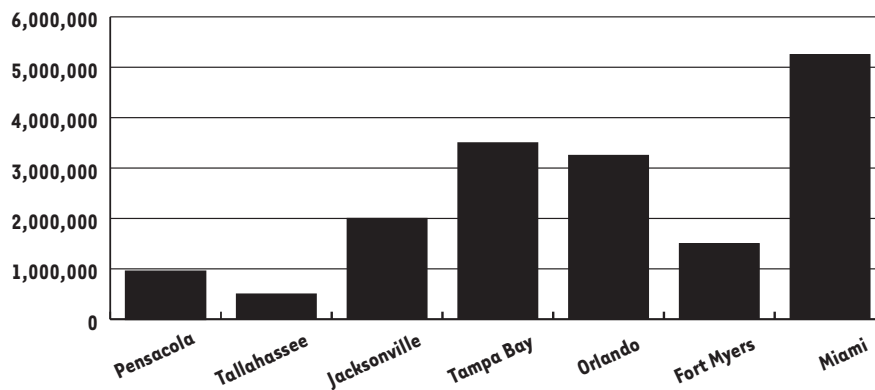
TRAUMA CENTER	COUNTY	BEDS	TC LEVEL	OWNERSHIP
All Children's Hospital	Pinellas	216	Pediatric	Not-for-Profit
Baptist Hospital	Escambia	492	II	Not-for-Profit
Bayfront Medical Center	Pinellas	502	II	Not-for-Profit
Broward General Medical Center	Broward	744	I	Public/Government
Delray Medical Center	Palm Beach	366	II/Pediatric	Investor-Owned
Halifax Medical Center	Volusia	734	II	Public/Government
Holmes Regional Medical Center	Brevard	509	II	Not-for-Profit
Jackson Memorial Hospital	Miami-Dade	1,498	I	Public/Government
Lakeland Regional Medical Center	Polk	851	II	Not-for-Profit
Lee Memorial Hospital	Lee	427	II	Public/Government
Memorial Regional Hospital	Broward	684	I	Public/Government
Miami Children's Hospital	Miami-Dade	268	Pediatric	Not-for-Profit
North Broward Medical Center	Broward	409	II	Public/Government
Orlando Regional Medical Center	Orange	517	I	Not-for-Profit
Sacred Heart Hospital	Escambia	431	II/Pediatric	Not-for-Profit
Saint Josephs Hospital	Hillsborough	559	II/Pediatric	Not-for-Profit
Saint Mary's Medical Center	Palm Beach	460	II/Pediatric	Investor-Owned
Shands Hospital at U.F.	Alachua	594	I	Not-for-Profit
Shands Jacksonville Medical Center	Duval	760	I	Not-for-Profit
Tampa General Hospital	Hillsborough	877	I	Not-for-Profit
West Florida Hospital	Escambia	473	II	Investor-Owned

Source: 2004-2005 Directory of Hospitals—FHA and FL Bureau of EMS

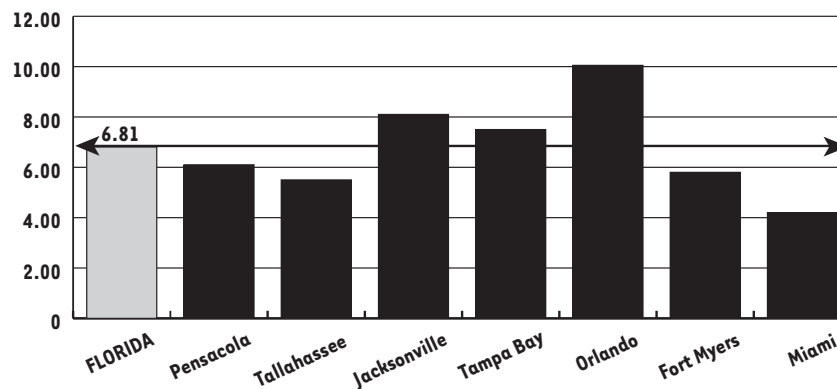
## Methods

Each county's population, growth statistics, and square miles were obtained from the 2004 Florida Statistical Abstract and are illustrated in Graphs 1 and 2. Crash fatalities were analyzed since motor vehicle crash (MVC) patients constitute approximately 50 percent of trauma cases and research has concluded that TCs increase MVC patient survival. The Florida Department of Highway Safety and Motor Vehicles provided 2003 crash, injury, and fatality statistics. These were adjusted for 2003 population statistics to calculate each county's crash, injury, and fatality rates per 100,000 population. The Office of Rural Health identifies rural counties, as well as the number of advanced life support (ALS) vehicles, emergency medical technicians (EMTs), and paramedics (EMT-Ps) per county. This information was used to calculate each county's ALS vehicles, EMTs, and paramedics per 1,000 population and per 100 square miles (Graphs 3 and 4). Air medical services were identified through EMS air licenses accessed from the Department of Health, the Association of Air Medical Services Directory, and the Atlas and Database of Air Medical Services (ADAMS).

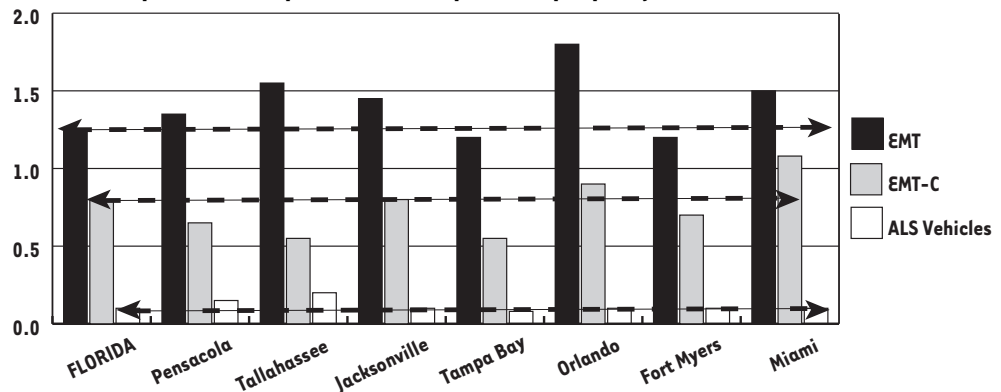
**Graph 1: Population by Domestic Security Task Force Region**



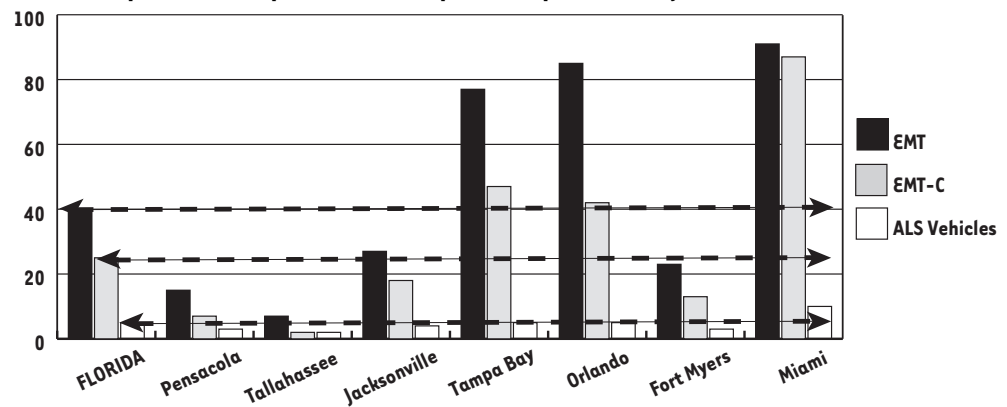
**Graph 2: Population Growth by Domestic Security Task Force Region**



**Graph 3: Pre-hospital Resources per 1000 people by DSTFR**



**Graph 4: Pre-hospital Resources per 100 square miles by DSTFR**



Trauma volumes, population, traffic-crash fatality statistics, and pre-hospital resources were analyzed by Domestic Security Task Force (DSTF) regions.

The DSTF regions and the trauma-system implementation plan share goals and have overlapping missions, such as regional planning, surge capacity, funding sources, and education. In addition, they have overlapping stakeholders, including trauma centers, acute care hospitals, and pre-hospital providers.

For purposes of this analysis, trauma patients were identified using the inpatient discharge data from the Agency for Health Care Administration for 2003 as previously described in a previous section.

## Traffic Crash, Injury, and Fatality Analysis

Maps were created for the 2003 data of crash, injury, and fatality rates per 100,000 population by county (Maps 6 through 11, Appendix 7). A 50-mile radius was identified around each trauma center. Shands Hospital in Alachua County became a trauma center on October 1, 2004, so it was not a regional trauma center during 2003, and is not identified as a TC except on Map 12 in Appendix 7.

Nationally, urban areas have higher crash and injury rates, reflecting traffic congestion. In contrast, rural areas have higher crash fatality rates since crashes occur at higher average speeds and typically necessitate longer EMS response times and transport times. Counties with the highest traffic fatality rates were generally rural counties outside the 50-mile buffer of a trauma center (Maps 11 and 12, Appendix 7.) These included Panhandle counties outside the Pensacola trauma center 50-mile radius (excluding Leon County), counties surrounding Alachua County, and Okeechobee and Glades counties. Despite the higher crash rates in most TC counties, 11 of the 13 counties with trauma centers had fatality rates from .01 to 20 per 100,000 population. Lee and Polk counties had higher crash fatality rates.

## Trauma Service Areas

Florida has 19 trauma service areas, four trauma agencies, and seven trauma regions (Maps 2 and 3, Appendix 7). Florida Statutes require that each trauma service area should have at least one trauma center. Six areas lack a trauma center:

- Area 2—Bay, Gulf, Holmes, and Washington counties
- Area 3—Calhoun, Franklin, Gadsden, Jackson, Jefferson, Leon, Liberty, Madison, Taylor, and Wakulla counties
- Area 6—Citrus, Hernando, and Marion counties
- Area 13—DeSoto, Manatee, and Sarasota counties
- Area 14—Martin, Okeechobee, and Saint Lucie counties
- Area 17v Collier County

Florida Statutes also require that a trauma agency be promoted in each trauma service area, and the state

must approve the development of each trauma agency. Trauma agencies are responsible for developing a plan for approval by the state, administering an inclusive regional trauma system, coordinating arrangements to develop a trauma system, and updating the plan. However, trauma agencies do not have authority over EMS providers or trauma centers. Only five of the 19 trauma service areas have a trauma agency.

■ **Area 10—Hillsborough County Trauma Agency**

■ **Area 4 (excluding Putnam County) and Area 6—North Central Florida Trauma Agency**

■ **Area 16—West Palm Beach County Trauma Agency**

■ **Area 18—Broward County Trauma Agency**

A survey of these trauma agencies was conducted to examine the structure, roles, and responsibilities of each, including characteristics, operating methods, patient loads, and perceived barriers to success for trauma center hospitals, as well as non-trauma center hospitals. Medical directors and administrators from three of the four trauma agencies participated in the survey, as well as multiple EMS providers throughout the state. Surveys suggest the need to re-evaluate the trauma agency role in regional planning. Currently, their activities reflect local priorities rather than the DSTF regional initiatives. There are inconsistent perceptions regarding the value of certain trauma agency activities due to their lack of authority over EMS providers, trauma centers, and acute care hospitals. A full report of the EMS survey can be found in Appendix 4.

Florida's Domestic Security Strategy was developed as a comprehensive approach to address and limit potential vulnerabilities related to acts of terrorism within or affecting Florida and other matters regarding Florida's domestic security. The domestic security strategic initiatives include a health and medical component. Last year, three working groups (pre-hospital, hospital, and community) recommended seven projects that the State Working Group subsequently recommended for funding, for example, conversion of non-clinical space to clinical space for hospital-surge capacity.

These efforts are organized around seven Domestic Security Task Force regions (Map 4, Appendix 7) The state also created trauma regions that are contiguous with these Domestic Security regions.

(1) The department shall establish a state trauma system plan. As part of the state trauma system plan, the department shall establish trauma regions that cover all geographical areas of the state and have boundaries that are coterminous with the boundaries of the regional domestic security task forces established under s. 943.0312. These regions may serve as the basis for the development of department-approved local or regional trauma plans. However, the delivery of trauma services by or in coordination with a trauma agency established before July 1, 2004, may continue in accordance with public and private agreements and operational procedures entered into as provided in s. 395.401. — section 395.4015, Florida Statutes -- State regional trauma planning; trauma regions.—

Domestic security planning has encompassed initiatives related to pre-hospital and trauma care. This includes preparing first responders and increasing surge capacity of EMS providers; enhancing the public health and bioterrorism response capacity including responding to disasters and establishing effective processes for triage; planning for hospital surge capacity; planning for EMS/public health interface including trauma systems to respond to emergency disaster systems and in coordination with the state disaster plans and establish guidelines specific to the transport of trauma patients; and, supporting education and training to assure appropriate human resources for EMS and trauma systems. Funding for domestic security initiatives are reported by source in The Domestic Security in Florida 2004 Annual Report, which is available on the Florida Department of Law Enforcement web site at <http://www.fdle.state.fl.us/osi/DomesticSecurity/reports.htm>. Examples of initiatives related to trauma and EMS by funding source are:

1. **Center for Disease Control and Prevention (CDC)**. Public health preparedness, including planning, training, and readiness; strategic national stockpile management; mass casualty response; and exercise plans and systems
2. **Health Resources and Services Administration (HRSA)**. Burn, blast, trauma capacity; hospital and EMS chemical and biological protection; medicines and vaccines; patient decontamination capability; mass casualty equipment for trauma care and trauma centers; and surge capacity for trauma care and trauma centers and non-trauma centers

3. **Office of Domestic Preparedness (ODP).** Mobile incident command; mass casualty equipment and supplies; and first responder personal protective equipment (PPE).
4. **State General Revenue.** Establish Florida Emergency Medical Foundation Education Center; and training firefighters, medical technicians and paramedics

Each of Florida's Domestic Security Task Force regions also conducts regional planning. The seven regions have implemented healthcare initiatives that are funded through Florida's Domestic Security Strategy revenue pool, as noted on Map 5 in Appendix 7.

## Trauma Regions

Trauma center resources were analyzed by trauma region, as reported in Table 11. The analysis concluded that:

**Region 1.** The trauma-center-per-population is nearly three times higher than the state average due to the misdistribution of trauma centers in Escambia County. Pensacola includes Trauma Service Area 2 (Bay, Gulf, Holmes, and Washington Counties), which lacks a trauma center. This is the east section of the region and is located outside the 50-mile radius of the three Pensacola TCs. A TC is recommended in Bay County to serve the citizens outside the 50-mile radius of Pensacola trauma centers.

**Region 2.** Tallahassee lacks a trauma center. This region is also Trauma Service Area 3. It is recommended that a TC be added in Leon County.

**Region 3.** Jacksonville has a trauma-center-to-population average that is less than the state average. In addition, it has high trauma volumes per TC and high population growth rates. It also includes Marion County, which is one of the three counties comprising Trauma Service Area 3, which is a trauma service area that lacks a trauma center.

**Region 4.** Tampa Bay has adequate trauma center access at this time. However, it includes two counties from Trauma Service Area 3 (Citrus and Hernando counties) that lacked a trauma center in the area.

**Region 5.** Orlando has trauma-center-to-population averages that are less than the state average. It also has high trauma volumes per TC and the highest population growth rate in the state. The region includes Trauma Service Area 14 (Martin, Okeechobee and Saint Lucie counties), which lacks a trauma center.

**Region 6.** Fort Myers cannot be properly analyzed due to a coding error at the Lee Memorial trauma center. Trauma patients were not coded as emergencies and thus trauma is under-reported. Their data has been resubmitted to the AHCA and can be analyzed once it becomes available. However, based on existing information, the region appears to have too few trauma centers. The region includes Trauma Service Areas 13 and 17. Both lack trauma centers.

**Region 7.** Miami has a TC-per-1-million-population rate that approximates the Florida average and a trauma-volume-to-TC that is less than the Florida average.

The trauma-volume-to-TC rate considers the entire trauma volume in the region, managed at both trauma centers and non-trauma centers, relative to the number of trauma centers in the region. The TC-per-1-million-population rate is the population divided by the number of trauma centers, then adjusted per one million population (Graph 5, Appendix 7).

In addition to defining trauma-center distribution according to geography and patient population served, national and Florida data support a concept of trauma-center capacity. This concept would suggest that capacity can be judged by the availability of personnel and medical infrastructure, as well as physical facilities. Table 1 in Appendix 7 shows caseloads and staffing for the Florida trauma centers at the last state designation survey. The capacity to care for additional patients within a single physical facility should be assessed prior to recommending that a new facility be added.

The percent of population currently within 85 minutes of total evacuation time for a trauma center was

calculated (Map 15, Appendix 7). This interval was chosen because of the wide availability of high-level pre-hospital care services. Data support that this definition will allow definitive care to begin with the “golden hour.” At present, 95.7 percent have access. If trauma centers are developed at hospitals in Bay and Leon counties, the percent having access would increase to 99.2 percent.

**Table 11: Florida Trauma Statistics by Trauma Region**

TRAUMA REGION	2003 POPULATION	2000–2003 GROWTH	URBAN COUNTIES	RURAL COUNTIES	TRAUMA VOLUME	* OF TRAUMA CENTERS	TRAUMA VOLUME TO TCS	TC PER 1 MILLION POPULATION	PERCENT TREATED IN TCS*
Pensacola	934,092	6.09%	4	6	1,655	3	552	3.2	53%
Tallahassee	530,127	5.39%	1	12	770	0	N/A	0	0
Jacksonville	1,948,237	8.07%	6	7	3,841	1	1,920	1	50%
Orlando	3,275,362	10.04%	9	0	6,934	3	2,311	0.9	44%
Tampa Bay	3,550,457	7.48%	8	1	8,531	5	1,706	1.4	47%
Fort Myers	1,496,891	6.34%	4	5	2,678	1	2,678	0.7	2%
Miami	5,336,342	4.26%	3	1	10,913	7	1,559	1.3	39%
Florida	17,071,508	6.81%	35	32	37,442	20	1,783	1.23	38%

\* Percent treated in trauma center = (Trauma Center Volume/Trauma Volume)

## Pre-Hospital Care Resource Analysis

Florida has hundreds of EMS providers, and the state approves trauma transport protocols for each EMS provider. Data on advanced-life-support (ALS) vehicle, emergency medical technicians (EMT), and paramedics (EMT-P), by county, per 1,000 population, and per 100 square miles, are summarized and illustrated in Tables 2–3, Graphs 3–4, and Maps 13–14 in Appendix 7. Most counties with higher crash fatality rates have fewer pre-hospital care resources per 100 square miles. Counties with trauma centers typically had fewer ALS vehicles per 1,000 population than counties that do not have a TC, possibly reflecting reduced transport times. Resources vary by region, in part, based on the rural-urban mix. Regions that have less than average pre-hospital resources per square mile have more rural than urban counties.

## Regional Planning Conclusions and Recommendations

1. There is a need for additional trauma centers in the state to improve access to trauma centers for Florida residents with serious injuries. Additional trauma centers, particularly near rural counties, should assist in reducing high rural traffic fatality rates by providing more proximate access to trauma care. Trauma centers are recommended in:
  - a) Region 1—Pensacola in Bay County (high priority)
  - b) Region 2—Tallahassee in Leon County (high priority)
  - c) Region 3—Jacksonville in Duval and Flagler counties
  - d) Region 5—Orlando in Orange and Martin counties
2. It is feasible for the existing trauma service areas to be modified to fit the seven DSTF regions, which are also termed “trauma regions,” to facilitate regional planning. These regions are the platform of initial response to natural or manmade disasters. Consistent with current efforts, each region could integrate planning for trauma and pre-hospital resources, and then the Office of Trauma can assist the trauma regions with regional planning efforts. The infrastructure of the trauma regions should be supported where the trauma center and Office of Trauma staff assist in coordination of activities. This change would require careful thought and deliberation. Concerns expressed by members of the State Steering Committee include the fact that some DSTF regions

are composed of areas that have highly developed trauma agencies adjacent to areas where there is no trauma agency. Some trauma centers in the state (Tampa Bay and the trauma center at Shands Hospital in Gainesville) serve two and three DSTF regions respectively.

3. Currently, the trauma agencies are operating at a local level, and only five trauma service areas have this structure. It is recommended that further discussion occur regarding the role of the trauma agency and its reporting structure to a local, regional, or state agency.
4. An annual regional assessment is recommended to analyze pre-hospital resources, ICU beds and capacity, and other medical resources based on per-population estimates to plan for response and improvements.

# FINANCING TRAUMA CARE IN FLORIDA

## Costs

Cost issues have been consistently identified as principal drivers of trauma system

distress. The situation in Florida illustrates this fact graphically. Table 12 below shows financial data supplied to the investigators by the Florida Trauma Alliance. The Florida Trauma Alliance has indicated that these figures are the results on an analysis completed by them using information from the “Medicare Cost Reports” of 18 of the 21 trauma centers in Florida. The net loss to each hospital is the sum of losses due to uncompensated care and preparedness costs. The figures labeled “preparedness costs” are costs designated by each hospital. At the aggregate level, all trauma centers are incurring operational losses associated with the provision of this care. These losses are similar in amount and appear to be the result of the significant investment in preparedness costs by each institution. These figures indicate the magnitude of the problem from the perspective of trauma center hospitals. These figures can be contrasted with data from South Carolina, which indicated a \$102.4 million loss for the seven Level I and Level II trauma centers on that state.<sup>xxiv</sup>

**Table 12 Hospital Costs (millions of dollars, 2003)**

	LEVEL I	LEVEL II	TOTAL
<b>Cases</b>	<b>15,530</b>	<b>14,184</b>	<b>29,714</b>
<b>Net Loss</b>	<b>(\$46,624)</b>	<b>(\$46,018)</b>	<b>(\$92,643)</b>
<b>Preparedness Costs</b>	<b>\$45,889</b>	<b>\$48,718</b>	<b>\$94,607</b>
<b>State Funds Received</b>	<b>\$6,450</b>	<b>\$7,840</b>	<b>\$14,290</b>

In response to the concerns stated in the Governor’s veto message dated May 28, 2004, the investigators reviewed and analyzed data from several sources. The investigators had two questions. First, are there tax initiatives used in other states that might be useful as local or statewide initiatives in Florida, and what factors are perceived to be advantageous or disadvantageous regarding each type of initiative?

Second, to the investigators wanted to assess tax initiatives for health care that currently exist in Florida to determine if these are associated with improved health outcomes. Tables 1 and 2 in Appendix 8 list tax initiatives currently in force by other states to fund trauma care and emergency medical services.

Where tax initiatives are present, the opinions of state trauma system leaders disclosed that the taxes levied for trauma are broadly supported by the citizenry, especially for those taxes levied for traffic violations and intoxication. Also, there is vigorous competition for the funds generated in each state, and certain taxes do not generate sufficient funds to support the entire statewide system.

Data regarding the association of improved health outcomes with tax initiatives is available in a Studnicki and associates’ report, specifically relevant to Florida.<sup>xxv</sup> These investigators assessed the relationships of public hospital availability and special taxing authority to health outcomes for 62 separate health conditions in the categories of major diseases and specifically cancers, avoidable hospitalizations, trauma/accidents, infectious diseases, and maternal-child conditions. There was a significant association that favored tax initiatives for 43 of the 62 conditions examined. In the trauma/accident category, taxing was favored for 7 of the 10 specific subcategories including motor vehicle crash mortality, firearm mortality, and other intentional injuries. The available evidence supports the conclusions that taxation strategies are used in many states; that partnerships between statewide and local tax initiatives are feasible; and that the taxes are associated with improved health outcomes.

## Funding Alternatives for Trauma Centers and Providers

Trauma care plays an important role in reducing the burden of injury by saving lives and returning those individuals who are seriously injured to productivity. The increasing numbers of persons without medical insurance and the revenue reductions from public and private payers pose a worsening dilemma for trauma care providers. Florida currently has laws that support funds for trauma and EMS services. Section 125.271, Florida Statutes, allows certain counties to levy a special assessment to fund emergency medical services. Section 395.4035, Florida Statutes, creates the Trauma Services Trust Fund in the state Treasury to be used for the development and support of a system of state-sponsored trauma centers. Section 395.403, Florida Statutes, provides for financial support to state-sponsored trauma centers, as appropriated. Table 3 in Appendix 8 summarizes the appropriations made. However, there is a lack of stable funding for trauma care.

### THE "FLORIDA SENATE INTERIM PROJECT REPORT 2004-108" (NOVEMBER 2003) REPORTS THE FOLLOWING ABOUT TRAUMA CENTER FUNDING.

For the past three years, the funding for trauma care beyond the normal reimbursements from Medicaid, other third party payers and private payers has come from the Medicaid program in the form of special non-recurring Medicaid payments under the Upper Payment Limit Program. In the last three years, \$44 million in Medicaid payments have been made for trauma care through the Upper Payment Limit Program. Medicaid also estimates they paid \$97.7 million during 2002 in fee-for-service payments for trauma-related diagnoses. Prior to 1998, there was no specific funding for trauma centers. Earlier efforts in 1990-91 were stymied because of a budgetary shortfall and the resources appropriated were cut from the state budget.

Other states have used many alternatives to fund trauma or indigent care (Tables 1 and 2, Appendix 8) Funding sources include traffic fines; vehicle and driver's license surcharges; alcohol, sales or property taxes; telecommunication fees; and tobacco settlement funds.

**Driving under the influence (DUI) and Moving Violation Traffic Fines:** Several states rely on traffic fines to fund uncompensated trauma care. These states increase or add fines for serious infractions, such as DUI, reckless driving, or speeding. For example, Illinois added \$100 to each DUI violation to fund the state's trauma system. Proponents of traffic fine surcharges justify these fines since nearly half of trauma center cases result from motor vehicle crashes. DUI is associated with more than 40 percent of traffic fatalities, and crashes that occur at higher speeds are associated with increasing severity of injury. The Florida Emergency Medical Services Trust Fund currently receives approximately 7.2 percent of its revenue from a civil traffic fine. Barriers to a traffic fine surcharge include the significant competition for these fine revenues. Also, associations representing the "motoring public" typically lobby against such surcharges. More importantly, revenue from citations would be unpredictable because citations are decreasing in some counties. The Florida Department of Highway Safety and Motor Vehicles' driver's license facts indicate a decrease in citations written over a two-year period. Citations decreased from 3.9 million in fiscal year 2001 to 2.8 million in fiscal year 2003. Roadway improvements (for example, adding traffic signals) are a more effective means to reduce crashes and fatalities and can reduce the need for enforcement, thus decreasing citations. The Wall Street Journal reported that some municipalities use citations as a revenue source, so citation totals may fluctuate with municipality revenue needs.<sup>26</sup>

**Safety Belt Fines:** Safety belt violations are categorized as a non-moving traffic violation. Currently, Senate Bill 216 and House Bill 3 propose to delete the provision that restricts enforcement of the safety belt law to a secondary action. The National Transportation and Highway Safety Administration reported safety belt use in Florida decreased from 75 percent in 2002 to 73 percent in 2003. Research concludes the use of seat belts decreases fatal injuries by 9 percent and non-fatal injuries by 2 percent. In addition, studies conclude that seat-belt use increases by 14 percentage points in primary law states, relative to secondary law states. Safety belts provide a direct means of reducing fatalities and injuries if a crash occurs. Thus, a surcharge on seat belt fines further penalizes persons who put themselves at higher risk for severe and fatal injuries.

**Vehicle and Driver's License Surcharges:** Surcharges on motor vehicle registrations and driver's licenses have financed trauma programs in Arizona, Idaho, Ohio, Kansas, Washington, and Oklahoma. In June 2003, Maryland established the "Maryland Trauma Physician Service Fund" to provide for increased trauma physician reimbursement for trauma services delivered to uninsured and Medicaid patients, and to help trauma centers pay for coverage. The funding is financed through a \$5 surcharge added to vehicle registration renewal fees. Oklahoma added \$5.50 per driver's license renewal for the state's indigent care fund and the state's emergency medical system and trauma system administration. Since the numbers of vehicles and drivers greatly outnumber traffic citations, the potential to generate more funds for trauma or indigent care is greater in contrast to traffic fines. However, retired voters have typically opposed such increases.

**Ad Valorem Taxes:** Property taxes have been successfully used to assist with indigent and trauma care. Los Angeles County, California, recently passed a measure to increase property taxes by \$3.50 per month on the average house to fund trauma centers, emergency departments, and bioterrorism preparedness, and it was estimated to raise \$168 million annually. Florida laws limit property taxes to a maximum of 10 mills for operating purposes, but allow local voters to authorize additional millage for specific purposes (Table 4, Appendix 8) A separate analysis of selected assessed taxes, which occur at the local level, are discussed in the following section.

**Sales Taxes:** Taxes on retail products have been implemented to fund trauma and indigent care. Florida Statutes allow a county to levy a trauma center surtax not to exceed a half penny or 0.5 percent. Also, Florida Statutes allow counties with populations of fewer than 800,000 to levy a voter-approved, indigent-care surtax. In Florida, Hillsborough County has a half-cent sales tax that funds a nationally recognized healthcare program. In March 2004, Polk County voters approved a half-cent, indigent-care sales tax. The barrier to this tax is the likelihood of political and electoral support for this funding source being quite small. The Hillsborough County Health Care Plan is a comprehensive managed care plan for indigent residents with incomes up to 100 percent of the federal poverty level who do not qualify for other coverage. Enacted in 1991, Hillsborough County, Florida, established a half-cent sales tax to fund indigent health care. In Miami-Dade, the Health Care Trust Fund (PHT) operates the county-owned healthcare facilities, and also is responsible for county-wide planning to ensure access to health care for all residents. In addition to the state mandate, the Board of County Commissioners approved a referendum to impose a half-cent sales tax, the proceeds of which are considered "unrestricted tax revenue of the Trust and shall be used only for the operation, maintenance and administration of Jackson Memorial Hospital." The half-cent sales tax (healthcare surtax), together with Miami-Dade County funding, accounts for the publicly funded indigent care in Miami-Dade County.

**Gasoline Taxes:** Some states have proposed taxes on the sale of gasoline without success. A \$0.01 gas tax was defeated by Florida's Hillsborough County Commission in a 4-3 vote. The proposal was intended to raise money to continue providing health care to the poor.

**Alcohol and Cigarette Taxes:** Several states (California, Missouri, and Oregon) have attempted to add a surcharge on items such as alcohol and cigarettes, which are regarded as neither luxuries or necessities. Maryland, for example, increased the state alcoholic beverage tax to fund the Emergency Medical Services Operation Fund. California proposed \$0.05 tax per drink of alcoholic beverage to reimburse government expenses that increased for medical expenses for alcohol-related emergencies. Missouri is attempting to legislate a \$0.41 tax on each pack of cigarettes to generate \$100 million for unfunded trauma care. In November 2002, voters in Arizona approved a \$0.60 tax on cigarettes that will generate \$62 million annually for hospital emergency rooms, medical research, and health care for the poor. Known as the "sin tax," this tax has received much resistance from the beverage industry lobby and the general public who drink beer and wine.

**Sick Taxes:** Healthcare provider taxes to finance trauma and indigent care are known as the "sick tax," and have been imposed with much controversy. Florida was the first state to implement a provider tax program, which resulted in the development of a hospital tax program in 1984. Revenues from the tax program helped pay for expansions of health services for low-income residents, including starting a medically needy program. Recently, New Jersey enacted a 3.5 percent tax on gross receipts of selected outpatient providers to fund charity care provided by hospitals this year. Minnesota passed a 2 percent gross revenue tax in 1992 on medical services paid out of pocket by patients

or passed through to health plans. The tax was implemented to fund the newly created program for the uninsured – MinnesotaCare – which helps low-income workers buy health insurance. Opposition to allowing a state to tax hospitals and other healthcare institutions to supplement state funding of Medicaid program costs per se has come from groups such as the American Hospital Association who see it as a way to ease the state’s financing burden. Nevertheless, public hospitals typically favored this financing provision.

**Telecommunications Taxes:** Telecommunication taxes have recently been proposed as a means to fund trauma care. California proposed a phone tax to fund emergency care. The initiative would increase the 911 tax on phone calls made within California. The tax would be capped at \$0.50 per month for residential telephone customers, but not cellular or commercial lines, and seniors and low-income customers would be exempt. The funding would be divided among a number of groups, including 911 dispatch, emergency departments, trauma centers, emergency physicians, urgent care clinics, and pre-hospital providers. This initiative received strong opposition from the telecommunications industry, which ran advertisements stating the tax was a case of one industry taxing another. Critics also argue that many hospitals will still close even if reimbursed for emergency care. Proponents include the California Medical Association, the American College of Emergency Physicians, and other physician organizations that argue the money would reduce the number of emergency room closings and avert a shortage of urgent care, which would affect both people with or without health insurance.

**Firearms and Ammunition:** Some states have taken on initiatives to tax guns and/or ammunition, which are a cause traumatic injury, but achieved little success. California proposed a \$0.10 per bullet tax on ammunition sold to customers to fund trauma centers. The National Rifle Association and other “right to bear arms” advocacy groups substantially resisted. Illinois, however, has successfully passed an additional \$100 fine on the illegal discharge of firearms, because of the public’s outrage over violent crime in the Chicago area.

**Tax Districts:** Several regions, such as Palm Beach County, Florida, have instituted specific tax districts for trauma care. Public hospitals often offer trauma care as part of their mission, which is funded by a broader hospital district tax base, or the county and/or state tax base. Moreover, Florida state law authorizes counties to establish funding districts for indigent health care and to levy local ad valorem taxes to fund such care. The tax may be levied up to whatever maximum millage rate is approved by the voters (not to exceed five mills). Once established, the district may establish and maintain clinics, purchase institutional services for indigent patients, and fund county health services. Trauma-center funding would be allowable from the revenues of the annual property tax and would not be limited to funding trauma care for indigent patients only. For instance, in 1988, Palm Beach County residents voted to pay higher taxes to create a new government agency that would pay for medical care for uninsured people. Today, the Health Care District of Palm Beach County's Coordinated Care Program provides health coverage to 22,000 county residents who cannot afford private insurance and do not qualify for state or federal assistance. Once enrolled, residents have more than 100 doctors and specialists from which to choose, and can get an unlimited supply of prescription drugs and hospital care from any institution in the county. Residents program, which is similar to health maintenance organizations (HMOs), get free health care. County taxpayers pay the bill, which in the 2004 fiscal year ended September 30, was \$46.5 million. The money generated also helps to run the county's trauma system.

Another example of implemented tax districts as a means to finance indigent care has occurred in Texas where counties have created hospital districts with the authority to tax the property owners to provide health care to the indigent residents of their county. Counties and their commissioners have the ability to tax up to \$0.75 on every \$100 valuation on all property within their boundaries to fund the care of indigent residents—an ad valorem tax.

**Automobile Insurance Tax:** Taxes on auto insurance premium fees have been assessed in some states. The public policy rationale is that some or all of assessed tax revenues should be related to the source from which they are derived. Since approximately 50 percent of trauma center patients are injured in motor vehicle crashes, auto insurance premium revenues are a logical source for contributing to trauma care funding. In addition, drivers who receive citations and cause crashes typically have higher insurance premiums. Florida has a history of assessing a tax on all insurance

premium products. Specifically, section 624.509(1)(a), Florida Statutes, assesses a 1.75 percent tax on the gross premium insurance receipts. Within the construct of the public policy rationale suggested above, a portion of the revenue derived from automobile insurance policies could be set aside or carved out for designated use as a funding source for trauma care, and/or the existing premium tax could be increased. An estimate of the available funds from this source may be calculated based on the total premium tax that police collected on automobile insurance policies, which is assessed within incorporated areas only. At a 0.85 percent tax rate, the police collections on automobile insurance premium taxes were \$61 million in 2003. Nearly half of all Floridians live in unincorporated areas; however, their insurance premiums rates would be lower due to lower risk. Based on the police collections of premiums taxes, the 1 percent tax to automobile insurance premiums is estimated to be approximately \$100 billion annually.

**Examples of Revenue Forecasts:** Examples of funding alternatives from traffic fines are provided using 2003 statistics for driver’s licenses and citations written to drivers who paid the fine, paid and attended driver school, or were found guilty. The total seat-belt citation volume is for 2003. Speeding is the most frequently written, non-criminal moving infraction. At present, municipalities receive the entire DUI fine. The 2004 statistics for vehicle titles and registrations are used as examples.

**Table 13: Examples of new/additional fees or surcharge forecasts**

EXAMPLES OF FUNDING SOURCES	NEW/ADDITIONAL FEE OR SURCHARGE	ANNUAL VOLUME	REVENUE FORECAST
Driving under the influence	\$100	42,000	\$4.2 million
Seat belt violations	\$25	229,000	\$5.7 million
Speeding	\$20	650,000	\$13 million
Drivers license original/renewal, transfer	\$5	3 million	\$15 million
New/used/transfer vehicle titles	\$5	4.1 million	\$20.5 million
Car & truck vehicle registration	\$5	13.7 million	\$68.5 million
Auto Insurance Premium Tax (estimate)	1%	All	\$100 million

## Local Public Tax Sources of Support for Trauma

While the state and federal governments provide various direct and indirect support, Florida law permits local governments (both municipal and county) to levy certain local taxes in support of specific uses. These uses include both health care, generally, and trauma care, in particular. Florida has 18 taxing districts, which are summarized in Table 4 in Appendix 7.

Some of these taxes are ad valorem against assessed values of properties; others are sales taxes. Some taxes are expressly designated for health or trauma; some are derived from general revenues. Only one county, Palm Beach, has a designated ad valorem assessment expressly intended for trauma services. Some healthcare institutions are permitted to issue tax-exempt revenue bonds that may be underwritten by either local tax revenues or separate county government underwriting. The proceeds of these issues are generally for facility construction to provide care—a significant factor in the delivery of trauma services. Nearly every county has general revenue funds that are budgeted for healthcare services—generally for indigent or uncompensated care provided to or on behalf of residents in specific institutions.

Local healthcare tax-supported programs are generally under the management and control of local taxing authorities, which may be associated with a single hospital facility, or with a group of hospitals in a county. Tax revenues are assessed as part of formal, local, ad valorem taxing mechanisms, and proceeds are made available to the taxing authority for direct deployment to its related institutions. Sales tax revenues, such as those derived from the national award winning Hillsborough County Health Care Plan, are controlled by the county government. Other, general tax revenues are under the direct distribution control of a local government entity (city or county government).

To glean information about the sources and uses of tax revenues, investigators consulted taxing districts' annual filings with the Florida Department of Revenue, and obtained copies of the annual revenue reports submitted by each of the state's hospital taxing districts. These reports are required by law each year for direct and indirect taxing district entities in the state. Historically, little use has been made of these reports or the data contained within them.

Further, there is no standard format for the presentation of data to the state. Some of the reports are merely reiterations of basic, audited financial statements. Others contain substantial amounts of documentation and references to investments, as well as modest references to uses of funds. Most of the reports contain summary data that can be found in the annual financial reports prepared by the healthcare institution or the taxing authority's accounting firms.

While the reports provide limited information about the amount of certain tax-generated revenue procured by each of the districts or entities, there is wide variation in the level of detail proffered about these sources, and virtually no data regarding the uses of these fund sources.

There are substantial discrepancies within reports regarding the amounts of tax revenues claimed/reported by certain entities. For example, total ad valorem reported revenues may not equal the sum of separately reported restricted and unrestricted tax revenues. There is no consistent application of tax-based revenues to operating costs versus non-operating revenue account classifications; so, financial statement analysis across institutions may not reflect similar nomenclatures. There are deductions from tax revenues that are not explained in notes. In addition, there is evidence across the districts of various forms of related party transactions involving separately created not-for-profit and for-profit corporations designed to provide a category of care or service, and these separate entities appear to have varied and separate contractual arrangements with the parent entity. The cash flows, between and among entities, are generally presented at a macro-level only, making it difficult to distinguish uses of funds for trauma and related services.

These reports, however, have provided some insight about the use of alternative, public sources of funds, which were not identified earlier as potentially available for use in trauma and other care, including local contracts with health units and county governments for the provision of indigent and uncompensated care and other categorical services.

Cross analyses of the AHCA hospital discharge and financial data provide no useful information about sources of tax revenue used to pay for healthcare services – even within categories of trauma care. Rather, the tax revenues that devolve to individual institutions generally are placed in non-operating funds, then deployed for a variety of uses, which may or may not include direct healthcare services and/or facilities.

Accountability for the use of ad valorem tax revenue sources does not appear to be uniformly or aggressively required by taxing districts or the state.

The investigators recommend a thorough analysis of all sources and uses of all public funds, which are intended for, and/or used in, the provision of trauma services. The current reporting system is not adequate to provide accurate and useful data about this issue. As was the case 15 years ago for children's health services in Florida, there are too many unanswered questions about the actual uses of public funds intended for a particular purpose. Therefore, the investigators encourage a comprehensive study that tracks the sources and uses of public funds throughout the state that are intended for use in trauma and related services.

# FINDINGS

## 1. Status of Trauma systems in the United States

- The majority of the studies report a 15–19 percent reduction in injury-related mortality resulting from the implementation of the trauma system.
- The most severely injured patients with the greatest risk of dying are triaged to trauma centers. Thus, an increased or unchanged mortality risk is observed in trauma centers compared to other hospitals.
- Financial crises have led to closures of trauma center hospitals and reductions in access to trauma care in many areas of the country. The 2002 HRSA report regarding the development of state trauma systems cited finance and human resource availability as the two greatest threats facing states as they developed their trauma systems.

## 2. Status of the Florida Trauma System

- There were 20 trauma centers and 221 acute care hospitals in the state of Florida in 2003.
- In 2003, 37,842 true trauma patients were treated in Florida. Of these patients, 38 percent were treated in trauma centers.
- Challenges noted for the Florida trauma system included the availability of human resources and durable financing.
- These two problems have almost led to the closures of two trauma centers, one of which is the only center serving a city with a population of nearly one million.

## 3. Trauma Outcomes in Florida

- Trauma centers are regional resources and serve patients from surrounding counties. Level I trauma centers each serve on average 20 counties.
- A county's overall mortality rate is higher if a trauma center is not present in that county.
- The percentage of trauma center patients in the most severely injured category is 3.4 times higher than in non-trauma centers.
- The age distribution in non-trauma centers is skewed toward the elderly with relatively minor injuries, and in trauma centers, is concentrated in the 21–44 age group with more severe injuries.
- Trauma center patients are more likely to have multiple injuries and require more procedures.
- Trauma center patients are more likely to be admitted as a transfer from another acute care facility, suggesting some degree of intra-trauma system transport and triage.
- An evaluation of the length of stay and charges illustrate the increased cost of care associated with the increased severity of injuries found in patients treated in trauma centers.
- The uninsured consist of 5.8 percent and 11.2 percent of trauma victims in non-trauma centers and trauma centers, respectively.

## 4. Regional Planning for Trauma Care in Florida

- Florida has 19 trauma service areas, four trauma agencies, and seven trauma regions. Six areas lack a trauma center.
- Section 943.0312, Florida Statutes, provides "[a]s part of the state trauma system plan, the department shall establish trauma regions that cover all geographical areas of the state and have boundaries that are coterminous with the boundaries of the regional domestic security task forces established under s. 943.0312."

- **There is a need for additional trauma centers in the state to improve the access to trauma centers for Florida residents with serious injuries.**
- **Overall, the triage rate of injured patients to trauma centers is lower than the national average at 38 percent.**
- **Acceptable access to the trauma system by ground or air evacuation is currently available for about 95 percent of the citizens of Florida.**

## 5. Funding of Florida Trauma Centers

- **An analysis of finances at 18 of the 21 trauma centers in Florida for 2003-2004 demonstrates an aggregate loss of \$92 million dollars.**
- **The net loss to each hospital is the sum of losses due to uncompensated care and preparedness costs.**
- **Despite the establishment of an organized trauma system more than 20 years ago, Florida has not provided for a stable recurring source of funding for trauma.**
- **Florida has 18 taxing districts (Table 4, Appendix 7) that may provide funds for both health care, in general, and trauma care, in particular.**
- **Other states have used many alternatives to fund trauma or indigent care (Tables 1 and 2, Appendix 8) including traffic fines; vehicle and driver's license surcharges; alcohol, sales or property taxes; telecommunication fees; and tobacco settlement funds.**
- **Public funding of healthcare initiatives in these states have been associated with improved patient outcomes.**

# CONCLUSIONS

The data analyzed and reported herein support the following primary conclusions.

1. The existing Florida trauma system works well, albeit within the limitations of its geographic pattern of deployment. Overall, the rate of triage of injured patients to trauma centers is lower than the national average at 38 percent. It is reasonable to set, as a system goal, an appropriate triage rate of 65 percent. Actions, which would improve triage, would include altering the trauma alert criteria to make age 65 or older a primary indication for a trauma alert designation (red criteria), and placing new trauma centers in Tallahassee and in Bay County. The addition of the new trauma centers would increase the triage rate to nearly 50 percent. Trauma agencies placed within each DSTF region could be charged with improving triage in each region consistent with the previously mentioned, triage goal. Where trauma centers are geographically close, most injured patients are delivered to centers with the possible exception of the elderly. Each of the trauma centers serves a wide geographic area and Level I centers each serve more than 20 counties. Compared to national norms and to results in non-trauma centers in Florida, clinical outcomes are excellent for the “true trauma” patients the system was designed to serve. Of concern is the observation that distance from a trauma center increases the motor vehicle injury fatality rate. This finding underscores the need for additional trauma centers especially in the Tallahassee region and in Bay County.
2. Acceptable access (delivery to a trauma center within the “golden hour”) to the trauma system by ground or air evacuation is available for more than 90 percent of the people in Florida. Deployment of trauma centers in Tallahassee and in Bay County would increase access to the system to 99 percent.
3. Trauma center hospitals face significant financial pressure, as the data disclosed. In the main, the losses can be ascribed to expenses needed to support up-to-date trauma care and provide for medical specialist coverage. As reimbursement for professional medical services has been reduced and malpractice insurance costs have increased, this problem has become more severe and threatens the trauma system in Florida, and almost every other state system as well. Survey data gathered for this report indicate that these two areas are the most frequently cited as threats. Moreover, medical and hospital leaders cite concerns about medical specialist costs, medical staff opposition, and liability risk as the main disincentives for Florida hospitals to join the trauma system (see responses in Appendix 5). As can be seen from a review of hospital executives’ responses, these deterrents to join the trauma system overshadow decisions about becoming a trauma center, even when the option to join the system is considered to be in keeping with the mission of the hospital. Several avenues for productive local-state partnerships are available for tax support of the trauma system, and the data indicate that taxation for the support of healthcare initiatives is associated with improved health outcomes.
4. The data support the feasibility of transforming the Florida Trauma Service Areas to coincide with the Domestic Security Task Force Regions. Trauma agencies need to be developed in each region, and these agencies should coordinate performance improvement efforts for all segments of the trauma care continuum. Further, the agencies should have community outreach and service goals so that the value of the trauma systems are emphasized, and local financial support of the system is realized.
5. Florida trauma centers are not recording performance in a consistent similar manner. There is a need for trauma center leadership in the area of injury prevention, as well.

The state trauma registry has not reached its full potential as a useful data source due to weaknesses in the data submitted to the registry. A state-level initiative to strengthen the registry and develop a method for an annual trauma-center performance assessment would signal the value of the trauma system to Floridians. The data also suggest that the annual performance review would be a useful addition to the state-designation process and that injury prevention activities for each trauma center should be evaluated periodically.

# RECOMMENDATIONS

1. Trauma centers should be placed in Tallahassee and in Bay County, which do not currently have a trauma center. Orlando and Jacksonville need additional trauma centers to meet the needs of the growing populations. The suggested addition of these trauma centers would provide access to a trauma center for 99 percent of the people in Florida.
2. It is reasonable to set, as a system goal, that 65 percent of trauma patients will be treated at a trauma center. The addition of new trauma centers as recommended would raise triage to a trauma center to 50 percent of injured patients.
3. Designation of additional trauma centers should be based on the need as determined by trauma region. Deployment of additional trauma centers should take place based, not only on the number of patients served per trauma center, but according to a concept of “trauma center capacity,” which would be determined by the staffing levels of medical specialists and other healthcare professionals. An annual regional assessment is also recommended to analyze pre-hospital resources, ICU beds, capacity, trauma center performance including trauma registry data, and other medical resources based on per population estimates to plan for response and improvements.
4. The data support the feasibility of transforming the Florida Trauma Service Areas so that these would coincide with the Domestic Security Task Force Regions (DTSF). Trauma agencies need to be developed in each region, and these agencies should coordinate performance improvement efforts for all segments of the trauma care continuum. The agencies should have community outreach and service goals, so that the value of the trauma system is emphasized and local financial support of the system is realized. These changes would require careful thought and deliberation. Concerns expressed by members of the State Steering Committee include the fact that some DSTF regions are composed of areas, which have highly developed trauma agencies adjacent to areas where there has been no trauma agency. Some trauma centers in the state (Tampa Bay and the trauma center at Shands Hospital in Gainesville) serve two and three DSTF regions, respectively. If trauma service areas are reorganized by DSTF regions, the overriding principle of trauma care—that the patient be taken to the nearest trauma center regardless of region—should still be observed.
5. It is reasonable to fund trauma centers with public funds, based on the unrecoverable financial burden incurred by trauma centers. This would best occur through a methodology that recognizes the level of effort by the institution and the population served. The available evidence supports the conclusions that taxation strategies are used in many states to support trauma care; that partnerships between state and local tax initiatives are feasible; and that the taxes directed for health care are associated with improved outcomes. Decisions for specific formulas may best be determined by consensus with consideration given to local healthcare initiatives, cost, effort, and the population served by a particular trauma center.

# APPENDICES