THE COSTS OF TRAUMA CENTER PREPAREDNESS

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MDContent

TRAUMA COST METHODOLOGY STUDY

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SUMMARY OF FINDINGS

Trauma center hospitals spare no expense caring for patients with traumatic injuries. They staff general surgeons, neurosurgeons, orthopedic surgeons, plastic surgeons, radiologists, anesthesiologists, and other physician sub-specialists round-the-clock. All are ready at any moment. These hospitals invest heavily to upgrade their physical facilities, they optimize procedures and install safeguards, and they comply with strict and expensive regulatory requirements. On the pre-hospital front, they work with aero-medical providers, ambulance companies, and referring physicians; and before and after discharge they prepare the way for rehabilitation, home health care, follow-up clinic visits, occupational therapy, and other services that ensure continuity of care. In addition, trauma centers engage in extensive outreach and prevention programs. The end goal is to establish trauma centers as hubs of organized regional systems.

As background, trauma patients are highly resource-intensive but draw upon the same hospital resources as non-trauma patients, and they are billed in the same manner. There are few hospital assets that are specialized to trauma care, and trauma patients are typically assessed the same charges as non-trauma patients for conventional services such as nursing, medications, MRI's, and lab tests. Moreover, trauma patients may be systematically less well insured than non-trauma patients, but there is no available data documenting this, and no obvious reasons why they would be disproportionately low-paying.

Yet it is precisely because trauma care draws *emergently* on so many conventional resources hospital-wide that verified trauma centers face difficult financial hurdles. Trauma patients are billed for many of the same services and in the same fashion as other patients, but they are not charged for the cost of having the entire hospital always at the ready. (The analogy made here is to a hypothetical airline that is obliged to accommodate every last-minute passenger but without charging them any more than those who buy non-refundable tickets weeks in advance. Once onboard, all passengers may be indistinguishable, but the *ex ante* cost of serving these groups is quite different.) For this and other reasons, the study abstracts away from services that are billed to (and collected from) individual trauma patients. It focuses on direct, extraordinary, and unbillable costs, most of which derive from the intense, variable, and stochastic demands that trauma patients make on facilities and clinicians. Trauma patients arrive randomly at all hours of the day and night, often with complex and life-threatening injuries. To be prepared, hospitals must arrange for ten or more sub-specialist physicians to be available "24-7," and they must invest heavily in their infrastructures and other human resources. Few of these investments can be tagged to individual trauma patients and some cannot even be attributed to the trauma service. Trauma center hospitals, for example, must maintain spare capacity hospital-wide to accommodate occasional but inevitable spikes in demand for key assets, including durable medical equipment, operating rooms, and ICU beds. In both theory and practice, the costs are substantial, and for various reasons they will grow more problematic over time.

The study draws upon data submitted by ten of the State of Florida's twenty verified trauma centers as part of a March 2002 survey. The study identifies four categories of recurring fixed costs: the cost of physician on-call coverage, the cost of periodic re-designation, the cost of outreach and prevention programs, and other extraordinary and *non*-chargeable costs. The last category by design can capture a wide variety of expenses, but it is worth pointing out that this study

omits several significant types of costs, including start-up costs for new trauma centers; the costs of uninsured and underinsured trauma patients; and many *indirect* facility costs associated with being prepared to treat trauma patients.

Start-up costs are non-recurring but substantial, as evidenced by a 2000 study in the *Journal of the American Medical Association* by Nathens, et al. that documents a decade-long *clinical* maturation process for new trauma center hospitals.[1] If new trauma centers need years to refine and optimize the delivery of care, it follows that they also likely require years to optimize financial performance. As such, start-up costs merit a separate inquiry. A determination of the costs of caring for uninsured and underinsured patients would also require its own comprehensive, and patient-level analysis. Finally, many of the facility costs associated with being prepared to treat trauma patients are not captured by conventional cost accounting methods, and for various reasons discussed in this report they are inherently difficult to measure.

To repeat, the four categories of costs addressed here are as follows:

The cost of physician on-call coverage. – Of the four categories, the cost of round-the-clock physician on-call coverage is most significant. Historically, hospitals have not paid physicians explicit stipends for on-call coverage. Instead, physicians' on-call compensation was included in salary or benefits, or coverage was a *quid pro quo* for the privileges that hospitals extended to them. In recent years, however, physicians in general and surgeons in particular have relaxed their ties to hospitals, and as they have done so their clinical obligations and contractual relationships have changed. Many physicians are now active in off-site surgery centers, and physicians' group practices are more often in direct competition with hospitals. The contracts that these group practices negotiate with hospitals on behalf of their members are more "arms-length," and the cost of (and compensation for) trauma care has become more transparent. Under the pressure of market forces, physician cross-subsidies to trauma have been reduced or eliminated, and hospitals have assumed more of the financial burden.

To determine the cost of this coverage, the study utilizes data submitted by those Florida trauma center hospitals that pay their physicians stipends for on-call coverage.[2] These stipends vary modestly across trauma center hospitals and markedly across physician sub-specialties. General surgeons, neurosurgeons, and orthopedic surgeons are the most active providers of trauma care, especially at the emergent stage, meaning that among the various sub-specialties, they bear the brunt of the costs surrounding the uncertainty and variability of trauma care. Their on-call stipends reflect this activity and uncertainty:

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[1] "The Effect of Organized Systems of Trauma Care on Motor Vehicle Crash Mortality," Avery B. Nathens, MD, PhD; Gregory J. Jurkovich, MD; Peter Cummings, MD, MPH; Frederick P. Rivara, MD, MPH; Ronald V. Maier, MD, *Journal of the American Medical Association,* 1990 – 1994, Vol. 283, No. 15, April 19, 2000.

[2] The presumption here is that those hospitals that do *not* offer stipends are compensating their physicians in other ways, (e.g., by underwriting malpractice insurance, by providing generous staff privileges, or through salary and benefits). Overall, physician compensation must track prevailing market conditions regardless of how it is structured.

On-Call Coverage Stipends for General Surgery, Neurosurgery, and Orthopedic Surgery		
	Reported Range[3]	**Median**
General Surgery Stipend	$790 - $2595/day (N=7)	$1800 per day
Neurosurgery Stipend	$97 - $1500/day (N=4)	$625 per day
Orthopedic Surgery Stipend	$253 - $3288/day (N=5)	$958 per day
Total for these 3 sub-specialties:	$313,900 - $2,182,518/year (N=7)	$912,500 annually

Source: Surveys of Florida Verified Trauma Center Hospitals

Media accounts of on-call compensation at trauma centers outside Florida often fall in these ranges. If a trauma center pays these surgeons stipends, then it also pays stipends to other physician sub-specialists, as well, along with a salary for its trauma director.[4] Total physician compensation is as follows:

The Costs of Physician On-Call Coverage		
	Reported Range (Annual)	**Median (Annual)**
General surgery, neurosurgery, and orthopedic surgery	$313,900 - $2,182,518	$912,500
All other sub-specialists	$127,750 - $1,481,900 (N=5)	$638,487
Other costs of on-call specialists[5]	$24,000 - $1,244,461 (N=6)	$422,351
Total sub-specialist compensation:	$337,900 - $4,208,051 (N=7)	$2,080,103

Source: Surveys of Florida Designated Trauma Center Hospitals

The responses also revealed the following:

- these stipends are tied directly to trauma care, and they are nearly all "incremental" in the sense that the hospitals would not have to pay them if they were not designated trauma centers;
- although these stipends are primarily intended as compensation for "covering call," the physicians who participate have other obligations and responsibilities;
- in some sub-specialties just a few physicians bear the brunt of covering call (e.g., the median number of neurosurgeons covering call at least twice each month is just three);
- in some sub-specialties, physicians' professional activities are closely linked to the hospital (e.g., the neurosurgeons), but in other cases the physicians engage in much of their professional activity off-site (e.g., the plastic surgeons);
- compensation for trauma directors varies considerably across hospitals (three of ten designated trauma centers pay less than $25,000 annually for the administrative services of their trauma directors, and four pay $100,000 or more); and
- even hospitals that extend stipends to their physician sub-specialists report temporary or chronic shortages, and dissatisfaction among the physicians with overall compensation for trauma call coverage.

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[4] The trauma director is a board-certified surgeon (general surgery) whose job description includes granting service privileges, service creation and definition, protocol development, teaching, research, administering quality assurance programs, and budgetary oversight.

[5] These other costs include the trauma director's salary and other costs related to on-call coverage, such as additional trauma personal, CME costs, licensure costs, supplemental payments, & recruitment.

The cost of periodic re-designation. – Re-designation of a trauma center hospital occurs every three years, but the work involved in re-designation is ongoing and year-round. In particular, the American College of Surgeons Committee on Trauma (ACS COT) guidelines require that verified trauma centers meet stringent clinical standards and establish a structured, evidence-based effort toward a continuous process for improving care. (The State of Florida maintains a separate designation program, but the standards are nearly identical.) These guidelines provide for a trauma registry at each center, which takes on the following form and function:

> "The registry provides for the collection, storage, and reporting of information about trauma patients, including the facts related to the patient's injury event, severity, care, and outcome. … the trauma registry is a tool to drive the performance improvement process for hospitals, emergency medical services, and regional trauma systems and allows comparisons to benchmarks across systems of care." (p. 63)

This registry is the foundation on which trauma centers and outside auditors base their process for improving care. The hospital's trauma registry may also be integrated into regional, state, or national trauma registries, such as NATIONAL TRACS or the National Trauma Data Bank.

The cost of maintaining this registry includes the hardware and software; the time and expense incurred by clinicians both to learn the hardware and software, and to input the relevant data; the administrative commitment from the trauma medical director; and perhaps most significantly, the wages, benefits, and training costs of a designated trauma registrar. The ACS COT trauma guidelines estimate that one full-time equivalent will be required for 500-1000 patients annually.

In addition to the trauma registrar and the trauma medical director, the trauma program requires a trauma nurse coordinator/trauma program manager who is "… usually responsible for logistic information, coordination of daily data processing, and monitoring of the effectiveness of interaction of all included services, including case management and resource utilization." (p. 70.) In addition, multidisciplinary review and oversight is provided through several channels. A Trauma Program Performance Committee comprised of physicians, pre-hospital personnel, nurses, technicians, administrators, and other personnel meets at least quarterly to review system-related issues and to analyze and propose corrective actions, where necessary. Trauma programs also include periodic case reviews or didactic conferences – usually held weekly in high-volume trauma centers and somewhat less often in low-volume centers. Trauma care is also governed by Trauma Peer Review Committees.

Due to these ongoing efforts, trauma center hospitals incur expenses annually, even though the re-designation occurs only once every three years. The explicit costs that this study has endeavored to measure include personnel (excluding the trauma director's compensation, which is counted elsewhere), hardware and software, office space and supplies, and "other costs." Based upon survey results from ten of the state's twenty designated trauma centers, the total annual costs of re-designation can be estimated as follows:

The Costs of Trauma Center Re-Designation		
	Reported Range (Annual)	**Median (Annual)**
Personnel (excluding Trauma Director):	$69,850 - $153,000 (N=7)	$98,750
Office Space, Supplies, & Equipment	$1,900 - $66,090 (N=7)	$16,900
Other Verification Costs	$200 - $301,418 (N=2)	---
Total annualized re-verification costs:	$88,000 - $456,258 (N=7)	$124,120

Source: Surveys of Florida Designated Trauma Center Hospitals

Outreach and prevention programs. – Every verified trauma center is required to provide outreach and prevention programs to other health systems, pre-hospital and post-hospital providers, and the communities where they provide care. Much of their educational activity surrounds injury prevention. This education encompasses both prevention of injury ("primary prevention") and the limitation of energy transfer whenever injuries occur ("secondary prevention"). Verified trauma centers also engage in tertiary prevention, which spans the entire pre-hospital delivery of care to improve outcomes after injuries occur. Finally, trauma centers also prepare for mass casualties, and this preparation includes a hospital disaster plan, a triage plan, and information transfer in times of disasters.

Survey results from ten of the State of Florida's twenty trauma center hospitals yielded the following costs for outreach and prevention:

Outreach and Prevention Costs		
	Reported Range (Annual)	**Median (Annual)**
Personnel (excluding trauma director):	$14,700 - $85,000 (N=4)	$54,250
Materials, Travel, Equipment, & Space	$2,000 - $152,266 (N=6)	$19,324
Other	$3738 - $5000 (N=2)	$4,369
Total outreach and prevention:	$2,000 - $215,766 (N=6)	$56,543

Source: Surveys of Florida Designated Trauma Center Hospitals

Unfortunately, many of the respondents left large portions of this section of the data request incomplete, and as such the median figure, $56,543, is no doubt low, even by the very conservative measures adopted throughout this study. Moreover, some personnel costs are either omitted or accounted for elsewhere in this report. For example, the trauma medical director typically administers these outreach and prevention programs and spends a considerable amount of time on them, but the director's compensation is included instead in the first part of this study (on physician on-call compensation).

Other extraordinary and *non*-chargeable costs. – In an effort to provide respondents with the opportunity to delineate additional costs of designated trauma centers, the data request also included a section entitled, "Other extraordinary and *non*-chargeable costs." There was no guidance given to the respondents. Instead, they were given complete discretion to identify and quantify any costs that they chose to report. The objective here was to give the respondents more or less free reign to identify expenses that the survey may have omitted, both to make certain that nothing was inadvertently excluded and to provide guidance in framing the next iteration of this study. The bulk of the costs reported surrounded aeromedical transportation, personnel, or indirect overhead, and many of the personnel costs were arguably needed for patient care (and therefore at least potentially reflected in patient charges). Many of these costs should be considered

in subsequent iterations of this methodology, especially if the scale or scope of analysis is expanded. (Aeromedical transportation and transfer centers, for example, are obvious candidates.) this section of the report also serves to illustrate how the costs and benefits of the trauma service extend well beyond the narrow confines of this methodological perspective.

The total costs identified in this trauma cost study can be summarized in the table below:

The Total *Unreimbursed* Costs of Designated Trauma Centers		
Cost Category	**Reported Range (Annual)**	**Median (Annual)**
Sub-Specialist On-Call Compensation (Incl. Trauma Director Salary & other costs related to on-call coverage)	$337,900 - $4,208,051	$2,080,103
Re-Designation Costs	$88,000 - $456,258	$124,120
Outreach and Prevention Costs	$2,000 - $215,766	$56,543
Other Direct and Non-Chargeable Costs	$17,440 - $3,925,448	$811,274
Total:	$1,840,250-$8,588,823 (N = 7)	$2,706,510

Source: Surveys of Florida Designated Trauma Center Hospitals

No designated trauma center reports less than $1.8 million in incremental, non-chargeable, and direct costs, and the median total cost is $2.7 million. The compensation paid to physicians for on-call coverage comprises the bulk of this expense, and yet the remaining costs are also significant – and almost certainly underreported here.

Because Florida's twenty designated trauma centers are so diverse, the cost per patient varies widely. Two designated trauma centers in the ten-hospital sample (both pediatric) admit 500 patients annually, and $2.7 million amortized over 500 patients equals $5400 per patient. On the other hand, three respondents admitted more than 2500 trauma patients per year, and $2.7 million amortized over 2500 patients equals $1080 per patient. These cost per patient calculations are crude, but they nonetheless illustrate that smaller trauma centers may face significantly more financial stress than larger centers. They are crude in the sense that number of admissions has not been factored into the methodology used here (the sample size is too small to do so), and large trauma centers face higher costs than smaller centers. The largest centers have two or more registrars, for example, and may engage in more extensive outreach and prevention programs.

I. INTRODUCTION

This cost methodology study delineates the following incremental expenses that hospitals incur to serve as verified trauma centers: the cost to trauma center hospitals of compensating physician sub-specialists for round-the-clock call coverage; the direct costs of periodic re-designation; the direct costs of trauma outreach and prevention programs; and other extraordinary and *non*-chargeable costs that trauma center hospitals incur.

The objective is to provide the Florida Legislature with a rigorous and transparent methodology to measure the financial ramifications to hospitals and health systems of maintaining a verified trauma center. The study details the lengths to which verified trauma center hospitals go to *prepare for and treat* patients with traumatic injuries, and to invest in organized trauma systems that extend from pre-hospital to post-hospital care, and to outreach and prevention programs.

Toward this end, the study hones in on the core costs to hospitals of providing trauma care – the extraordinary, direct expenses that the hospitals cannot recoup by billing patients for care. There is no attempt here to allocate a proportionate share of hospital overhead to trauma patients. There are no pre- or post-hospital expenditures, post-discharge rehabilitation or clinic visits, or professional charges of any kind factored into this methodology. The calculations that follow do not include costs that are linked directly to charges for rooms, intensive care, lab tests, anesthesia, operating room time, or other clinical activities. Hospitals can recoup the costs of these clinical activities through conventional billing practices. This study captures only those *incremental*, non-chargeable costs that a verified trauma center could avoid if it could shed its obligations to care for significant numbers of patients with traumatic injuries.

The bottom line figures reported here enumerate many direct and extraordinary costs to trauma center hospitals of regulatory "compliance" and clinical preparedness.[6] To function as verified trauma centers, hospitals must staff physician sub-specialists round-the-clock, and to recruit these physicians to "take call" hospitals must often supplement physicians' professional fees with stipends. There are no direct patient charges linked to these stipends, and thus these large expenditures by trauma center hospitals go un-reimbursed. Trauma centers also have other un-reimbursed personnel costs (e.g., for the trauma nurse coordinator and trauma director). There are significant outlays, as well, for designation, and for outreach and prevention programs. All of these costs are included here, as well as a final category for "other costs."

This study deliberately omits the costs of caring for individual trauma patients, so long as those costs can be billed to those patients and recovered through conventional means. Trauma care is multi-disciplinary – it draws upon resources from throughout the hospital – but there are relatively few activities or hospital assets that are specialized to the trauma service. If a trauma patient requires an MRI or CT scan, for example, the care is delivered in the same way to trauma patients as all other patients, and the transaction is billed and reimbursed in precisely the same

[6]Direct (or incremental) costs include trauma service overhead but not hospital (i.e., indirect) overhead. Depending upon circumstances, direct/incremental cost may be more or less relevant than total cost. For example, for a hospital to remain solvent, its revenues must cover *total* costs, and as such total cost may be the more relevant metric when considering billing and patient revenue issues. Here, though, direct/incremental costs are especially useful for providing baseline measures of the costs hospitals incur simply to "open their doors" as trauma centers.

manner. There is therefore no obvious reason why such costs should be included in this study. There is a legitimate concern that some verified trauma centers' patients are disproportionately uninsured or underinsured, but with some notable exceptions, there is no evidence indicating that trauma center hospitals are systematically reimbursed on less favorable terms for their trauma patients than for their non-trauma patients.

The scale and scope of this methodology are dictated in part by data and resource constraints, but there are other reasons to take this perspective. First, the target audience for this study is the Florida Legislature, which determines the regulatory framework within which the State's trauma center hospitals function. By parsing costs in this manner, this study provides a clear, transparent, and straightforward measure of the cost to trauma centers of regulatory compliance. This study can thereby help the Legislature refine these regulations and ensure that funding is available to offset the regulated costs associated with trauma center designation, of staffing sub-specialist physicians, and of outreach and prevention.

Second, by taking this approach, the study sidesteps for now many subjective and potentially contentious decisions that would have inevitably arisen had the scale and scope been broader. For example, had the study attempted to measure *total* rather than *incremental* costs, it would have been necessary to determine how to allocate indirect hospital overhead. Although there are guidelines that cost accountants use to determine how to allocate indirect costs to individual patients (meaning such overhead as the CEO's salary, subsidies to the hospital's cafeteria or parking structure, etc.), there is also considerable discretion and judgment involved, and any effort to take on this task would have required far more data from the hospitals than they were willing or able to provide.

Third, the Executive Council felt that the development of this methodology should be staged over several years. In subsequent iterations, the Department of Health and the Executive Council may elect to measure fully allocated costs, but as a first step this approach was deemed neither expedient nor especially relevant to the fundamental issue of how to fund the State's trauma centers. Similarly, in the years ahead the methodology might expand in scope to include pre- and post-hospital costs, professional fees, or other considerations. The goal for this study is to establish a rigorous and consistent baseline from which to build in these components over time.

Section II offers background. Section III provides details on the study's scale and scope. The data are described in Section IV, and the study's results are reported in Section V. Section VI discusses the results, and a conclusion follows.

II. BACKGROUND

This section begins with basic information on trauma patients and trauma care (Parts A through C), and it high describes how the extraordinary volatility attending trauma patients creates costs that are significant, difficult to measure, and largely unreimbursed through conventional billing and collections practices (Part D). Sections E and F then discuss how trauma care is reimbursed overall, and whether or not trauma centers are financially viable. Section G provides some additional background on health care industry trends, and with all of this background in mind, the final section describes the direction that this trauma cost study takes.

A. What is the Nature of Traumatic Injuries?

The National Center for Injury Prevention and Control reports that approximately 146,000 people died from traumatic injuries in 1997.[7] The National Vital Statistics Report identifies unintentional injuries as the fifth leading cause of death in the United States after heart disease, cancer, stroke, and lung disease. Unintentional injuries are the leading cause of death for all age groups 1 – 34; it is the second-leading cause of death in adults ages 35 – 44, and the third leading cause of death in adults 45 – 54.[8] The Centers for Disease Control and Prevention estimates that in the United States in 1993, injuries accounted for 57% and 78% of all deaths among persons aged 1-34 and 15-24 years, respectively.[9] The National Center for Health Statistics calculates "Years of Potential Life Lost Before Age 65," or "YPLL" by cause of death, and for 1995 it determined that unintentional injuries accounted for more than 2 million YPLL. This exceeded years lost due to cancer (1.9 million YPLL), heart disease (1.4 million YPLL), and HIV (1.1 million YPLL). Suicides and homicides accounted for an additional 1.5 million YPLL. The Injury Fact Book 2001 – 2002 reports that the financial cost of injuries is estimated at more than $224 billion per year, and that the federal government alone pays about $12.6 billion annually in injury-related medical costs and $18.4 billion in death and disability benefits.[10]

Trauma victims not killed by their initial injuries often have long-lasting hardships. For example, one million people suffer traumatic brain injuries (TBI) in the U.S. each year. (TBI accounts for one third of all injury-related deaths.) Of these individuals, 230,000 are hospitalized, 50,000 die, and 80,000–90,000 experience the onset of long-term disability. There are 5.3 million individuals living with a permanent TBI-related disability in the U.S., with an estimated annual economic burden of $37.8 billion.[11] Moreover, many of the costs are neither financial nor visible:

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[7] These injuries resulted from motor vehicle crashes (43,591 deaths), drownings (4,724), falls (12,555), poisonings (17,692), suicide (30,535), and homicide (19,491). See www.cdc.gov/ncipc/about/aout.htm. Also see the Web-Based Injury Stateis Query and Reporting System (WISQARS, pronounced "whiskers") for additional details.

[8] National Vital Statistics Report, Vol. 49, No. 11, October 12, 2001.

[9] *Recommended Framework for Presenting Injury Mortality Data*, Morbidity and Mortality Weekly Report, Centers for Disease Control and Prevention, August 29, 1997, page 1.

[10] National Centers for Injury Prevention and Control, Centers for Disease Control and Prevention, Nov. 2001, p. 7.

[11] Of this figure, only $4.5 billion resulted from direct expenditures for hospital care, extended care, and other medical care and services. Of the remainder, $20.6 billion resulted from injury-related work loss and disability, and $12.7 billion resulted from lost income from premature death. Intangible costs born by family and friends were not included in these estimates. See *Traumatic Brain Injury in the United States: A Report to Congress*, Prepared by Division of Acute Care, Rehabilitation Research, and Disability Prevention, national Center for Injury Prevention and Control, December 1999. Available at www.cdc.gov/ncipc/pub-res/tbicongress.htm. For the original source, see Max W, MacKenzie EJ, Rice DP. Head Injuries: Costs and Consequences. J Head Trauma Rehabil 199;6:76-91.

"For the estimated 5.3 million Americans who live with a TBI-related disability, the financial cost is only part of the burden. The long-term impairments and disabilities associated with TBI are grave and the full human cost is incalculable. Yet because these disabilities are not readily apparent to the public – unlike a broken leg, for example – TBI is referred to as the *invisible epidemic*. These disabilities, arising from cognitive, emotional, sensory, and motor impairments, often permanently alter a person's vocational aspirations and have profound effects on social and family relationships."

The National Trauma Data Bank (NTDB) Report 2001 describes traumatic injuries and trauma care at 67 hospitals in 29 states over the period 1994 - 1999.[12] The data set includes 181,371 patients. The comments from this report provided the following brief summary:

"This review demonstrates that trauma occurs in patients of all ages and follows a bimodal distribution. Trauma in teenagers and the young occurs most commonly. The patients in this group are mostly males, and their injuries are predominately due to violence (shootings, stabs, and fights) and to motor vehicle crashes (MVC). Trauma in older adults occurs more commonly in women than in men, and results predominately from falls and MVC. …

"The majority of injuries are blunt. MVC are the most common mechanism of injury in the teenage years and adulthood. Although MVC continue to be an important cause of injury throughout life, falls are the predominant mechanism of blunt trauma requiring hospital care after age 55. Falls are also slightly more common than MVC in early childhood. The mechanism of blunt trauma with the highest mortality rate throughout life, however, is the struck pedestrian."

Keeping in mind that the NTDB data span admissions to only 67 hospitals that provide extensive trauma care, the age and gender distribution of patients is as follows:

Age Groups	Patient Count	% of Patients	% of Age Group Male	% of Age Group Female
Age 0 - 15	20,545	11.9%	64.3%	35.7%
Age 16 - 55	108,162	62.6%	72.8%	27.2%
Age 56 - 99	44,058	25.5%	39.5%	60.5%
Total Age 0 - 99	**172,754**		**63.3%**	**36.7%**
Age > 99	85		16.5%	83.5%
Age Unknown	8,363		62.3%	37.7%
Gender Unknown	169			
All Patients	**181,371**			

Source: National Trauma Data Bank Report 2001, Table 1

[12] The report is sponsored by the American College of Surgeons Committee on Trauma (http://www.facs.org/ntdbreport 2001/).

Trauma patients' injuries are scored by an "injury severity score," or "ISS." Although less severe injuries (ISS 1 – 9) comprise nearly 70% of all trauma admissions, with an average length of stay of 5.55 days, they account for only 17% of all deaths from injury. The most severe injuries (ISS > 15) account for 20% of trauma admissions but 71% of all deaths:

Injury Severity Score (ISS)	Patient Count	% of Patients	Deaths	% of Deaths with ISS	Average Mortality Rate	Average Length of Stay
ISS 1-9	109,968	69.3%	1,379	16.8%	1.25%	5.55
ISS 10-15	17,340	10.9%	338	37.2%	1.95%	7.76
ISS > 15	31,470	19.8%	6,511	71.3%	20.69%	12.18
Total	**158,778**		**8,228**		**5.18%**	**7.11**
Unkown	9,299		908		9.76%	6.38
All Patients	168,077		9,136		5.44%	7.07

Source: National Trauma Data Bank Report 2001, Tables 11 and 12.

The NTDB set often records include mechanism of injury. Although mechanisms may differ in Florida, the table below provides insights into how trauma patients are injured:

Mechanism	Patient Count	% of Patients	Deaths	% of Deaths with ISS	Average Mortality Rate
Motor Vehicle Crash	34,119	38.4%	1,432	40.0%	4.20%
Fall	24,891	28.0%	675	18.9%	2.71%
Pedestrian	4,553	5.1%	285	8.0%	6.26%
Motorcycle Crash	3,353	3.8%	123	3.4%	3.67%
Machine	2,282	2.6%	34	1.0%	1.49%
Bicycle	1,758	2.0%	54	1.5%	3.07%
Burn	1,559	1.8%	146	4.1%	9.36%
Assault	5,593	6.3%	144	4.0%	2.57%
Gun shot wound	7,123	8.0%	639	17.9%	8.97%
Stabbing	3,518	4.0%	45	1.3%	1.28%
Total	**88,749**		**3,577**		**4.03%**
Other Mechanisms	21,073		609		2.89%
All Patients	**109,822**		**4,186**		**3.81%**

Source: National Trauma Data Bank Report 2001, Table 4

B. What is a Verified Trauma Center?

To appreciate the extraordinary costs that trauma centers incur, it is necessary to understand their unique environment. Trauma patients typically arrive suddenly, emergently, and at all hours of the day and night, and their needs take priority over other patients. Several patients with life-threatening injuries may arrive simultaneously. Their injuries are often acute and complex, affecting multiple organs, and requiring a wide range of clinical expertise and hospital re-

sources. The patients themselves span all demographic categories and pre-injury health states, meaning that no one is immune to traumatic injuries, and those patients' injuries come "on top" of whatever other health issues they may face. Clinicians are rarely, if ever, witnesses to the events leading up to these injuries, they nearly always lack any prior relationship with their patients, they usually have no knowledge of the patients' medical histories, and often they are unable to communicate with either the patients themselves or their families. Physicians must often act quickly to treat these injuries, yet in doing so they frequently begin "in the dark."

The American College of Surgeons Committee on Trauma (ACS COT) was established in 1922, and first published trauma center guidelines in 1976. The Committee's most recent guidelines appear as *Resources for Optimal Care of the Injured Patient: 1999*. Chapter 23 lists essential trauma facilities criteria for Level I, Level II, Level III, and Level IV trauma centers, as well as pediatric trauma centers. Since Florida has no Level III or Level IV trauma centers, the relevant distinctions are as follows:

Level I Trauma Centers	Level II Trauma Centers
"The **Level I** facility is a regional resource trauma center that is a tertiary care system. … This facility must have the capability of providing leadership and total care for every aspect of injury, from prevention through rehabilitation. "Because of the large personnel and facility resources required for patient care, education, and research, most **Level I** trauma centers are university-based teaching hospitals. …" (p. 2)	"The **Level II** trauma center is a hospital that is also expected to provide initial definitive trauma care, regardless of the severity of injury. Depending on the geographic location, patient volume, personnel, and resources, however, the **Level II** trauma center may not be able to provide the same comprehensive care as a Level I trauma center. Therefore, patients with more complex injuries may have to be transferred to a Level I center (for example, patients requiring advance and extended surgical critical care). **Level II** trauma centers may be the most prevalent facility in a community, managing the majority of trauma patients."(p.2)
Pediatric Trauma Centers	
"Proper care for injured children is redefined in terms of resources. **Pediatric hospitals** are recognized as special resources that are available in some communities. These institutions have the responsibility to meet the same criteria as adult hospitals. … **Pediatric hospitals** can commit to resource levels that are equivalent to Levels I–IV."(p.4) *Note*: Adult trauma centers caring for injured children face additional requirements.[13]	

Source: Resources for Optimal Care of the Injured Patient, 1999.

Level I trauma centers are expected to have 1200 or more trauma admissions annually and 240 admissions with injury severity scores (ISS) exceeding 15 (or 35 patients/surgeon with ISS > 15). At present, the State of Florida has twenty verified trauma center hospitals:

[13] At Level I and Level II adult centers caring for injured children, trauma surgeons must be credentialed for pediatric trauma care. Each surgeon must have six hours of pediatric continuing medical education (CME). These centers must have a pediatric emergency department area, pediatric resuscitation equipment in all patient care areas, microsampling, a pediatric-specific performance improvement program, and a pediatric intensive care unit.

Hospital Name	Trauma Center Level	City	County
All Children's Hospital, Inc.	Pediatric	Saint Petersburg	Pinellas
Baptist Hospital-Pensacola	Level II	Pensacola	Escambia
Bayfront Medical Center	Level II / Pediatric	Saint Petersburg	Pinellas
Broward General Medical Ctr	Level I/Pediatric	Fort Lauderdale	Broward
Delray Medical Center	Level II / Pediatric	Delray Beach	Palm Beach
Halifax Medical Center	Level II	Daytona Beach	Volusia
Holmes Regional Medical Ctr	Level II	Melbourne	Brevard
Jackson Memorial Hospital	Level I/Pediatric	Miami	Dade
Lakeland Regional Medical Ctr	Level II	Lakeland	Polk
Lee Memorial Hospital	Level II	Ft Myers	Lee
Memorial Regional Hosp, Hollywood	Level I/Pediatric	Hollywood	Broward
Miami Children's Hospital	Pediatric	Miami	Dade
North Broward Medical Ctr	Level II	Pompano Beach	Broward
Orlando Regional Healthcare System	Level I/Pediatric	Orlando	Orange
Sacred Heart Hosp - Pensacola	Level II / Pediatric	Pensacola	Escambia
St. Joseph's Hospital of Tampa	Level II / Pediatric	Tampa	Hillsborou
St. Mary's Hospital	Level II / Pediatric	West Palm Beach	Palm Beach
Tampa General Healthcare	Level I/Pediatric	Tampa	Hillsborou
Shands Medical Ctr - Jacksonville	Level I/Pediatric	Jacksonville	Duval
West Florida Regional Medical Ctr	Level II	Pensacola	Escambia

The most visible clinical commitment and the extraordinary financial cost revolves around fifteen physician sub-specialists who must be on-call and available immediately (or promptly) 24 hours/day:

- General surgery
- Anesthesia
- Emergency medicine
- Neurosurgery
- Orthopedic surgery
- Cardiac surgery
- Hand surgery
- Microvascular/replant surgery
- Obstetrics/gynecological surgery
- Oral/maxillofacial surgery
- Plastic surgery
- Critical care medicine
- Radiology
- Thoracic surgery
- Opthalmic surgery

In a relatively few cases, a single physician may provide call coverage for two or more sub-specialties (e.g., a surgeon may be board-certified in plastic surgery and provide coverage for plastics, hand, or oral-maxillofacial services). Many of these physicians must meet incremental professional requirements in order to provide trauma care.

All verified Level I, Level II, and pediatric trauma centers have an established trauma program, a trauma service, a trauma team, a trauma program medical director, a trauma multidisciplinary committee, and a trauma program manager. These hospitals meet stringent requirements for their emergency departments, operating rooms, post anesthetic recovery rooms, intensive or critical care units, respiratory therapy service, radiological service, clinical laboratory service, acute hemodialysis service, and rehabilitation service. Verified trauma center hospitals also have either a formal in-house burn service or a transfer agreement with a burn center, and an in-house acute spinal cord management service or transfer agreement with a regional acute spinal cord injury rehabilitation center.

All verified trauma center hospitals maintain an in-house trauma registry covering all of their trauma admissions, and they participate in local, state, regional, and national trauma registry efforts. They have extensive performance improvement programs that include, for example, reviews of pre-hospital trauma care, times and reasons for trauma-related bypass and transfers of injured patients. All verified trauma center hospitals engage in extensive education, outreach, and prevention programs, which are described in greater detail elsewhere in this report.

In addition, all Level I and most Level II trauma centers engage in education and research. Education often takes the form of a residency training program and medical student rotations within the trauma center. Accounting for the costs of these activities is beyond the scope of this analysis, but it is important to recognize the critical role a trauma center plays in the education and training of future physicians. Moreover, the clinical platform of trauma care provides a rich environment for the fostering of clinical and basic science research. Florida has many leaders in the field of trauma training, education, and research.

The table on the next page provides a simple comparison of trauma center hospitals to other large hospitals in Florida. The figures are taken from data compiled by the Agency for Health Care Administration, which each year provides information on all inpatient admissions at hospitals throughout the state. Of the 15 largest hospitals in the state (ranked by number of admissions), nine are designated trauma centers, and 11 of the 24 hospitals with 20,000 admissions are trauma centers.[14] Yet seven trauma centers had fewer than 15,000 patients, implying that hospitals need not be huge to function effectively as designated trauma centers. Designated trauma centers are typically active in a full range of clinical domains. Of the 15 trauma centers ranked in the top 50 in 1999, for example, childbirth accounted for at least one quarter of all admissions at all but Orlando Regional Healthcare System (which is affiliated with Arnold Palmer Hospital, where 73% of admissions are related to childbirth) and Delray Medical Center. In short, designated trauma centers provide much routine care. At the same time, designated trauma centers are also active in critical care. Patients requiring intensive care account for 40% or more of all inpatient charges at 14 of the state's 20 designated trauma centers. Of the 40 non-trauma center hospitals in this table, only 10 meet this 40% threshold.

C. What is a Trauma System?

The ACS COT guidelines describe a long history of trauma centers and trauma systems, dating to the care of wounded soldiers in Napoleon's armies. In this country, the first civilian centers arose in the 1970s from inner city hospitals, which provided care for the uninsured. In 1990, Congress passed the Trauma Care Systems Planning and Development Act, which in turn led to publication in 1992 of *The Model Trauma Care System Plan* by the Health Resources Services Administration. This document has provided the template for many new trauma systems nationwide, in which "the trauma center remains a key component, but the system recognizes the necessity of other health care facilities. *The goal is to match a facility's resources with a patient's needs so that optimal and cost-effective care is achieved."* (ACS COT guidelines, p. 5.)

System integration includes injury prevention initiatives, pre-hospital care, triage guidelines, community hospital participation, definitive care facilities, rehabilitation, research, education,

[14] Arnold Palmer Hospital, ranked 17th in admissions, is affiliated with Orlando Regional Healthcare System (11th).

1999 Rank (Admissions)	Hospital Name	County	Trauma Center? (2000 Admissions)	Number of 1999 Admissions	% of Admissions Childbirth-Related*	ICU Patients' Charges as a % of All Charges
1	Jackson Memorial Hospital	Dade	Yes	49,145	25.7%	58.9%
2	St. Joseph's Hospital of Tampa	Hillsborou	Yes	43,732	31.7%	45.5%
3	Florida Hosp Medical Center	Orange		43,630	19.1%	67.3%
4	Lakeland Regional Medical Ctr	Polk	Yes: 676	33,590	18.2%	26.6%
5	Baptist Hospital of Miami, Inc.	Dade		31,466	25.9%	39.8%
6	Morton Plant Hospital	Pinellas		31,321	20.0%	20.0%
7	Memorial Regional Hosp, Hollywood	Broward	Yes	29,633	22.1%	53.5%
8	Tallahassee Memorial Hospital	Leon		28,671	30.1%	36.3%
9	Sarasota Memorial Hospital	Sarasota		27,462	18.0%	20.0%
10	Tampa General Healthcare	Hillsborou	Yes: 1,132	25,537	27.0%	41.3%
11	Orlando Regional Healthcare System	Orange	Yes: 3,325	25,083	0.2%	39.9%
12	Baptist Medical Ctr-Jacksonville	Duval		25,062	26.4%	30.8%
13	Holmes Regional Medical Ctr	Brevard	Yes	24,835	17.3%	29.8%
14	Halifax Medical Center	Volusia	Yes: 1,782	23,798	18.3%	47.9%
15	Broward General Medical Ctr	Broward	Yes	23,541	29.5%	21.5%
16	St. Vincent's Medical Center	Duval		23,494	21.5%	23.0%
17	Arnold Palmer Hospital	Orange		23,398	73.2%	30.2%
18	Shands at the University of Florida	Alachua		22,765	21.7%	65.5%
19	Munroe Regional Medical Ctr	Marion		22,244	13.7%	34.4%
20	Mount Sinai Medical Center	Dade		22,219	18.2%	48.4%
21	Columbia JFK Medical Center	Palm Beach		21,650	0.2%	12.2%
22	Boca Raton Community Hosp	Palm Beach		20,995	15.9%	25.9%
23	Shands - Jacksonville	Duval	Yes: 2,876	20,988	32.4%	40.7%
24	Sacred Heart Hosp - Pensacola	Escambia	Yes	20,877	30.0%	39.5%
25	University Community Hosp of Tampa	Hillsborou		19,945	23.9%	14.4%
26	Palmetto General Hospital	Dade		19,853	32.6%	41.6%
27	Bayfront Medical Center	Pinellas	Yes: 2,973	19,638	36.7%	37.9%
28	South Miami Hospital	Dade		19,553	43.8%	34.5%
29	Mercy Hospital	Dade		19,356	18.4%	26.1%
30	Columbia Memorial Hsp	Duval		19,129	25.4%	58.2%
31	Naples Community Hospital	Collier		18,775	0.4%	22.8%
32	Columbia Cedars Medical Ctr	Dade		18,680	0.1%	25.7%
33	Manatee Memorial Hospital	Manatee		18,483	22.4%	41.9%
34	Columbia Brandon Hospital	Hillsborou		18,129	38.4%	20.9%
35	Bethesda Memorial Hospital	Palm Beach		18,079	27.9%	19.6%
36	Holy Cross Hospital	Broward		17,800	15.4%	36.7%
37	Memorial Hospital West	Broward		16,951	46.8%	28.0%
38	North Florida Regional Med Ctr	Alachua		16,485	21.8%	32.2%
39	Delray Medical Center	Palm Beach	Yes	15,674	0.0%	81.2%
40	Florida Medical Center Hosp	Broward		15,353	0.2%	71.6%
41	Martin Memorial Medical Ctr	Martin		15,155	18.5%	54.3%
42	Parkway Regional Medical Ctr	Dade		14,892	22.6%	35.2%
43	Leesburg Regional Medical Ctr	Lake		14,781	15.7%	32.5%
44	Baptist Hospital-Pensacola	Escambia	Yes	14,504	16.0%	45.2%
45	St. Mary's Hospital	Palm Beach	Yes	14,298	32.6%	33.5%
46	Winter Haven Hospital	Polk		14,255	0.2%	35.9%
47	Columbia Kendall Reg Med Ctr	Dade		14,102	19.8%	12.1%
48	Florida Hosp-Altamonte Springs	Seminole		13,885	25.6%	47.2%
49	Plantation General Hospital	Broward		13,690	63.4%	34.6%
50	Ocala Regional Med Ctr	Marion		13,467	13.0%	26.6%
53	Lee Memorial Hospital	Lee	Yes: 1,797	12,917	0.1%	46.3%
54	West Florida Reg Med Ctr	Escambia	Yes	12,848	11.3%	55.7%
58	North Broward Medical Ctr	Broward	Yes	12,609	0.5%	27.5%
86	Miami Children's Hospital	Dade	Yes: 501	9,706	3.2%	45.7%
115	All Children's Hospital, Inc.	Pinellas	Yes: 442	7,088	7.1%	45.2%

*Includes all patients in DRGs 385 - 391 (child) and 370 -384 (mother).

Source: Inpatient data gathered by the Agency for Health Care Administration; and Surveys of Florida Designated Trauma Center Hospitals.

quality assurance, finance, and legislation. Verified trauma centers are an integral component of any comprehensive trauma system. The State of Florida does not have a fully integrated trauma system, but nationally the State of Florida is a recognized leader in the delivery of trauma care.

As one example, consider how trauma centers must coordinate their efforts with pre-hospital ground and air emergency medical providers to properly triage patients:

> "The entire trauma system is driven by the tenet that severely injured patients should be triaged to the appropriate trauma facility. Imprecision results in over-triage, as minimally injured patients are transferred to trauma centers, and under-triage, as severely injured patients are taken to non-trauma centers. In general, priority has been given to reduction of under-triage, because under-triage may result in preventable mortality or morbidity from delays in definitive care. Although over-triage carries minimal or no adverse consequences for the patient, it does result in excessive costs and burden for the trauma center. In most systems, an under-triage rate of 5 to 10 percent is considered unavoidable and is associated with an over-triage rate of 30 to 50 percent. An over-triage rate of up to 50 percent may be required to maintain an acceptable level of under-triage in a community." (p. 13)

This single passage illustrates the complexities of a trauma system, and the potential clinical and financial returns that come from sound management, strong leadership, and full systems integration. The passage also illustrates how decisions made by one constituency can have clinical and financial implications for other constituencies, meaning that trauma systems can not be "optimized" component by component. Clinically and financially, investments and decision-making must be integrated.

D. Cost Drivers: The High Cost of Variability and Its Relationship to Capacity

The analysis thus far has stressed the highly uncertain and variable demands that trauma care imposes on the hospitals that provide it – and the costs that attend this variability. For many reasons, conventional cost accounting tools are incapable of measuring these costs. Fortunately, recent advances in operations management have demonstrated the practical implications of high variability for firms' business processes. This research is complex, but the upshot is that variability creates significant costs, and these costs rise dramatically as firms' assets become more fully employed.

Figure 1 below shows how this variability imposes costs on trauma center hospitals.[15] The horizontal axis depicts capacity utilization, which is a measure of how intensively an asset is employed. This asset may be a piece of durable medical equipment, an operating room, an ICU bed, or a surgeon. (For example, if an operating room is available 40 hours per week and is in use on average for 32 of those hours, then capacity utilization is 80%). The vertical axis measures how long on average a user must wait to use the asset as a function of its capacity utilization, and the two solid curves depict the tradeoff between utilization and average wait times for low variability and high variability processes, respectively. The striking aspect of Figure 1 is its non-linearity: variability is especially problematic at high levels of capacity utilization.

[15] Figure 1 is a straightforward graphical representation of the "queue length formula," which is a mainstay of operations management analysis. See, for example, *Managing Business Process Flows*, by Ravi Anupindi (Editor), Prentice Hall, 1999, 267 pages, Chapter 8.

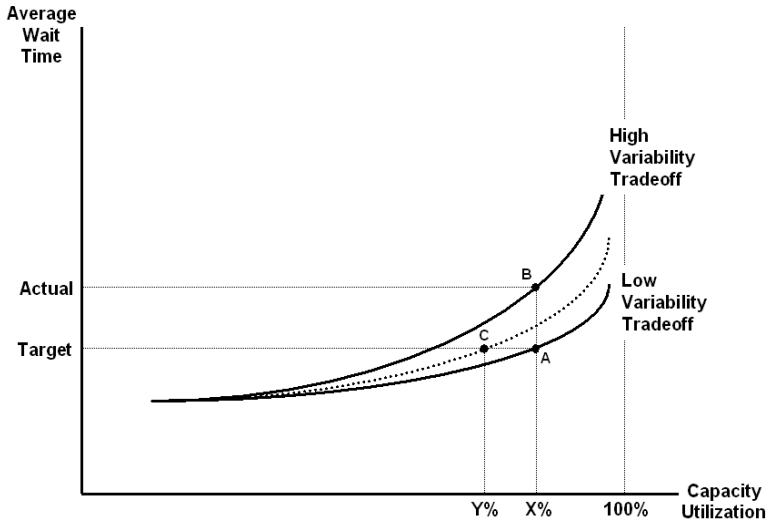

Figure 1

With a low variability process, the hospital may achieve its target wait time and yet also maintain relatively high capacity utilization (Point A). But with a high variability process, the hospital will inevitably suffer longer wait times (Point B), especially at high levels of capacity utilization. Trauma center hospitals, with their high variability, face the prospect of significantly longer wait times than non-trauma hospitals, especially if they seek to achieve high capacity utilization, which is necessary to effectively amortize their large fixed costs. If longer wait times are unacceptable – and we assume that they are – then trauma center hospitals must make two types of adjustments to their clinical activities. First, they must make substantial investments in their business processes to improve the tradeoff between wait time and capacity utilization (as indicated by the dotted line), and they must add spare capacity (Point C) in order to reduce overall capacity utilization.

These adjustments can be quite costly, and the expenditures are neither easy to account for nor clearly attributable to the trauma service. Long waits are not measured in dollars and cents, and in any event it is typically non-trauma patients who must do the waiting whenever queues develop. As such, it is non-trauma patients who benefit most directly from investments in additional capacity, even though the need for that capacity derives directly from the unpredictable and highly variable needs of trauma patients.

It is important to emphasize that these costs do not derive simply from long waits. Real resources are involved – including investments in spare capacity for such key assets as operating rooms, intensive care units, and durable medical equipment. Physicians who take call face real resource costs, because they must rearrange (and curtail) their non-trauma patient schedules, suffer inevitable disruptions to their professional practices, and otherwise adjust their personal and professional priorities downward to accommodate their obligations to the trauma center hospital.

In other industries, customers whose demands are most variable or uncertain routinely pay a premium. Airline passengers, for example, who purchase their tickets at the last moment, pay more than passengers who purchase non-refundable tickets weeks in advance. Airlines go to great lengths to guarantee service to last-minute fliers (e.g., by reserving seats that often go unused and by bribing advance purchase ticket-holders to give up their seats), and the costs must be reflected in the prices these passengers pay. Similar premia are charged for last-minute tickets to

various types of events (e.g., professional conferences). Premia are also charged in settings where demand is uncertain and capacity is constrained – parking garages charge more for "gold" passes that assure the customer of a spot, for example, and electric utilities charge commercial users more in the summer time if they need uninterrupted service.

E. How (and How Well) is Trauma Care Reimbursed?

Trauma centers face several vexing billing and collections problems. While an exhaustive analysis of these problems is beyond this study's scope, two examples are worth mentioning. First, at the pre-hospital stage, the cost of transporting patients from accident scenes to trauma center hospitals many miles away is substantial, and yet EMS and aeromedical services providing this transport can bill patients' health or auto insurance within hours, and be reimbursed fully before hospital or professional fees can even be determined. If a patient has only limited insurance coverage (e.g., $10,000 personal injury protection from an auto policy), little may be left for the hospital or physicians to collect. Second, many trauma patients can not leave the hospital and simply "go home," and when those patients lack adequate insurance to pay for their post-hospital care (e.g., rehabilitation, intermediate care facilities, home health care), trauma center hospitals may be unable to discharge them in a timely manner. Placing uninsured and underinsured patients in appropriate post-discharge settings is a major clinical and financial challenge.

As such, many trauma center hospitals ultimately underwrite the cost of EMS and aeromedical transport, as well as the cost of some care that would otherwise be provided after discharge. Many trauma center hospitals (and physicians) also bear the cost of providing care to uninsured and underinsured trauma patients, though to repeat, there are no data available to gauge the extent of this last problem, either in absolute terms or in relation to these hospitals' non-trauma patients. These costs are not included in this study, not because they are unimportant, but because of data issues and decisions by the Executive Council regarding manageable scale and scope.

Aside from specific issues such as these, billing and collections are routine. Trauma care is highly multidisciplinary – it draws upon resources from throughout the hospital. As such, there is nothing unusual about trauma services that would impede hospitals' efforts to bill individual trauma patients for services rendered. A trauma patient's room charge, for example, is presumably identical to a non-trauma patient's room charge. Thus, any financial losses incurred by trauma services must result either from costs that cannot be tagged to individual patients or from difficulties collecting from payers. This study focuses on un-billable fixed costs, but consider some factors influencing collection rates for trauma patients:

Factors Contributing to …	
High Reimbursement	**Low Reimbursement**
Trauma patients often have several layers of insurance, including conventional health and auto insurance (personal injury protection, or "PIP").	⇨ Trauma patients' charges may exceed the limits of their coverage (especially their PIP coverage), and at some hospitals trauma patients are disproportionately uninsured.
Trauma center hospitals rarely compete with one another for trauma patients, and thus often enjoy some "monopoly power."[16]	⇨ Trauma center hospitals compete aggressively for *non*-trauma patients, and because they negotiate "global" contracts with individual payers, they may be unable to bargain for adequate reimbursements on their trauma patients.
For various reasons, hospitals may often succeed in collecting "full billed charges" from a significant subset of their trauma patients.[17]	⇨ Trauma center hospitals likely suffer from "adverse selection," meaning that they attract sicker and more resource intensive patients, even controlling for diagnosis or procedure. Moreover, payers may scrutinize trauma patients' charges more closely, and more often challenge charges that they have not "pre-approved."
Trauma centers generate significant new "downstream" activity – patients, once discharged, may return to the hospital for subsequent care.	⇨ Trauma center hospitals vie with pre-hospital (EMS and aero-medical) and post-hospital providers (intermediate care facilities and home health care) for limited insurance reimbursement.

In short, reimbursement depends upon many countervailing forces, and their net impact may vary markedly across trauma center hospitals. Indeed, since most hospitals negotiate "global contracts" with individual payers (i.e., contracts that bundle together all inpatient and outpatient care), it is not even clear that "trauma profits" are especially meaningful.[18]

F. Are Trauma Centers Financially Viable?

The analysis to this point has shown that narrowly defined accounting measures may overstate profits for the simple reason that they do not adequately capture or tag the expenses surrounding the uncertainty and variability that comes with trauma care. Nonetheless, a brief survey of the available evidence helps to put the financial viability of trauma care into perspective. Unfortunately, few studies have been conducted. In its 1998 report, *Establishing a Trauma Center*, the Health Care Advisory Board studied six trauma center hospitals. It determined that all six of the trauma services were 'break even financially or marginally profitable.' (page 2.) This small sample was not random – all of the trauma centers were located within non-profit hospitals in small cities – but the institutions were geographically dispersed and included Level I and Level II centers. Motor vehicle accidents comprised the largest fraction of injuries and reimbursed well, especially in states with no-fault auto insurance. In those instances care was often fully reimbursed by

[16] In a March 29, 2002 story on Tampa General Hospital written by the Health Care Advisory Board, the following explanation was given for the hospital's financial turnaround: "Hardball negotiating tactics, market leverage, and timing all contributed to TGH's success in managed care contracting, according to [CFO Steven] Short. The hospital made clear its willingness to cancel contracts with insurers that refused to include stop-loss and other key language, and no payer refused TGH's demands – perhaps because the hospital maintains the market's only transplant, burn, and trauma centers."

[17] For example, trauma patients are more likely than non-trauma patients to come from far away. The payers who insure these "distant" trauma patients are therefore less likely to have pre-existing contracts with the hospital.

[18] To illustrate, suppose Hospital A negotiates $50 per day more reimbursement than Hospital B on all inpatient admissions hospital-wide, while Hospital B negotiates generous "outlier payments" for patients with charges exceeding $50,000. Hospital A will likely realize lower trauma profits than Hospital B, but higher non-trauma profits, and yet for the hospitals overall, collection rates (i.e., revenues as a percentage of billed charges) and profits may be quite similar.

auto insurers (up to the limits of the drivers' personal injury protection) and was often backed up by patients' conventional health insurance. Consistent with the results reported here, the Advisory Board's report identified "the expense of maintaining a dedicated trauma team 24 hours per day" as the largest cost associated with establishing an ACS-verified trauma program.

Taheri et al (1998, 1999) studied trauma service margins at the University of Michigan Health System in the late 1990s and determined that trauma care there was also profitable there, and that the most complex and highest-cost cases generated a disproportionate share of trauma profits.[19]

Given the paucity of hard data on trauma center finances, an alternative approach is to survey media coverage of trauma centers to glean information from hospitals' decisions to enter or exit this clinical domain. Appendix B provides a brief synopsis of trauma center reports in various written media outlets from March 2001 – March 2002. While this synopsis may be incomplete, it identifies severe financial difficulties at many trauma centers and trauma systems nationwide, including Las Vegas, Houston, Charleston, Cincinnati, Los Angeles, Jacksonville, San Diego, Georgia, Saint Louis, Washington DC, Cleveland, and Pennsylvania. There are accounts of major new openings or expansions in St. Louis, Wisconsin, Rhode Island, Akron, and Mississippi, and we suspect that media attention focuses more often on trauma center closures rather than openings. There is ample evidence that the financial viability of trauma centers is mixed, at best, notwithstanding the anecdotal evidence that trauma centers can record accounting profits.

The accounts of financial stress often center not on profitability per se, but rather on precisely those extraordinary and unreimbursed costs that are the focus of this study. The expense surrounding "24-7" on-call coverage of physician sub-specialists (including the cost of providing them with malpractice insurance) is the most frequently cited source of problems, and it overshadows all others.

The unreimbursed (and often unaccounted) costs reported here sum to millions of dollars annually for each trauma center hospital, and thus thousands of dollars per trauma admission, even for high-volume trauma center hospitals. Why would any hospital provide trauma care? It is important to point out that trauma center hospitals that bear these costs often also enjoy significant offsetting financial and clinical benefits. Important financial benefits include the following:

- The trauma payer mix may be good, and in many settings trauma services provide bargaining advantages for trauma center hospitals in their contract negotiations with payers;
- In some settings, trauma center hospitals enjoy significant government support;
- Trauma services generate significant incremental inpatient and outpatient activity;[20]
- The investments made to establish and maintain verified trauma centers also help to support other types of clinical activities; and
- Trauma services provide a marketing boost to hospitals vis-à-vis patients, referring physicians, potential donors and grant-making institutions, payers, and others.

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[19] Taheri PA, Butz, DA, Watts, CM, Griffes LC, Greenfield LJ. Trauma Services: A Profit Center? *Journal of the American College of Surgeons*, 1999;188:3-49. See also, Strauch GO, "Trauma Care Economics: Black, Like 'In the Black'," *The Journal of Trauma*, 1999; 47:436.

[20] This incremental activity is clearly advantageous whenever hospitals have significant unutilized capacity; but when capacity becomes tight, this highly uncertain and variable addition to a hospital's clinical obligations can be both financially and clinically problematic.

The clinical benefits are also substantial, even though they may be even more difficult to quantify. Both the logistical and regulatory demands made by the trauma service on the hospital-at-large serve to elevate clinical standards everywhere, and clinical expertise in trauma helps hospitals in such specific areas as organ procurement and transplantation, burn care, aeromedical transportation, and neurosurgery and orthopedic surgery.

G. Physician Considerations

Physicians who take trauma call face many of the same issues with respect to capacity limitations, except that as individuals their constraints are even more binding. Not all of these physicians build their professional practices around trauma care, but many do. Many must forego at least some opportunities in their private practices. Even physicians who have thriving private practices must reconfigure them to meet the unpredictable and immediate needs of their trauma patients, who take priority over all private practice patients. In many cases, these physicians must join multi-physician practices to ensure adequate trauma coverage, and they must adjust their professional and personal lives to the ebbs and flows of staffing such practices. They must contend with the billing problems and liability concerns that disproportionately burden trauma care, and they must invest in training and continuing education that is highly specialized. These physicians also become more reliant not just on the volume of trauma patients, but also on the financial acumen of their hospital management.

Trauma care is grueling work, and it can take a cumulative toll. General surgeons must sleep in the hospital during their designated call nights. Many other sub-specialists – and especially orthopedic surgeons and neurosurgeons – are called into the hospital at all hours of the day and night. After working long hours and without advance notice, they must then fulfill their other personal and professional responsibilities without missing a beat; and often then proceed to take call again within a few days. Because trauma call takes priority over everything else, many physicians who participate must rearrange both their personal lives and their private practices, and they must cancel elective surgeries or office visits whenever they are needed in the trauma service. They must also schedule their other activities with the knowledge that they may be called. The foregone opportunities and cancelled activities involve both enormous personal sacrifices and very tangible lost income.

With some exceptions, physicians who participate in the trauma system do so from a group practice perspective, and to understand these physicians' participation, one must understand these group practices. The decision to participate in trauma call is typically a ***group*** decision, and at least occasionally a ***multi-group*** decision – meaning that two or more private practice groups partner to provide trauma call. Thus, participation in the trauma service has significant scheduling repercussions for all of the groups' physicians. For example, if the physician covering trauma works all night and cannot perform all of his or her duties the next morning, then his or her partners must cover (or cancel) those daytime obligations. Trauma coverage is partly in contradistinction to the mission of these private group practices, which is to maximize profits while delivering service to their private patients and their referring physicians.

If compensation for physician sub-specialists is inadequate, the impact is more than merely financial. As some physicians opt out of providing call coverage, those who remain confront a disproportionate burden – covering call twice each week involves more than twice the work and more

than twice the uncertainty and disruption involved with taking call once each week. Once attrition begins, it can create a downward spiral that results in an unmanageable burden for those remaining and further defections. In extreme cases, the entire service can collapse if even a few physician specialties are inadequately reimbursed. And as the trauma system approaches this limit, efforts to improve compensation become less effective: physicians who have exited the system may be reluctant to return, both because they have reconfigured their private practices to de-emphasize trauma care and because they may no longer trust those who finance the trauma system.

H. Background on Current Health Care Industry Trends

Any study of trauma care must proceed against the backdrop of the larger health care industry. There are many health care issues confronting health systems, but for the purposes of this study, three stand out: i) nationwide hospitals and health systems are reaching capacity, with constraints and bottlenecks become increasingly binding; ii) surgeons and their patients are moving from inpatient to outpatient settings, and from outpatient settings to off-site venues; and iii) malpractice insurance. The constraints and bottlenecks seem to have worsened quite suddenly and unexpectedly, while the migration of surgeons and patents away from hospitals has been ongoing for a decade or more.

Hospital capacity. – In a November 2001 study, The New Economics of Care, the Advisory Board reaches a variety of startling conclusions about trends in health care economics that it says, "… may prove as wrenching to hospitals as the transition from fee-for-service to managed care a decade ago." (page xii.) Specifically, it reports that "… in just the last year or so, all signs point to a sea change in hospital supply and demand; to the mind of some, hospitals [are] rapidly exiting an era of surplus, and entering a period of prolonged and chronic shortage." The study also concluded that medical admissions are growing much faster than surgical admissions, claiming a greater share of available capacity, and in many cases surgical admissions are being crowded out. These same conclusions are echoed by others, including mass media such as *The New York Times* (e.g., "Patients Surge and Hospitals Hunt for Beds," March 28, 2002).

These trends are ominous for trauma care for several reasons. First and foremost, the uncertainty and high variability attending trauma care will have more adverse consequences than in the past, when hospitals operated with fewer bottlenecks and spare capacity. Disruptions attributable to the trauma service will grow more frequent and more problematic, wait times will increase throughout trauma center hospitals, trauma center hospitals will need to invest more to coordinate care and to expand capacity, and congestion will likely crowd out other more profitable clinical activity. Tensions with surgeons operating on non-trauma patients will likely grow more severe, making it even more difficult for hospitals to stem the migration of these surgeons and their patients to off-site surgery centers. Second, and related, hospitals face higher opportunity costs of providing trauma care, meaning that with capacity constrained they face more serious tradeoffs between providing trauma care and pursuing other, more profitable clinical activities.

Third, by the same reasoning hospitals will have greater difficulty persuading physicians to participate in trauma care. As these physicians become more fully employed, the opportunity cost of providing trauma care rises markedly, and as Figure 1 shows, they face longer and longer queues to treat their non-trauma patients (especially relative to the short wait times they enjoy at off-site, physician-owned surgery centers).

Surgeons' links to hospitals. – Hospitals and individual physicians have historically enjoyed close relationships. In recent years, however, both administrators and physicians have taken a harder business line: margins have evaporated, physicians more often transact with hospitals only as part of their physician group practices, and medicine has become more outpatient focused. Surgical procedures, in particular, have migrated from inpatient to outpatient settings, and outpatient procedures have increasingly moved out of hospitals and into independent off-site facilities – often owned in part by the surgeons themselves. In 1990, half of all 22 million surgical procedures nationwide were inpatient, but in 1999 not quite two thirds of the 25.5 million surgical procedures were outpatient. Moreover, hospitals' share of this growing outpatient volume has declined steadily. The Advisory Board reports that while two thirds of outpatient surgeries were conducted in hospital-owned facilities in 1992, by 1999 their share was barely half.

The media have begun to note these developments. For example, in her news report, "Doctors Try New Specialty: Hospital Entrepreneurship," Julie Appleby of *USA Today* recently reported on growing discontent among physicians in traditional hospital settings.[21] The number of same-day surgery centers, she writes, has doubled in ten years to 3000, and physicians who work at these surgery centers can increase their incomes by 20% to 100%. One expert was quoted saying that orthopedic surgeons in particular could increase their earnings by 50% by owning a portion of a surgery center. Appleby describes surgeons who are less willing in traditional hospital settings to have surgeries delayed for emergency cases, and they object to generally poor turnaround time and on-start reliability, inadequate compensation, and other inefficiencies. She writes that surgeons are attracted by the opportunity to invest in (and control) their own off-site facilities, and to "cream-skim" the most lucrative surgical cases. The physicians who move sometimes claim that their specialty facilities offer better care and improved outcomes.

These trends put surgeons in direct competition with hospitals, and they put increasing financial pressure on hospitals and physician group practices alike. Even physician group practices that are highly committed to trauma care and to traditional hospital-based surgical care are profoundly affected, because (for example) they must recruit and retain physicians who have the opportunity to earn higher pay and equity interests elsewhere, and to wield greater control over their patients and careers. Trauma center hospitals, for their part, must manage the impact that trauma care can have on both the physicians who participate in trauma care *and physicians who do not*, since the latter group may be unhappy with the disruptions that trauma patients can create.

The rise of managed care has altered the culture of medicine, forcing hospitals and physicians to more often base their decisions on health system investments and clinical lines, vendors, and even professional recruitment on financial imperatives.

Malpractice insurance. – The expense and availability of malpractice insurance is a significant contributing factor to the difficulties trauma center hospitals have faced when trying to recruit physician sub-specialists for trauma call coverage. While malpractice is a concern to all physicians, those engaged in the care of patients with traumatic injuries are especially vulnerable to malpractice litigation. First, physicians have no pre-injury relationship with their trauma patients, and they make decisions in many cases quickly and without the benefit of patient consultation or deliberation. Second, the clinical stakes of those decisions are often life-changing, and given the complex-

[21] March 17, 2002. Also available at www.usatoday.com/money/health/2002-03-18-cover.htm.

ity of the care required, sound physician judgment must accompany rigorous training and years of experience. It is difficult to prove retrospectively that the course of action a physician chose (or declined to choose) was absolutely correct. Third, the injury itself may have been the result of a tort, and the clinician may be drawn into litigation as an expert witness even if he or she delivers the best possible care. Finally, many physician sub-specialties require high malpractice premiums even when the care being delivered is not neither trauma-related nor life-threatening. The media reports surveyed in Appendix B attest to the role that malpractice insurance plays in discouraging physician sub-specialists from participating in on-call coverage.

I. Summary and Direction for a Trauma Cost Study

Traumatic injuries are the leading cause of death for many demographic groups, and for those patients who survive their injuries the effects can be both life-long and debilitating. In its study, *State Trauma System Plan: December 2000 – December 2005*, the Florida Department of Health estimates that there are approximately 116,000 injuries in the State each year, with 5,500 deaths from unintentional injuries and 3,000 suicides and homicides. Trauma centers and organized trauma systems in Florida and nationwide have evolved to meet these patients' needs, but the clinical, logistical, and financial demands are extraordinarily complex. Level I, Level II, and pediatric trauma centers in Florida admit a majority of the most severely injured of these patients, but they must coordinate care within larger, regional trauma systems that ideally integrate all aspects of care from pre-hospital to hospital settings and then through discharge and successful rehabilitation.

Historically, much attention has focused on the financial burden that hospitals bear to provide care to uninsured and underinsured patients. Yet once patients arrive at designated trauma centers, they draw upon conventional clinical resources hospital-wide, and they are billed in the same way as non-trauma patients. Unless the payer mix is markedly worse for trauma patients than for non-trauma patients, neither the cost of treating trauma patients *once they are admitted* nor the process of billing or collecting should be problematic. The payer mix for trauma patients might be better or worse than the payer mix for non-trauma patients – there are countervailing forces that likely vary significantly across trauma centers – but if the trauma payer mix is worse, then trauma hospitals could document their financial problems in a straightforward manner.

Regardless, trauma center hospitals nationwide are enduring extreme financial distress, to the point that many are threatening to downgrade their service levels or exit altogether even though doing so might endanger lives. This background section makes the case that this financial distress arises not primarily because of the cost of treating trauma patients once they arrive, but rather because of the cost of readiness incurred beforehand. The distinguishing feature of trauma patients is not that they consume different resources or services than other patients, but rather that they may suddenly need conventional resources intensively, and from almost any corner of the hospital, at any time, without warning, with a priority over other patients, and with a level of coordination and multidisciplinary teamwork that requires extensive (and costly) advanced planning. The feature of trauma care that makes it different from any other type of clinical activity *is the cost of readiness*.

The analogy made here is to last-minute airline passengers. Once these passengers arrive at the airport, it costs the airline no more to issue them boarding passes, check their luggage, usher them to their seats, or serve them in-flight meals than it costs the airline to serve any other passen-

ger. Yet the vast majority of costs surrounding airline travel lie not with these relatively modest activities but rather with the fixed cost of capacity – the plane itself, the crew, the fuel, take-off and landing fees, and even the reservation system and the airport itself. To earn a normal return on their investments, airlines must charge last-minute passengers a significant premium to recover the cost of holding capacity in reserve. If airlines must have ample capacity in reserve, available for last-minute passengers whether or not they appear, then those last-minute passengers who do appear must pay more. In practice, passengers who buy non-refundable tickets weeks in advance enjoy lower fares than passengers who prefer the option simply to show up and be guaranteed a seat. In a competitive marketplace, the price differential reflects the higher cost to the airline of accommodating last-minute fliers, even though, once onboard, they may be indistinguishable. Cost and price differentials are also routine in other industries where capacity costs loom large.

Yet hospitals lack the means to set their charges in the same manner. Trauma patients are assessed the same charge for a specific lab test or medication as non-trauma patients, and in most instances insurance companies do not reimburse more generously for trauma patients than for non-trauma patients. (Trauma center hospitals could negotiate "trauma carve-outs" with payers, and this could remedy the problem, but such arrangements remain unusual.) As such, trauma center hospitals have no means to recoup the high costs of being prepared at all times to treat incoming trauma patients.

Figure 1 provides a framework for explaining why this cost of preparedness has recently become more problematic, and why it is likely to become progressively more urgent. For two decades hospitals have suffered from *excess capacity*, as their clinicians have shifted from inpatient to outpatient settings and reduced lengths of stay. With capacity utilization low (toward the left side of the horizontal axis), trauma patients imposed relatively modest costs on trauma center hospitals for the simple reason that capacity was not an issue. But recently this excess supply has turned rather suddenly into *excess demand*, and hospitals are now operating at untenably high levels of capacity utilization (on the right on the vertical axis) – where the cost of variability and uncertainty rises in a highly non-linear fashion. Similar capacity constraints confront physicians, whose practices are busier than ever. And with payers reducing reimbursements to hospitals and doctors alike, and with surgeons, in particular, migrating away from hospital-based practices, the financial stress is inevitable. All available data indicate that this stress will get worse rather than better, as evidenced by the growing number of media reports of trauma center financial problems nationwide.

In short, once trauma patients are admitted, their care can be tracked, billed, and reimbursed in conventional ways, because while trauma patients are resource-intensive, those resources are conventional. The cost of preparedness is more difficult to measure, and more problematic because under the status quo hospitals can neither bill these costs to trauma patients nor recoup them in other ways. This cost study therefore focuses on these latter costs of preparedness.

III. SCALE AND SCOPE OF THIS COST METHODOLOGY STUDY

Partly by necessity and partly by choice, this study encompasses only a subset of the costs of caring for patients with traumatic injuries. This section describes the study's scale and scope.

A. Inpatient Care at Verified Trauma Centers

The study focuses on the cost of inpatient trauma care provided at designated trauma centers. It includes neither pre-hospital nor post-hospital costs, and it makes no attempt to include the costs of treating patients with traumatic injuries who are treated at non-trauma center hospitals. Neither the Executive Council nor the Department of Health had access to data that would be necessary to undertake an all-encompassing analysis of trauma system costs, and the time and resources required to canvass the universe of outpatient providers (and to reconcile and render consistent all of the data collected) would be prohibitive. There was also no opportunity to consider inpatient costs at non-trauma centers without also investigating quality of care issues, and this would have introduced an entirely new dimension to the analysis.

B. Non-Chargeable, *Incremental* Costs

Patients with traumatic injuries draw upon the same resources as other patients, they are billed in precisely the same way as other patients are billed, and they are reimbursed by the same payers and typically on the same terms as other patients. Indeed, patients with traumatic injuries often have multiple levels of insurance, including not only their conventional coverage, but also motor vehicle insurance or Workmen's Compensation. As such, there is every reason to believe that trauma center hospitals can recover the bulk of their costs of treating individual trauma patients. As such, it is appropriate to focus this study solely on *non-chargeable* costs.

Moreover, the study measures only the *incremental* (i.e., direct) costs of serving as a verified trauma center. For each existing trauma center, it asks which ongoing, non-chargeable, and incremental expenditures would disappear if that hospital discontinued its care of patients with traumatic injuries. For prospective trauma centers, it asks which non-chargeable incremental expenditures that hospital would have to incur if it ever became a trauma center. Both perspectives yield similar but not necessarily identical costs, as the text below explains.

This is a conservative way to enumerate costs, and at first glance it may lead to highly counterintuitive results. One might think that hospitals with the most highly developed and capital-intensive facilities would also encounter the highest costs of serving as verified trauma centers. Yet tertiary care hospitals that already have in place much of the infrastructure required to serve as verified trauma centers may also have relatively *few* incremental trauma center costs, if little of this infrastructure is specifically devoted to trauma care. Hospitals with relatively less infrastructure already in place must incur substantial incremental cost to serve as trauma centers.

C. Notable Omissions: The Cost of Providing Care to Underinsured Patients

For various reasons, including data constraints, this study does not factor into its analysis the cost to the twenty trauma center hospitals of caring for patients without adequate health insurance coverage. For many of the twenty trauma center hospitals, overall payer mixes for trauma

patients are likely no worse than the payer mixes for those hospitals' non-trauma patients; and yet several hospitals face a very heavy burden caring for uninsured and underinsured trauma patients. For several trauma center hospitals, the unreimbursed costs of providing trauma care to patients without adequate health care insurance dwarf all other costs. Based on highly aggregate data, half or more of Florida's twenty trauma centers appear to have payer mixes on their trauma admissions that are not markedly worse than the payer mixes for these same hospitals' other patients. Further analysis is warranted, and the handful of trauma center hospitals that clearly suffer from the financial burden of providing care to uninsured and underinsured patients merit special attention and consideration. Unfortunately, such an analysis is not possible here.

D. Notable Omissions: Other Intangible Costs

Although trauma patients draw upon many of the same resources and hospital infrastructure as other patients, they do so in unique and potentially costly ways. For example, trauma patients often arrive without warning, and their care can involve spikes in resource consumption and capacity utilization that create systematic bottlenecks and disruptions. In addition to the direct (but often immeasurable) impact that such disruptions may create, trauma center hospitals must maintain a certain level of excess capacity and institutional "slack" as a buffer against such spikes in activity, and they must invest in the capability to handle such "trauma alerts."

Hospitals may also face some "opportunity costs" of serving as designated trauma centers. If a hospital has only limited overall inpatient capacity, and if this capacity is heavily utilized (i.e., if the hospital is nearly "full"), then the decision to be a trauma center hospital may imply foregoing other clinical opportunities. As a practical matter, such opportunity costs often loom very large, and this study would be remiss if it simply ignored such costs. A health system that has little excess capacity may find that serving as a trauma center "crowds out" other financially or clinically attractive opportunities, while a hospital with underutilized facilities could make a strong case for becoming a trauma center even if the revenues from trauma patients would cover only its incremental costs, and not the total cost of that trauma care.

While such intangible, indirect, and opportunity costs are clearly relevant, they are not easily documented; and they can be both speculative and difficult to integrate into a conventional cost accounting framework. Moreover, it would be difficult to broaden the scale and scope of this analysis to include such considerations without also answering some related questions:

- To the extent that hospitals upgrade their facilities and improve their processes to respond better and faster to patients with traumatic injuries, won't many of the resulting benefits accrue to patients and clinical activities hospital-wide, and if so, then what is the justification for counting these expenditures as specifically trauma-related?
- By the same reasoning, won't investments in additional capacity also ease bottlenecks for non-trauma patients?
- For some hospitals, the decision to become a trauma center hospital may involve substantial opportunity costs, so that trauma "crowds out" some other clinical activities. Yet in other instances this decision may enable (or "crowd in") new clinical activities, especially over the long run. Can this study legitimately consider crowding out effects without also including crowding in?

The answers to these and other questions are important but well beyond this study's scope of analysis. Thus, for example, the answers to the opportunity cost questions depend largely upon profit/loss calculations for trauma care *compared to all other types of clinical activities*. Any rigorous profit/loss analysis would require a substantial reworking of the study's presently narrower focus, and a hospital-wide analysis of costs and revenues.

In the end, the methodology does not incorporate such intangible costs, although the discussion in Section VI reintroduces these issues and elaborates upon their potential importance.

E. Gross Costs versus Net Costs: Trauma Centers as a Health Care Safety Valve

It is important to remain mindful that this methodology measures the core clinical and financial "costs of compliance" or "readiness costs" *to trauma center hospitals*. Historically, the premise behind trauma centers is that for many reasons trauma patients fare better *clinically* if they are treated at a central location. Yet given the very high fixed costs of staffing and operating trauma centers, we believe there is also a strong financial case for treating trauma patients at centralized locations. The bulk of the costs of operating a trauma center arise from predominately *fixed* expenses (e.g., round-the-clock staffing of physician sub-specialists), and thus it makes sense to incur these fixed costs at a relatively few hospital centers and then to bring trauma patients to these centralized resources. These fixed costs represent a significant financial burden to trauma center hospitals – and it is the goal of this cost methodology study to measure this financial burden – and yet this arrangement yields enormous cost savings to non-trauma center hospitals, precisely because they can avoid incurring these costs. In short, while the gross cost of centralizing trauma care at specific hospitals is quite high, the net cost to the State-wide network of hospitals and health systems is much lower, and it is likely that on net investments in trauma center hospitals will yield significant cost *savings* from a State-wide perspective.

F. Summary

This study measures the non-chargeable, incremental costs that the State of Florida's twenty trauma center hospitals incur providing inpatient care to patients with traumatic injuries. Assuming that these hospitals are adequately reimbursed for care that they can bill directly to patients, this study identifies the direct cost savings that the state's twenty trauma center hospitals could individually realize by ceasing to serve as a verified trauma centers. It also provides a reasonable approximation of the incremental, unreimbursed costs that other hospitals would incur if they decided to become verified trauma centers. Some caveats apply – this methodology does not capture opportunity costs or measure the impact of disruptions and other intangibles – but this study provides a simple and transparent measure of the direct costs of complying with the regulatory and clinical mandates that come with being a trauma center.

V. SOURCES AND USES OF DATA

The background sections of this report utilize statistics generated by the National Center for Injury Prevention and Control, the National Vital Statistics Report, the Centers for Disease Control and Prevention, the National Center for Health Statistics, and the National Trauma Data Bank. For background information on Florida hospitals, the study utilizes data from the state's Agency for Health Care Administration (AHCA). Unfortunately, the otherwise high-quality AHCA data do not identify trauma admissions, and though there is software for estimating these admissions, there was sufficient concern within the Executive Council overseeing this study that we elected to gather primary data instead.

In February 2002 MDContent circulated a draft of a data request to the Executive Council, and after receiving feedback the data request was sent to all twenty designated trauma center hospitals in March 2002. The template for this request is included as Appendix D.

The following ten designated trauma center hospitals responded with information that was at least partially complete: All Children's Hospital, Bayfront Medical Center, Halifax Medical Center, Lakeland Regional Medical Center, Lee Memorial Hospital, Miami Children's Hospital, Sacred Heart Hospital – Pensacola, Orlando Regional Healthcare System, Tampa General Healthcare, and Shands Medical Center – Jacksonville. All ten hospitals completed the bulk of the first two sections of the survey (relating to background information and physician call coverage), though specific questions proved to be problematic and mostly went unanswered. Question I.21, for example, was completed by only one of the responding hospitals. The remaining three sections (on re-designation costs, outreach and prevention costs, and local government trauma support) were less completely addressed, as the results and discussion makes clear.

At the outset of this study, several trauma center hospitals expressed concerns that MDContent might request and then report data that the hospitals deemed either sensitive (e.g., because these data involved patient-level detail) or proprietary. At that time, it was decided that MDContent would not use patient-level data (even from publicly available AHCA data sets), and that MDContent would report its results in aggregate form. On page 16, the study discloses the number of year 2000 trauma admissions at each trauma center hospital, but otherwise the data from these surveys are aggregated so that readers cannot make specific inferences about individual trauma center hospitals.

VI. RESULTS

This section summarizes the results of the ten trauma centers' surveys by proceeding through the data request question-by-question. A discussion appears in the next section.

A. Background

All ten designated trauma centers that submitted data provided background information on their trauma admissions. There was considerable variation across hospitals. For example, three hospitals had more than 2500 trauma admissions in 2000, but two had 500 or fewer admissions. (Both of the low-volume hospitals were pediatric trauma centers.) Two hospitals reported that 47% and 51% of their 2000 trauma admissions arrived via aeromedical transportation; four hospitals reported that 20-35% of their admissions were aeromedical transports, and three hospitals reported that less than 12% of their admissions arrived in this way. Transfers accounted for a majority of the trauma admissions at two designated trauma centers, but five hospitals reported that fewer than 10% of their trauma admissions were transfers.

Trauma admissions grew significantly between 1997 and 2000. Nine designated trauma centers provided data for this entire period, and in aggregate trauma admissions grew 9% from 1997-1998, 5% from 1998-1999, and 18% from 1999-2000. Five trauma centers reported that pediatric patients accounted for 9-13% of their overall trauma admissions, and a sixth center reported that 22% of its trauma admissions were pediatric.

The table below shows that trauma center hospitals (or at least those that responded to the data request) offer very complex care. Significantly, only one of the trauma centers answered "yes" to all ten questions, only one answered "yes" to nine of the ten questions, and the remainder answered "yes" to five, six, or seven questions – suggesting that with rare exceptions, even hospitals active in many complex clinical domains can not be active in *every* domain.

	Number of Trauma Centers Answering …	
	Yes	**No**
a.) Does your hospital have an MD surgery/anesthesia residency program?	**5**	**5**
b.) Does your hospital have a medical school affiliation?	**7**	**3**
c.) Does your hospital perform solid organ transplants?	**3**	**7**
d.) Does your facility provide pediatric critical care?	**9**	**1**
e.) Does your facility provide pediatric surgical services?	**9**	**1**
f.) Does your radiology service provide significant interventional radiology support?	**9**	**1**
g.) Do you have a designated cancer center or regional spinal cord treatment center in proximity to your institution?	**9**	**1**
h.) Do you perform high-risk obstetrical care?	**8**	**2**
i.) Does your facility have a designated re-implantation team?	**2**	**8**
j.) Does the volume of ED based admission in your institution merit in house radiology and anesthesia?	**9**	**1**

Source: Trauma Center Data Reports, May 2002.

B. The Cost of Physician On-Call Coverage

Nine of the ten respondents to the data request indicated that their hospital provides stipends to individual physicians or physician groups to provide trauma call coverage (question I.1), and one hospital does not. Seven hospitals answered that they have an established policy regarding trauma call coverage stipends (question I.2). The nine hospitals that pay stipends all provide compensation to their general surgeons, six provide neurosurgery stipends, and six provide stipends to their orthopedic surgeons (question I.3). In addition, four trauma center hospitals provide stipends to their plastic surgeons, three provide stipends to OMFS, and two provide stipends for anesthesia and ENT. Several hospitals provide payment to various other sub-specialties, including urology, hand surgery, and ophthalmology.

The level of compensation varies significantly both within and across physician specialties (question I.4). The table below provides a summary for the eight largest sub-specialties:

Physician Specialty	Number of Hospitals Paying Stipends (# "Incremental")	Range of Annual On-Call Compensation	Median Annual Compensation
General Surgery	9 (7)	$313,900 - $947,175 (N=7)	$657,000
Neurosurgery	6 (6)	$97 - $547,500 (N=4)	$228,125
Orthopedic Surgery	6 (5)	$92,345 - $1,200,120 (N=5)	$349,670
Anesthesia	2 (1)	$98,400 - $637,290 (N=2)	$367,845
ENT	2 (2)	$78,212 - $149,650 (N=2)	$113,931
OMFS	3 (3)	$127,750 - $273,750 (N=3)	$149,650
Plastic Surgery	4 (3)	$146,000 - $250,390 (N=3)	$182,500
Radiology	0		
Totals for all specialties:		$313,900 - $3,664,600	$1,510,900

Source: Surveys of Florida Designated Trauma Center Hospitals.

In nearly all cases, these stipends represent an "incremental" expense tied directly to the provision of trauma care, meaning that the hospitals would not have to incur this expense if they could somehow shed their obligation to provide trauma care. (See Question I.5.) Eight of the nine hospitals that extend these stipends report that they are designed primarily or exclusively as compensation for call coverage (Question I.6), and all nine hospitals report that these stipends are not tied in any specific way to the costs physicians incur for their malpractice insurance (Question I.8). Moreover, only three of the eight hospitals indicated that they underwrite the cost of medical malpractice insurance, and of these three one subsidizes only house officers and the other two provide subsidies only to general surgery, neurosurgery, or anesthesia (question I.9). At eight of the nine hospitals, physicians who receive stipends retain the right to bill for professional fees for their trauma patients (Question I.7).

At all ten designated trauma centers, physicians' activities are governed by specific trauma job descriptions, formal trauma performance metrics, or explicit trauma service expectations (Question I.10). When asked to identify the specific physicians governed by these descriptions/metrics, all ten named the trauma director, eight named general surgery, and six named

neurosurgery and orthopedic surgery. Four hospitals also identified anesthesia, and three identified OMFS, plastic surgery, and radiology. Several hospitals identified other physician specialties, including ENT, emergency medicine, and hand surgery. Moreover, all ten hospitals also responded affirmatively to Question I.11, "Are any physicians asked to participate in the periodic state verification process, outreach and prevention programs, or other trauma service activities and obligations?" Five hospitals responded yes (and five no) to the Question I.13, "Are there other inpatient trauma services that physicians provide to the trauma service for which they are *not* reimbursed." Nine of the ten hospitals indicated that their physicians have specific clinical, administrative, or financial obligations for the pre-hospital or post-discharge care of trauma patients (Question I.14). At the same time, however, seven of the ten hospitals provide no supplemental payments beyond on-call stipends (Question I.12). Only two hospitals reported that their physicians are generally satisfied with the level of their compensation, and seven indicated that they are not (Question I.15).

It may be important to know how designated trauma center hospitals recruit physicians, since in general they do not simply post a per diem stipend and enlist those physicians who express interest. Questions I.16 and I.17 are included in the data request to gauge the nature and variety of relationships between physicians and the trauma center hospitals. Question I.16 seeks to determine whether trauma center hospitals contract with physicians individually, or as part of group practices. The responses are summarized below:

Specialty	Contracts with Individual Physicians or Physician Groups? (Check one for each specialty)			
General Surgery	Individual*	5	4	Group*
Neurosurgery	Individual	2	7	Group
Orthopedic Surgery	Individual	4	5	Group
Anesthesia	Individual	0	7	Group
ENT	Individual	4	4	Group
OMFS	Individual	4	3	Group
Plastic Surgery	Individual	4	4	Group
Radiology	Individual	0	6	Group

* One hospital contracted with general surgeons both individually *and* as a group.

Source: Surveys of Florida Designated Trauma Center Hospitals.

Question I.17 asks, "Does the hospital have long-term or exclusive contracts (trauma or non-trauma) with any physician group practices?" Four hospitals reported that they have contracts with general surgery group practices; five hospitals reported they have group contracts with neurosurgery and radiology; and six hospitals contract with anesthesia group practices. For orthopedic surgery, ENT, OMFS, and plastic surgery, two hospitals indicated that they had contracts through group practices. There were also contracts with physician groups in emergency medicine, OB, neurology, neonatology, infectious disease, psychiatry, and more.

Specialty	# of physicians regularly taking call*	Number of hospitals reporting *temporary* shortages	Number of hospitals reporting *chronic* shortages
General Surgery	2,3,4,5,5,6,6,8	1	1
Neurosurgery	2,2,3,3,3,4,4,5,6	2	0
Orthopedic Surgery	4,6,7,8,8,9,15,29		1
Anesthesia	6,8,12,13,14,17,17	1	1
ENT	3,3,4,5,5,6,6	1	
OMFS	1,1,2,3,5,8,12	1	
Plastic Surgery	2,3,3,3,5,5,5,6	1	3
Radiology	5,5,10,14,15,20		
Other specialties reporting shortages …			
Hand			1
Psych			1

* Figures are in response to the question, "… approximately how many physicians participated twice or more each month in providing trauma call coverage?" The responses from all of the trauma center hospitals answering this question are listed here.

Source: Surveys of Florida Designated Trauma Center Hospitals

Question I.18 seeks to determine the number of physicians taking call for each physician sub-specialty. The table below summarizes the findings. The question asks, "… how many physicians participate twice or more each month in providing trauma call coverage?" and the first column in the table below provides all of the responses from the nine designated trauma centers that filled out this portion of the data request. Perhaps the most striking results surround the number of neuro-surgeons participating in call coverage. At five of the nine designated trauma center hospitals that completed this portion of the survey, only two or three neurosurgeons took call as often as twice each month. A small number of physicians also covered call for OMFS (median equals three surgeons) and plastic surgery (with four of nine hospitals reporting that three surgeons or less covered call). For most of the physician sub-specialties, one or more hospitals reported temporary or chronic shortages of physicians to cover call, with plastic surgery standing out.

Question I.19 asks, "For those specialties where shortages in trauma call coverage have been problematic, does the hospital perceive that compensation was a proximate cause? Were there other contributing factors?" Four respondents indicated that compensation is indeed the proximate cause, but four respondents also identified local and regional shortages of sub-specialists who can take call. Two respondents identified case load as an additional problem.

Question I.20 takes a retrospective approach, asking, "have there been shortages in the past three years, and if so, what were the causes of those shortages and how have they been resolved?" Four hospitals addressed this question, and three indicated that they had increased compensation (with one taking the novel approach of allocating half of all personal injury protection reimbursements – estimated at $500,000 – as a pro rata payment for compensating their sub-specialists). Two hospitals identified a change in physician staffing: the departure of disgruntled physicians and the return from leave of another physician. One hospital stressed dialogue with physician sub-specialists and a change in operations, and specifically mentioned the development of better transfer protocols and modified operating block schedules to accommodate surgical sub-specialties.

Question I.22 attempts to gauge the frequency with which the various sub-specialties participate in the care of patients with traumatic injuries. In particular, it asks, "For each of the physician sub-specialties listed below, please estimate as precisely as possible the number of trauma consults provided in each of the past three years." Only four hospitals provided these data, but the results provide important insights into each sub-specialty's trauma burden. One hospital's answers to this question are as follows, with the number of consults converted to percentage of cases with consults:

% of Admissions with Sub-Specialty Consults

Specialty	***1999***	***2000***
General Surgery	90-100%	90-100%
Neurosurgery	20%	25%
Orthopedic Surgery	40%	45%
ENT	3%	3%
OMFS	6%	8%
Plastic Surgery	1-3%	1-3%
Urology	< 1%	< 1%
Hand	3%	3%
Opthalmalogy	1-3%	1-3%

At the other three hospitals, the percentages differ slightly, but they are roughly the same.[22] General surgeons, neurosurgeons, and orthopedic surgeons participate much more frequently than other sub-specialists.

Question I.22 asks about physician dissatisfaction with the level of professional fee reimbursements. The question asks for no specific figures, and as such the responses are purely qualitative. The answers to this question demonstrate considerable dissatisfaction with the level of professional fee reimbursement (seven affirmative responses), which might be expected. Four surveys singled out the processes by which physicians must pursue their professional fees, which appear to require significantly more effort than for other types of care, as well as longer delays. Two hospitals also mentioned inadequate reimbursements from patients' personal injury protection (auto) coverage.[23]

Questions I.23 and I.24 attempt to measure in a crude way the extent to which physicians are "tied" to trauma center hospitals. The results for eight physician sub-specialties are listed below:

[22] At the remaining three hospitals, neurosurgery was consulted on 13-19% of trauma patients and orthopedic surgery was consulted on 34 – 47% of trauma patients. One hospital reported that ENT was consulted on less than 1% of trauma admissions and another reported that ENT was consulted on 6% of admissions. OMFS was consulted on 8% of trauma admissions at one hospital and 2% at another. Plastic surgery was required in 3% of trauma patients at one hospital, 7% at another, and 12% at a third hospital.

[23] Florida requires a minimum $10,000 in personal injury protection in all auto insurance policies, but physicians claim that this coverage is typically exhausted before they can bill for their professional fees. EMS and aeromedical providers may have the first opportunity to tap into this coverage; hospitals are often the second, and as a practical matter physicians may be left with any residual.

Specialty	How much of these physicians' clinical activity takes place outside the domain of the hospital's inpatient and outpatient activities? (For each specialty, check one.)		
	Less than 15%	***15% to 40%***	***More than 40%***
General Surgery	5	1	1
Neurosurgery	6	1	0
Orthopedic Surgery	3	3	1
Anesthesia	5	1	0
ENT	2	3	2
OMFS	2	3	2
Plastic Surgery	0	2	5
Radiology	4	2	0

Specialty	Compared to one decade ago, how much of these physicians clinical activity takes place outside the domain of the hospital's inpatient and outpatient activities? (For each specialty, check one.)			
	Greater	***Lesser***	***About the same***	***Don't Know/NA***
General Surgery	4	3	1	0
Neurosurgery	3	2	3	0
Orthopedic Surgery	4	3	1	0
Anesthesia	3	1	2	0
ENT	1	2	3	0
OMFS	1	3	3	0
Plastic Surgery	4	2	0	0
Radiology	2	1	3	0

The categories in this table are broad, and the sample is small and non-random, yet the general surgeons, neurosurgeons, and anesthesiologists appear to derive the bulk of their professional activities from their hospital base, while plastic surgeons often conduct a significant fraction of their work outside hospital settings. There is no strong indication of a migration of physicians out of trauma center hospitals, though plastic surgery may be an exception.

Question I.25 asks, "How much does your hospital compensate your trauma director for the director's administrative workload?" The answers varied considerably: two hospitals declined to answer the question; three hospitals responded that the trauma director's compensation is less than $25,000; and three hospitals pay their trauma directors $100,000 or more. One hospital reported only that it provides the trauma director with a 0.5 secretarial position and a stipend. One hospital estimated that 20% of its Trauma Medical Director's workload and 5% of the Medical Director of Surgical/Critical Care's workload is spent on administrative duties, and from this the hospital estimated that its administrative costs exceed $200,000.

Question I.26 provides the hospitals with opportunities to identify costs that are not specifically mentioned in the survey. Below is an exhaustive list of all of the responses:

- Recruiting costs
- Travel (trauma director)
- Regional trauma meetings
- TRAC's training/updates
- Continuing medical education
- Physician educational support
- Physician extender salaries
- Travel/CME for each trauma surgeon
- Travel/CME Medical Director Hand
- Dues/licensures/subscriptions
- "Net loss of physician practice"
- Trauma clinicians
- Clinical system administrative support
- Trauma physician assistant
- Books & subscriptions
- Trauma coordinator – Peds.
- Medical Director Hand
- Medical Director Ortho

There has been no attempt to verify the accuracy of these other reported costs, or to determine whether they represent direct and incremental costs. In many cases, the respondents do not attempt to quantify these expenses. Instead the personnel are merely listed.

Aggregating all of the costs of physician on-call coverage gives rise to the following table:

	Reported Range of On-call Coverage Costs (Annual)	**Median (Annual)**
General surgery, neurosurgery, and orthopedic surgery	$313,900 - $2,182,518	$912,500
All other sub-specialists	$127,750 - $1,481,900 (N=5)	$638,487
Other costs of on-call specialists	$24,000 - $1,244,461 (N=6)	$422,351
Total sub-specialist compensation:	$337,900 - $4,208,051 (N=7)	$2,080,103

Source: Surveys of Florida Designated Trauma Center Hospitals

C. The Cost of Trauma Center Re-Designation

Re-designation of a trauma center hospital occurs every three years, but the work involved in re-designation is ongoing and year-round. In particular, the American College of Surgeons Committee on Trauma (ACS COT) guidelines require that verified trauma centers meet stringent clinical standards and establish a structured, evidence-based effort toward a continuous process for improving care. (The State of Florida maintains a separate designation program, but the standards are nearly identical.) These guidelines provide for a trauma registry at each center, which takes on the following form and function:

> "The registry provides for the collection, storage, and reporting of information about trauma patients, including the facts related to the patient's injury event, severity, care, and outcome. … the trauma registry is a tool to drive the performance improvement process for hospitals, emergency medical services, and regional trauma systems and allows comparisons to benchmarks across systems of care." (p. 63)

This registry is the foundation on which trauma centers and outside auditors base their process for improving care. The hospital's trauma registry may also be integrated into regional, state, or national trauma registries, such as NATIONAL TRACS or the National Trauma Data Bank.

The cost of maintaining this registry includes the hardware and software; the time and expense incurred by clinicians both to learn the hardware and software, and to input the relevant data; the administrative commitment from the trauma medical director; and perhaps most significantly, the wages, benefits, and training costs of a designated trauma registrar. The ACS COT trauma guidelines estimate that one full-time equivalent will be required for 500-1000 patients annually.

In addition to the trauma registrar and the trauma medical director, the trauma program requires a trauma nurse coordinator/trauma program manager who is "… usually responsible for logistic information, coordination of daily data processing, and monitoring of the effectiveness of interaction of all included services, including case management and resource utilization." (p. 70.) In addition, multidisciplinary review and oversight is provided through several channels. A Trauma Program Performance Committee comprised of physicians, pre-hospital personnel, nurses, technicians, administrators, and other personnel meets at least quarterly to review system-related issues and to analyze and propose corrective actions, where necessary. Trauma programs also include periodic case reviews or didactic conferences – usually held weekly in high-volume trauma centers and somewhat less often in low-volume centers. Trauma care is also governed by Trauma Peer Review Committees.

Beginning with Question II.3, all ten respondents to this data request indicated that they pay no application fee to become re-designated. In question II.4, three hospitals reported that the cost of the actual two-day site visit amounts to $300 or less, and one hospital reported costs of $1000. The remaining hospitals either did not report these costs or reported no costs.

In questions II.5 through II.8, every hospital reported that all or nearly all of the trauma program manager's (TPM) and trauma registrar's time is spent meeting the clinical and regulatory standards necessary to be re-designated. The median wages and benefits paid to the TPM and registrar are $98,750, and the range was $69,850 - $153,000 (N=7).

In question II.10, the hospitals were asked to report the annual expense for their TRACS registry software, and all but one hospital reported a cost ranging between $1,750 and $3,000. The remaining hospital reported spending $7,750. Only four hospitals reported the cost of their office space, with rent ranging from $15 – 21 per square foot, and the space ranging from just 120 square feet to over 2000 square feet. One hospital reported that its costs for office space, supplies, and equipment add up to just $1900 (a figure that is implausibly low). The highest figure reported is slightly more than $30,000.

Question II.12 asks the trauma center hospitals to estimate their annual expenses for computers, office equipment and supplies, and other ancillary expenses linked to the re-designation process. Several hospitals reported no costs, and two hospitals reported less than $400. Three hospitals reported costs in the range $1,900 - $3500, while four hospitals reported expenses exceeding $10,000.

Question II.13 attempts to identify all those hospital personnel that must participate in the re-designation process. Nearly all of the hospitals indicated that they began preparing for the site visit 24-26 weeks in advance, and that the hospital CEO and CFO typically do not play important roles. Two hospitals reported that their hospital CEO and CFO spent 5% of their time helping to prepare for the site visit, but the remaining hospitals indicated that their CEOs and CFOs spent approximately 1% of their time. Apart from the trauma director, TPM, and trauma registrar,

other contributors to the preparation for the site visit included trauma clinicians, rehab services, the QA systems director, pediatric coordinator, department directors, and medical records. The respondents make no attempt to impute any costs to these contributors' time.

In question II.14, several hospitals indicated that they have paid overtime during the re-designation process, but with the exception of one respondent which listed nursing education, chaplain services and psychologist services, there were no significant expenses reported in the "other costs" category. Summarizing,

	Reported Range (Annual)	Median (Annual)
Personnel (excluding Trauma Director):	$69,850 - $153,000 (N=7)	$98,750
Office Space, Supplies, & Equipment	$1,900 - $66,090 (N=7)	$16,900
Other Verification Costs	$200 - $301,418 (N=2)	---
Total annualized re-verification costs:	$88,000 - $456,258 (N=7)	$124,120

Source: Surveys of Florida Designated Trauma Center Hospitals

D. The Cost of Outreach and Prevention Programs

Every verified trauma center is required to provide outreach and prevention programs to other health systems, pre-hospital and post-hospital providers, and the communities where they provide care. Much of their educational activity surrounds injury prevention. This education encompasses both prevention of injury ("primary prevention") and the limitation of energy transfer whenever injuries occur ("secondary prevention"). Verified trauma centers also engage in tertiary prevention, which spans the entire pre-hospital delivery of care to improve outcomes after injuries occur. Finally, trauma centers also prepare for mass casualties, and this preparation includes a hospital disaster plan, a triage plan, and information transfer in times of disasters.

All ten hospitals provided at least some information regarding their outreach and prevention programs. Three hospitals reported that their trauma program manager spends 0.10 FTE or less on trauma outreach and prevention programs; five hospitals reported that their TPM's spend 0.15 – 0.25 FTE on outreach and prevention; and two hospitals reported that their TPM's spend 30% or more of their time on this activity. In nearly every case, unfortunately, the percentages reported in III.1 and II.6 sum to more than 1.0 FTE, suggesting that there was confusion with the way this question was worded.[24] Seven hospitals also reported (in question III.2) that other FTEs were engaged in outreach and prevention. Below is an exhaustive list of these FTEs:

- Healthy Communities staff (0.8 FTE)
- SAFEKIDS Coord./Educator (1 FTE)
- Secretarial support (0.5 FTE)
- Aeromedical support (0.1 FTE)
- ED staff (0.05)
- Trauma medical director (0.5 FTE)
- Community relations coord. (0.2 FTE)
- Rural EMS coordinator (0.5 FTE)
- Other Nurses/Educator (0.1 FTE; 1 FTE)
- Educator (0.15 FTE; 0.2 FTE)

[24] A respondents could have been reporting, for example, that 100% of the TPM's time is devoted to becoming re-designated, and of this, 20% is devoted to outreach and prevention – an activity that is obviously required for re-designation. We capped TPM compensation at 1.0 FTE and allocated the time first to re-designation. As such, we may overestimate verification costs while underestimating outreach and prevention costs by an identical amount.

In two cases, the hospitals did not specify a budgeted amount, meaning that a significant expense was omitted from the calculations.

Few of the respondents provided figures for the costs of outreach and prevention:

- Only 3 of 10 hospitals reported using any office space (question III.3);
- Only 4 hospitals listed expenses for computers or office supplies and equipment (III.4);
- Only 6 hospitals identified purchases of software, program materials, or other content (III.5);
- Only 1 hospital reported costs surrounding the internal development of programs (III.6);
- Only 6 hospitals identified any travel and presentation costs, and in 4 of these cases the costs amounted to $2000 or less (III.7);
- Only 3 hospitals spent more than $250 in direct marketing expenses (III.8); and
- Only 2 hospitals reported any other costs (III.9).

Consequently, this analysis may significantly underreport the costs of outreach and prevention, but of those costs that are captured here; the results can be summarized as follows:

Outreach and Prevention Costs		
	Reported Range (Annual)	**Median (Annual)**
Personnel (excluding trauma director):	$14,700 - $85,000 (N=4)	$54,250
Materials, Travel, Equipment, & Space	$2,000 - $152,266 (N=6)	$19,324
Other	$3738 - $5000 (N=2)	$4,369
Total outreach and prevention:	$2,000 - $215,766 (N=6)	$56,543

Source: Surveys of Florida Designated Trauma Center Hospitals

E. Other Direct, Incremental, and Non-Chargeable Trauma Expenditures

Five respondents left this section entirely blank. A sixth identified professional dues of $640 and 800 square feet of office space (cost = $16,800). A seventh hospital listed only $26,471 in other (unspecified) overhead. Three hospitals listed utility costs of $6,000, $7,000, and $20,000.

The remaining items listed are both significant and individually noteworthy:

- $773,989 at one trauma center for "staffing beyond that required for a hospital without trauma designation";
- $173,473 at a second trauma center for "other indirect overhead";
- $71,587 at this second center for "discharge planners and outcomes mgmt.";
- $217,034 at this second center for a "transfer center";
- $2,322,278 at this second center for a "flight program";
- $23,608 at this second center for "additional security";
- $884,768 at this second center for "On-call clinical staff (OR, angio, CT) and research nurse";
- $65,000 at a third trauma center for "trauma courses, nursing education";
- $3,800,000 at this third center for "Aeromedical program – interfacility transport …";
- $26,000 at this third center for emergency nursing course, nursing education requirement for ED nurses …"; and
- $12,000 at this third center for "ATLS, PALS, APLS courses for ED and Surgical Physicians."

F. Local Government Trauma Support

Although Florida's twenty designated trauma centers receive some financial support from the Department of Health/EMS, nine of ten trauma centers reported no local government support either for their hospitals (V.1) or their physicians (V.2).[25] The tenth trauma center did not respond to this section of the report.

G. Summary and Totals

The results from the previous section can be summarized as follows, with a separate accounting of the range and median reported total costs:

Cost Category	Reported Range (Annual)	Median (Annual)
Sub-Specialist On-Call Compensation (Incl. Trauma Director Salary & other costs related to on-call coverage)	$337,900 - $4,208,051	$2,080,103
Re-Designation Costs	$88,000 - $456,258	$124,120
Outreach and Prevention Costs	$2,000 - $215,766	$56,543
Other Direct and Non-Chargeable Costs	$17,440 - $3,925,448	$811,274
Total:	$1,840,250-$8,588,823 (N = 7)	$2,706,510

Source: Surveys of Florida Designated Trauma Center Hospitals

The reported ranges deserve some explanation, because they are large and have received little attention to this point. The variation in sub-specialist on-call compensation depended on several factors. There was some variation in how much each hospital paid its general surgeons, for example, since three hospitals paid $800 – 900, two paid $1500 – 1800, and three paid $2400 – 2600. Yet there seemed to be much more variation in the number of sub-specialties receiving compensation, with one designated trauma center offering on-call compensation to eleven different sub-specialties. (This hospital also provided a quite lengthy list of job responsibilities, and it indicated that it had recently increased compensation as a result of shortages in several sub-specialties.) The wide range in re-designation costs was driven by a single hospital, which included some nursing education, chaplain services, psychologist services, and special equipment costs in its "other verification costs" category (Question II.15). The remaining hospitals provided cost estimates that were much more tightly grouped around the median cost of $124,120.

The wide range in outreach and prevention costs, as mentioned, derives (on the low end) from the fact that most trauma centers reported very little information, and those that did often provided data on just a small number of the items. Among the handful of hospitals that gave more complete responses, there was considerable variation in the amounts spent on outreach and prevention programs.

The bottom line is that no hospital reported less than $1.8 million, despite the fact that many of the forms were returned only partially complete, and the median hospital spent $2.7 million.

[25] Hillsborough County contributes $3.5 million to Tampa General for unpaid Level I costs, an additional $1.7million to the five hospitals in the health care plan for emergency room service and an estimated $3 million for physician ER and follow up care.

VI. DISCUSSION

The results from the previous section demonstrate first and foremost that designated trauma centers are quite diverse. Three of ten centers in the sample had more than 2500 trauma admissions in 2000, while two pediatric centers had 500 or fewer. Aeromedical transportation and transfers were each key sources from a majority or near-majority of patient admissions for two designated trauma centers, and yet aeromedical transports and transfers each accounted for 10-12% or less of the trauma admissions at several other hospitals. All ten hospitals are active in a variety of complex non-trauma domains, but only two hospitals (both Level I trauma centers) are engaged nearly across-the-board. The largest Level II centers have as many trauma admissions as the Level I centers, though the pediatric trauma centers by design specialize, and as such they have many fewer admissions.

Nine of the ten trauma centers that responded to the data request indicate that they pay on-call stipends to their physician specialists, and yet there is no way to know whether this sample of ten centers is representative, and the evidence indicates that the amounts paid differ substantially from one designated trauma center to the next. The costs incurred by each trauma center for both re-designation and outreach and prevention programs also vary considerably across trauma centers, though perhaps less so than the cost of on-call coverage.

A. What Does It Cost Trauma Center Hospitals to Staff Their On-Call Schedules?

Nine of the ten respondents pay stipends to some of their physicians for taking call. Within this group, general surgeons all receive stipends, and neurosurgeons and orthopedic surgeons receive stipends at six of nine hospitals that extend such compensation. Other hospitals pay stipends on a case-by-case basis. In nearly all cases, respondents indicated that these stipends represent an incremental expense, meaning that they are necessary only because the hospitals serve as designated trauma centers. Staffing these call schedules may bolster these hospitals' "clinical readiness" hospital-wide, but the stipends are tied directly to trauma.

In nearly all cases, hospitals report that the stipends are paid out primarily or exclusively as compensation for "taking call." In some instances, a lump sum is paid out annually to a physician group practice, which may or may not deduct expenses (e.g., for administering the call schedule), but the overriding sense is that the hospitals' outlays are intended to persuade physicians to "take call." At the same time, however, it is also clear that taking call exposes physicians to other costs and additional responsibilities. These include i) large incremental medical malpractice insurance costs, ii) added patient care obligations (often unreimbursed and extending well beyond patients' hospital stays), iii) *ongoing* commitments to the trauma service and to the trauma system, iv) specific obligations surrounding re-designation, and v) participation in outreach and prevention programs. Trauma directors may handle many of the routine administrative responsibilities, and they are compensated for doing so, but the individual physicians who take call are clearly also expected to do much more than merely "carry a pager" and treat trauma patients as they arrive. Significantly, the hospitals also report that they rarely, if ever, reimburse physicians for the incremental cost of their medical malpractice insurance, for added patient care obligations, for participation in the re-designation process or outreach and prevention programs, or for the various other administrative and leadership roles that these physicians play. As such, it

is important to recognize that while hospitals are appropriately preoccupied with staffing their call schedules, the on-call stipends must also be sufficient to compensate physicians for assuming all of these other costs and obligations.

The data also reveal a disproportionate role for three physician sub-specialties. In particular, general surgeons are nearly always involved in patients' care, orthopedic surgeons are consulted 40% of the time, and neurosurgeons participate in 15 – 25% of all cases. These three sub-specialties are frequently engaged emergently, and their initial participation often requires complex and lengthy operating room procedures. The neurosurgeons' participation is especially remarkable, since their call schedule responsibilities often rotate between just 2-3 individuals.

It is important to keep in mind that these physicians are simultaneously maintaining busy practices outside of the trauma service, and that these non-trauma activities provide the bulk of these surgeons' overall incomes. A general surgeon, orthopedic surgeon, or neurosurgeon who is up all night operating can not effectively deliver complex and physically demanding care the next day, and a surgeon who knows that he or she ***might*** be up all night can not schedule a busy day afterward. In short, the day post call must be relatively "protected," at a significant and quite tangible financial cost to the surgeon. If surgeons take call twice per week, the disruptive effects more than double.

At the other end of the spectrum, some surgeons must plan their schedules knowing that they might be consulted, but with a relatively low probability. Plastic surgeons, for example, may be involved emergently in as few as 1-3% of trauma admissions. Yet they must still go to the effort and expense of arranging contingencies for what amounts to a relatively small financial payoff in trauma-related professional fees.

The responses from the ten designated trauma centers in our sample also indicate that physicians must also arrange for their own malpractice insurance. They are also expected to perform a variety of administrative and community services in addition to taking trauma call.

Under these circumstances, it should not be surprising that many physician sub-specialists join group practices, where they can better coordinate their activities and share the burden of taking trauma call. Such group practice arrangements may also work to hospitals' advantage, since contracts with group practices may guarantee an assured supply of physician services in ways that contracts with individual physicians cannot. However, once group practices enter the equation, decision-making may become more "corporate," meaning that the terms of the contracts may become more arms-length and financially driven. These trends are reinforced by the overall migration of physicians to off-site surgery centers, where the physicians' ties to designated trauma centers are weak or non-existent.

Although $2.1 million in annual on-call compensation may seem steep, this amounts to just $240 per hour in all for the participating physicians in fifteen sub-specialties for the inconvenience of taking trauma call, the unpredictability, the late-night and weekend work, the lost revenues from non-trauma professional activities, and the administrative and community services that go along with taking call.

Our sense is that these costs will likely increase in the years ahead, and for several reasons. First, many hospitals pointed to underlying shortages of sub-specialists, both locally and regionally, and regardless of compensation. Nationwide, there are relatively few neurosurgeons, orthopedic surgeons, and other physician sub-specialists. Moreover, among the ten trauma center hospitals that submitted data, temporary or chronic shortages were reported in nearly every physician sub-specialty. Second, malpractice costs are rising, insurers are exiting the market, and those insurers that remain are more often capping their coverage. Trauma is inherently litigious, and as such the physicians who take trauma call are disproportionately affected by these industry trends.

Third, because professional activity is increasing faster than the number of surgeons, especially in specific sub-specialties, shortages loom ever larger. This suggests that hospitals will find it necessary to pay their physicians more, and not simply because of the law of supply and demand. Figure 1, reproduced here, shows again how the disruptive effects of variability increase as assets become more fully utilized. The highly non-linear relationship is as applicable to physicians as it is to hospitals. As physicians become busier, the adverse consequences to them of unpredictable and highly variable trauma patients become increasingly problematic. A fully employed orthopedic surgeon or plastic surgeon finds trauma call much more difficult (and expensive) than a plastic surgeon or orthopedic surgeon whose practice is not busy.

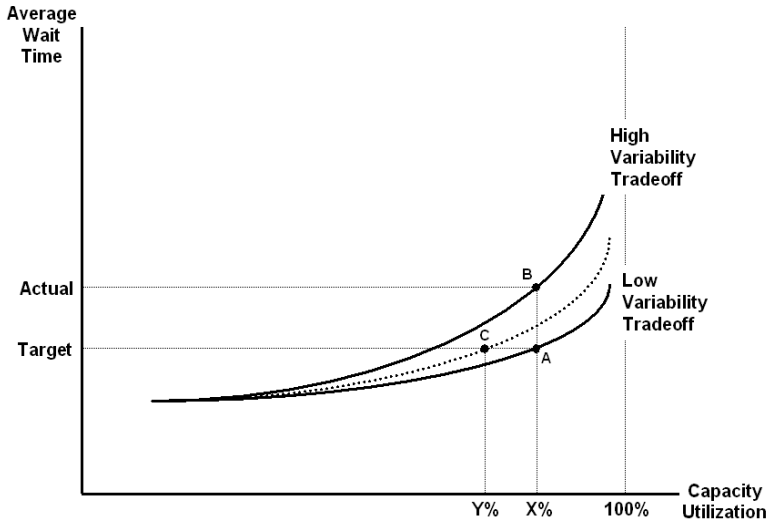

Figure 1

Finally, national trends show that surgeons are migrating away from hospital-based settings to off-site facilities, at the same time that surgery is being "crowded out" at many hospitals. Physicians are striking out on their own to an ever greater extent, and their ties to hospitals may be diminishing. The standards set by the American College of Surgeons and by the State of Florida for designated trauma centers leave no room for compromise or error. If hospitals fail to staff even one physician sub-specialty for any reason – local or regional shortages, low compensation, a malpractice insurance crisis, or physicians who are too busy or too far removed from hospital settings to be recruited for trauma call – the ramifications are severe. Appendix B at the end of this report has many examples from around the country showing how problems with one narrow slice of trauma care (e.g., malpractice insurance) or one physician sub-specialty (e.g., orthopedic surgeons) can jeopardize the entire trauma enterprise.

B. What Does It Cost Trauma Center Hospitals to Remain Designated Trauma Centers?

The costs of remaining a designated trauma center are more straightforward, but unfortunately few respondents provided much detail. Seven centers reported salary and benefits for their trauma program manager: at six centers these fell in the range of $50,000 - $65,000 (with the remaining hospital paying only slightly less). Salary and benefits for trauma registrars vary more, in part because higher-volume centers require more than one full-time registrar.

The remaining portions of this section of the data request were only partially completed or left blank. Given the paucity of data available from the respondents, no reasonable estimate can be made regarding *actual* costs incurred by trauma center hospitals. Yet by piecing together different hospitals' figures, and by relying on one especially conscientious trauma center, it is possible to sketch out a reasonable but conservative estimate:

Salary and benefits for trauma program manager:		≈ $55,000
Salary and benefits for one full-time trauma registrar:		≈ 30,000
Tracs software:		≈ 3,000
Office space (900 square feet @ $19/square foot):		≈ 17,100
Ancillary: Office supplies, PCs, utilities, etc.:		≈ 15,000
	Total:	≈$120,100

These figures come in very close to the $124,000 median cost established in the trauma center surveys. For various reasons, these figures are conservative. First, larger centers have more than one full-time registrar, and they may require more space. Second, these costs include no physician compensation, which is accounted for elsewhere. (For example, re-designation occupies a significant fraction of the trauma director's time, but his or her salary is accounted for elsewhere in this report.) Third, these calculations make no allowance for continuing medical education for physicians and nurses, which is required of designated trauma centers. (One hospital estimated the cost of nursing education alone at $54,000.)

It is also worth emphasizing that these costs are all unique to trauma care. For example, other clinical departments within the hospital also have administrative support staff, and the associated administrative costs of those staff members are presumably reflected in patient charges. But no other clinical domain faces the same "regulatory" scrutiny as a trauma service, and *the trauma program manager and trauma registrars' job responsibilities revolve specifically around trauma's unique re-designation process*. Put differently, they have no direct or indirect administrative counterparts in other clinical domains. From the hospitals' perspective, their salary and benefits represent incremental (and unreimbursed) expenses.

In summary, the $120,000 tally presented here represents a reasonable lower bound on the annual costs of trauma center re-designation.

C. What are the Costs of Outreach and Prevention?

This has been the least successful portion of this study. Hospitals declined to complete much of this section of the data request, and those that listed personnel and FTEs often omitted information regarding their compensation. The median figure reported here is $56,543, but this likely understates the resources committed to outreach and prevention programs. The highest reported costs at any hospital were $215,766, and this figure was arrived at through what appears to be a thorough and detailed accounting of expenses at a trauma center hospital that is actively engaged in outreach and prevention.

D. Are There Other Direct, Incremental, and Non-Chargeable Costs?

Here, too, the responses are highly incomplete, though as a "catch-all" category of costs this lack of completeness was not unexpected, and the list of costs is illuminating. By far the largest expenses reported were for aeromedical transportation – one hospital reported costs of $2.3 million and another reported costs of $3.8 million. Aeromedical transportation is clearly beyond the scope of this study, and yet most aeromedical services are both money-losing enterprises and closely identified with their respective trauma services. They may well qualify as direct and incremental costs, though we are unclear why these costs cannot be charged to patients who utilize the aeromedical services.

Other significant costs were largely personnel-related. One trauma center identified $773,989 for "staffing beyond that required for a hospital without trauma center designation," along with $217,034 for a "transfer center." (We presume that this transfer center's costs are mostly related to staffing.) A second hospital listed $884,768 for "On-call clinical staff (OR, angio, CT) and research nurse," as well as $71, 587 for "discharge planners and outcomes management."

This category serves to illustrate that expanding the scope of analysis would raise very legitimate issues about aeromedical services, transfers, non-physicians personnel who take call, and so forth. In subsequent iterations of this study, there should be an extended discussion of how broadly to define the trauma service. Aeromedical transportation seems to be a logical next-step, both because it is so closely associated with the trauma service, and because these enterprises often turn out to be very costly to operate.

VII. SUMMARY AND CONCLUSIONS

This study takes an unconventional approach to measuring the costs of providing trauma care. Historically, the financial stresses on designated trauma centers have been attributed primarily to the cost of treating uninsured and underinsured trauma patients. While this study mostly steers clear of insurance issues, a literature review turns up no solid evidence that patients with traumatic injuries are systematically less well insured than non-trauma patients. There is no doubt that some specific trauma center hospitals care for patients who are disproportionately uninsured. Yet at most trauma centers motor vehicle crashes are the primary source of injuries, and these patients are often covered by relatively well-paying auto insurance in addition to their conventional health insurance. From the data available, there is no way to know how well trauma patients at Florida's hospitals are reimbursed on balance, and uninsured and underinsured patients may still outnumber those patients who have multiple layers of insurance. But it is premature to depict trauma centers' financial problems as deriving primarily from a poor payer mix.

This study instead makes the case that much of the problem lies with the unusually high costs of trauma care rather than with poor insurance coverage *per se*. It asserts that trauma centers are essential public utilities, much like fire stations or police departments, and that like fire stations and police departments they incur very large fixed costs simply to ensure "readiness." These readiness costs are not reflected in patient charges, since trauma patients are billed for clinical services such as lab tests or medicines on the same terms as other, non-trauma patients. Put differently, trauma patients are billed only for care that is actually delivered, and not for the costs that the hospitals incur of being ready to provide that care on a moment's notice at any hour of the day or night. Trauma center hospitals do not recoup these readiness costs. As such, the problem plagues all trauma centers, whether or not they enjoy a favorable payer mix, and it compounds the difficulties facing hospitals that also provide care to large uninsured populations.

Here these readiness costs are estimated at $2.1 million for physician call coverage alone for the median hospital in a sample of Florida trauma centers. The median total cost is estimated at $2.7 million. Moreover, these costs are conservatively measured and include only those incremental expenses that can be attributed directly to trauma care. For a trauma center hospital with, say, 1350 annual admissions, this unreimbursed cost amounts to $2000 per patient. Larger trauma centers face somewhat lower costs per patient ($2.7 million amortized over 2000 patients equals $1350/patient), while smaller centers may face much higher costs per patient ($5400/patient for a pediatric trauma center with just 500 annual admissions). Moreover, one could argue that these fixed costs should be amortized only over those patients with relatively severe injuries, since subspecialty care is rarely required for less severe injuries. In this case the cost/patient could more than double. In a market environment in which hospitals are fortunate to earn margins of 2-5%, this represents a financial handicap that would be quite difficult to overcome, even if hospitals are reimbursed relatively well for the actual delivery of trauma care.

Furthermore, in this first iteration of a trauma cost methodology, some costs were surely left out. Respondents were asked to gather a great deal of information extending back several years, and to submit the report quickly. It should not be surprising that the responses were often incomplete, or that only two or three respondents made a serious effort to account for all of the "other

costs" that were not specifically requested. In subsequent iterations, with greater experience and data added prospectively, it is likely that hospitals will uncover additional costs.

Before concluding that trauma care is a financial failure, however, these estimates must be qualified on several levels. First, the sample of designated trauma centers used here is both small and non-random, and conclusions drawn from it must be considered tentative. Second, there are many indirect costs and benefits surrounding designated trauma center hospitals. Individually, some costs and some benefits may amount to hundreds of thousands of dollars, and in aggregate they could plausibly balance out to one million dollars or more – either way. Thus, for example, on the one hand the high variability that attends trauma care can impose significant (and diffuse) costs hospital-wide, especially for busy hospitals. On the other hand, trauma center hospitals also enjoy a hospital-wide bargaining advantage when contracting with payers, and the stature that comes with being a designated trauma center also increases referrals hospital-wide. (See Appendix B for examples.)

Third, designated trauma center hospitals and regional trauma systems with strong clinical and administrative leadership can manage these costs, and they can bolster their health system revenues significantly, as well. Aeromedical services that revolve around the trauma service are high fixed-cost enterprises, and once they are up and running they can be used for many other clinical activities (e.g., inter-facility transfers), as well, with little or no incremental cost or investment required. Outreach and prevention programs are costly but afford hospitals opportunities to market their health systems and increase their patient referrals hospital-wide. The list goes on at length. The point is not to suggest that trauma services can or will ever be significant health system profit centers, but that effective leadership can pare the $2.7 million in costs identified in this study to more manageable levels, while generating offsetting benefits.

Fourth, trauma center hospitals can exploit a tradeoff between the costs identified here and other considerations. Indeed, trauma center hospitals have some limited discretion to vary their level of readiness, and in doing so they can influence the readiness costs they incur. They can cap their on-call stipends, for example, even in the face of temporary or chronic shortages in specific physician sub-specialties, provided that the trauma director and perhaps the hospital CEO are willing to engage in last-minute scrambling (and arm-twisting) to fill empty slots. This strategy is risky, even in the short run, since there is a chance that some slots may go unfilled, and of course the added time spent by the hospital leadership to fill in the call schedule entails significant opportunity costs. Perhaps more important, in the longer run this strategy hurts morale throughout the institution, and may give rise to physician attrition, which can quickly accelerate. Because specific sub-specialties are staffed by a very small number of individuals, the decision by even a single physician to exit the system can place an enormous burden on those who remain engaged. Moreover, low compensation encourages a "shift" mentality, where trauma directors and hospital administrators focus on the immediate concerns of filling in the call schedule, and to enlist physician sub-specialists they downplay their expectations surrounding all of the physicians' other obligations to the trauma service. Underpaid physicians, in short, won't be fully vested. While trauma center hospitals may not feel the effects of such neglect in the short run, the long run toll can be quite significant, and the clinical and financial performance of the entire trauma system will ultimately suffer.

To conclude on a positive note, the $2.7 million in median costs enumerated here are large in absolute term, and they are a significant burden to the hospitals that incur them, and yet they comprise only a small fraction of the total expenditures within a well-organized trauma system. At the largest trauma center hospitals in Florida, for example, inpatient facilities charges and professional fees for trauma patients are likely approaching $100 million annually, and the pre- and post-hospital components of the surrounding trauma systems add tens of millions of dollars more. Physicians are the leaders of these trauma systems, and their leadership and active engagement can make an extraordinary difference in how well the systems function both clinically *and financially*. One million dollars or less can make the difference between physicians merely showing up for their on-call "shifts" and becoming fully vested in their trauma systems. Likewise, the relatively modest sums spent on re-designation provide demonstrable quality assurance payoffs, and outreach and prevention programs yield both clinical and financial returns. An analysis of return on investment for such trauma system expenditures clearly lies beyond the scope of this study, but it is worth pointing out that safety-conscious consumers show no reluctance to pay for airbags, and that the public's concerns surrounding faulty tires on sport utility vehicles can make headlines for weeks and months, and spark multi-billion dollar recalls. Our sense is that additional investments in trauma systems would not only pass any reasonable cost-benefit analysis, but that such investments would yield a return on investment that compares favorably to other private and public expenditures designed to prevent or minimize the impact of traumatic injuries.

APPENDIX A: TIMETABLE

Date	Event/Comments
04/01/01	MDContent initial meeting with Department of Health
06/15/01	Intranet Site Established
07/16/01	First Executive Council Meeting in Orlando – Executive Council & Working Group established. Initial methodology options discussed.
10/29/01	Second Executive Council Meeting in Tampa.
01/07/02	Initial data request & memo sent to Executive Council.
02/18/02	Final data request sent to Executive Council
03/15/02	Due date for data requests
04/08/02	Third Executive Council Meeting in Tampa
Date	**Upcoming Events**
1st Week of May	***Draft*** Report posted for the Executive Council
05/17/02	Close of Executive Council Comment Period
1st Week of June	***Final*** Report posted for the Executive Council

APPENDIX B: TRAUMA NEWS NATIONWIDE

Date	Article/Headline Summary	Source
04/26/02	**Car accidents drive trauma-center revenue / Trauma as a 'loss leader'** "Despite a reputation as unprofitable, trauma services actually provide some hospitals with a fairly steady revenue stream, owing in large part to the number of car-accident victims seen in trauma centers. Auto insurance generally covers at least some portion of medical treatment costs, ensuring that hospitals will generally receive payment when they treat crash patients. Half of the patients seen in Broward County (Fla.) trauma centers are injured in car accidents, which is why the three hospitals that house trauma centers there are fighting to prevent a fourth hospital, Westside Regional Medical Center, from opening a unit." "Ultimately, what appeals to many hospital executives most about trauma units is their halo effect—many of a hospital's patients enters through the emergency room, meaning that top-notch trauma care can generate loyal patients who return for more profitable procedures. In addition, surgeons affiliated with trauma centers provide hospitals with new referral streams. Having a trauma center 'forces you to always look at how you're delivering care,' an official at a Montana hospital said. 'It really, across the board, makes it a better hospital. And it makes the place a better place to work for the physicians' (Merriam, Missoulian, 11/18/01)."	Advisory Board
04/25/02	**CAMC (W. Va.): Agrees to pay on-call neurosurgeons $2,000 per day** "In an effort to maintain its Level I trauma status, Charleston Area Medical Center in West Virginia will pay on-call trauma neurosurgeons a $2,000 daily stipend to help the physicians offset losses from malpractice insurance rate hikes and treating uninsured and underinsured patients."	Advisory Board
04/18/02	**Cincinnati hospitals: Below-average pay leading to physician shortage** Bethesda North Hospital's "widely supported" plan to open a trauma center has been threatened by a lack of specialists willing to work extra shifts in the ED.	Advisory Board
04/12/02	**Colorado Hospital's bid for Level I trauma center designation postponed** Citing a technical error, the state has decided to postpone its recommendation to approve Swedish Medical Center's bid for Level I trauma center designation and has asked the hospital to resubmit its application. According to the Denver Post, nearby Denver Health—already a Level I center—notified the state that one of the four surgeons who evaluated Swedish no longer works at a Level I trauma center, as required by state regulations. Swedish officials say they are "very disappointed" and that reapplying could take up to a year. Swedish spent 14 months petitioning to have its designation bumped up from its current Level II status; the original application cost $26,000 and occupied weeks of staff time, says an administrator	Advisory Board
04/02/02	**Charleston Area Medical Center Physicians face rising malpractice costs** "CAMC Health System officials warn that a number of specialists at Charleston Area Medical Center will lose their malpractice insurance in the next year, including 100 physicians who will lose their St. Paul Cos. contracts May 1. The hospital's CEO notes that the neurosurgeons who cover CAMC's Level I trauma center may have to stop taking new patients April 1 because they have been unable to find coverage."	Advisory Board

Date	Article/Headline Summary	Source
03/11/02	**Nevada trauma center uses part-time MDs to stave off closures** "Las Vegas-based University Medical Center recently instituted a plan that will help its trauma center operate without interruption for at least three months, the Las Vegas Sun reports. The center was to begin closing as needed in response to the departure of two surgeons who could no longer afford to pay skyrocketing medical malpractice premiums. Under the temporary plan, the two surgeons will be granted temporary part-time status, allowing the center to cover all shifts and remain open."	Advisory Board
03/04/02	**Malpractice rate hikes spur a doctor shortage** "The cost of medical malpractice insurance is increasing upward of fourfold in some states, forcing doctors from Pennsylvania to New York to Nevada to close their practices. News of this upward trend is causing some doctors to stop practicing or to practice "defensively," ordering extra tests or choosing procedures that limit their risks."	Los Angles Times Advisory Board
02/21/02	**Lack of specialists in Cincinnati puts trauma system plans in limbo** "A lack of specialists in the Cincinnati area is complicating plans to implement Ohio's new statewide trauma system and is putting additional strain on hospitals that are already reporting a record number of diversions. At Bethesda North, as at many Cincinnati hospitals, officials are having trouble recruiting enough specialists, particularly neurosurgeons, to keep its trauma center staffed around the clock. Years of lower-than-average reimbursement rates for specialists have made 'key' physicians groups unwilling to staff on-call shifts; some have left for better pay and fewer new ones have been moving in."	Advisory Board
02/15/02	**California trauma system faces financial, patient-care crisis** "California's 45 trauma centers are reporting losses and requesting taxpayer support; however, a trauma task force—created as part of recent legislation establishing a Trauma Care Fund to support the statewide trauma system—wants to see proof of those claims." "Task force members say that because the hospitals do not report financial information, the task force cannot objectively evaluate the trauma centers' needs; disclosure of payer mix information, one member said, would 'bolster or discredit hospital officials' assertions' that increasing volumes of uninsured and indigent are taking a toll on trauma centers' bottom lines. Mandatory cost and fee disclosure, while not currently on the table, could follow, since payer mix alone does not 'provide a complete financial picture of California's trauma units,' one task force member said."	Advisory Board
02/06/02	**Shands Jacksonville: Seeking state dollars to shore up finances** With Shands Jacksonville's role as a safety net hospital and the city's only high-level trauma center 'in serious jeopardy,' lawmakers have requested $5 million in state funds to keep the hospital alive.	Advisory Board Jacksonville Times-Union
02/06/02	**San Diego County orders audit of six-hospital trauma system** The audit will examine the "system's efficiency, cost, performance in saving lives and how trauma patients are distributed" among hospitals to determine whether reforms are necessary.	Advisory Board
01/16/02	**San Diego's Palomar Medical Center's trauma center closes for two weeks because of a contract stalemate with physician specialists.** Physicians sought "higher payment for on-call duty, removal of the requirement that physicians with staff privileges take emergency room call, and improved efficiency and quality of care through replacement of old equipment and increases in nursing and technical staff."	San Diego Union Tribune Advisory Board

Date	Article/Headline Summary	Source
01/16/02	**Charleston Area Medical Center's Level I trauma standing in question** Last fall, hospital officials expressed concern that they did not have enough plastic surgeons and that their orthopedic physicians would not get insurance. The hospital has since filled its on-call lists, but acknowledges that if it cannot keep plastic surgeons, neurologists, or orthopedist on on-call schedule, their standing could be downgraded to Level III.	Associated Press
01/15/02	**Barnes-Jewish Hospital in Missouri opens new trauma center** The new $32.9 million center will be better able to handle the more than 80,000 ED visits a year – by far the busiest in the state.	Vandewater Advisory Board
01/09/02	**Georgia Gov. Roy Barnes announces support for creation of a statewide trauma network** The Governor has earmarked $600,000 for the creation of the trauma network. His decision comes after the state's Office of EMS completed an evaluation and re-designation of Georgia's existing trauma network. The process is expected to eliminate at least six of the state's 19 facilities.	Advisory Board
01/02/02	**Malpractice insurance rates affect PA trauma centers** Abingont Memorial in Pennsylvania nearly closes its trauma center because orthopedic surgeons had trouble renewing insurance coverage. Closure was averted only after state officials ordered a private insure to cover the surgeons for another 60 days.	Philadelphia Business Journal
12/29/02	**Survey outlines reasons why California specialists don't take call** A survey of 338 doctors by the California Medical Association concludes that: • Payment difficulties are a significant factor in specialists' willingness to answer calls • 8 in 10 surveyed said they have trouble obtaining payment for on-call services • 4 in 10 said they have reduced the amount of time they serve on call because of payment problems • 2 in 10 said they have stopped taking calls altogether because of payment problems. • One ER patient in four needs help from a medical specialist.	Los Angles Times
12/11/01	**Rhode Island Hospital expands** Rhode Island Hospital, the largest in state, is planning a $60 million expansion project to double the size of its ED (a Level 1 trauma center) and expand cancer care.	Providence Journal
11/28/01	**Broward County Florida supports opening of fourth trauma center** Commissioners are supporting the opening of a 4th trauma center in the area. Proponents for the hospital say "the area's growing populations merits a new center, but opponents argue that the new facility will siphon off more lucrative trauma patients from three existing hospitals."	Miami Herald
11/30/01	**Missouri hospital requests county funds to preserve trauma services** SSM DePaul Health Center in Bridgton, MO has asked St. Louis Count to approve a $200,000 grant to keep the hospital's trauma center up and running. Without the funding, DePaul would have to shutter trauma services. Hospital President Bob Porter said "the money would go to increasing daily stipends for on-call trauma surgeons who threatened to withdraw services if they were not compensated."	Advisory Board

Date	Article/Headline Summary	Source
11/21/01	**San Francisco without licensed air ambulance landing site** Campaigns to equip the city with landing pads encountered negative community response last fall. As a result, UCSF Medical Center and San Francisco general, the only trauma center in the city, have become increasingly inaccessible to the sickest patients.	Advisory Board
11/15/01	**Cleveland hospital considers closing ED** St. Luke's Medical Center, once a busy Level II trauma center, considers replacing its ED with an urgent care center because of under use. They attribute the lack of patients to the closing of an adjoining hospital in 1999 and lack of proper equipment, including a CT scan.	Advisory Board
10/27/01	**Ohio Hospital awarded trauma designation** Children's Hospital Medical Cent of Akron earned its Level II trauma center status. The hospital had been handling trauma cases for years, but was required by a new state law to be ACS designated. According to the hospital's director, Children's "has to spend several hundred thousand dollars to get things in tune."	Powell Advisory Board
10/11/01 09/25/01	**Arizona hospitals close region's only Level I trauma units** University Medical Center and nearby Tucson Medical Center both announced plans (within 2 weeks) to close their respective Level I trauma units. The two centers have been handling about 3000 cases per year and a face a combined deficit of $6 million. Both hospitals have appealed to lawmakers for funds to compensate undocumented immigrant care.	Associated Press Advisory Board
08/04/01	**Mississippi opens new $23.5M hospital** The University of Mississippi Medical Center recently opened a new critical care hospital, which will operate 4 specialized ICUs and contain 92 beds. "Officials hope that the new facility will strengthen UMC designation as Mississippi' only Level I trauma center."	Associated Press
07/31/01	**Texas hospital could lose its Level III trauma designation** Houston's LBJ hospital could lose its status as a trauma center if recent on-call problems are not corrected. In May, on-call surgeons responded in time for fewer than 20% of all calls (state law requires a 90% rate).	Houston Chronicle
07/02/01	**Wisconsin Hospital certified as Level I pediatric trauma** Wauwatosa's Children's Hospital of Wisconsin has been certified as a Level I trauma – making it one of only 14 Level I pediatric hospitals nationwide.	Milwaukee Journal Sentinel
05/15/01	**D.C. General's Hospital's inpatient and trauma care services to close** Nearby Washington Hospital Center said it might close its trauma center if D.C. General shutters its trauma unit.	Advisory Board
03/08/01	**Trauma system questioned as population grows** Critics of the current trauma system in Seattle question where the region's sole high-level trauma facility, Harborview Medical Center, is sufficient to serve the regions rapidly growing population. "Like many states, Washington limits the number of trauma centers in a region in order to ensure sufficient volume to maintain clinical expertise and economic viability."	Seattle Times Advisory Board

APPENDIX C: FLORIDA TRAUMA CENTER HOSPITALS AND EXECUTIVE COUNCIL MEMBERS

Facility	Title	Name
All Children's Hospital	CEO	Dennis Sexton
	PTPM	Kathleen O'Brien
	PTD	Rick Harmel, M.D.
	CFO	Arnie Stenberg
	ED	Alison Brent, M.D.
Baptist Hospital Pensacola	CEO	John Heer
	TPM	Jan Bailie, R.N.
	TD	M. Jane Benson, M.D.
	CFO	Joe Felkner
	ED	Mike Dolister, M.D.
Bayfront Medical Center	CEO	Sue Brody
	TPM	Shelly Wilt, R.N.
	TD	Ernst Vieux, M.D.
	CFO	Robert Thornton
	ED	Anthony Acostal, M.D.
Broward General Medical Center	VP	Timothy P. Menton
	TPM	Jeanne Eckes-Roper, R.N.
	TD	Ivan Puente, M.D.
	CFO	Christopher Lloyd
	ED	El Sinadi, M.D.
Delray Medical Center	CEO	Mitch Feldman
	TPM	Melissa Durbin, R.N.
	TD	Ivan Puente, M.D.
	CFO	Ralph Decerbo
	ED	Mary Ann Nevels, M.D.
Halifax Medical Center	Admin	Dan Lang
	TPM	Debra King, R.N.
	TD	Michael Fabin, M.D.
	CFO	Jeff Feasel
	ED	William Meek, M.D.
Holmes Regional Medical Center	Pres	Keith Slaughter
	TD	Emran Imami, M.D., F.A.C.S.
		John McPherson, M.D.
	CFO	Bob Galloway
	ED	Barbara Ozmar, M.D.
Jackson Memorial Hospital/	CEO	Ira Clark
Ryder Trauma Center	TPM	Marisa D'Heere, A.R.N.P
	TD	Stephen Cohn, M.D.
	CFO	Ronald Ruppel
	ED	David Shatz, M.D.
Lakeland Regional Medical Center	CEO	Jack Stephens
	TPM	Barbara Galloway, R.N.
	TD	Olumide Sobowale, M.D.
	CFO	Paul Powers
	ED	James Melton, III, M.D.
Lee Memorial Hospital	CEO	James Nathan
	CEO?	Dave Crockett
	TPM	Terry Rejonis, R.N.
	TD	Andrew Mikulaschek, M.D.
	CFO	John Wiest
	ED	Jeff Doucette, M.D.
Memorial Regional Hospital	CEO	J.E. Piriz
	TPM	Vicki Bennett-Shipman, R.N.
	TD	Lawrence Lottenberg, M.D.
	CFO	David Smith
	ED	Rosemary Bossom, M.D.
Miami Children's Hospital	CEO	Thomas Rozek
	PTPM	Paul Taber
	PTD	Malvin Weinberger, M.D.
	CFO	David Carroll
	ED	Richard Dellerson, M.D.
North Broward Medical Center	CEO	Joe Scott
	TPM	Paula Cassel, R.N.
	TD	Khalil Burshan, M.D.
	CFO	Max Owens
	ED	Jerry Brooks, M.D.
Orlando Regional Medical Center	CEO	John Hillenmyer
	VP	Abe Hoffman
	TPM	Dianna Liebnitzky, R.N.
	TD	Pat Quijada, M.D.
	PTD	Ross Morgan, M.D.
	Asst. TMD	Ernest Block, M.D.
	CFO	Paul Goldstein
	ED	Tim Bullard, M.D.
Sacred Heart Hospital	CEO	Patrick Madden
	TPM	Judy McDaniel, R.N.
	TD	Karanbir Gill, M.D.
	CFO	Robert Granger
	ED	Gary Pablo, M.D.
St. Joseph's Hospital	CEO	Isaac Mallah
	TPM	Lauren Stewart, A.R.N.P.
	TD	Nicholas PRICE, M.D.
	CFO	Fleury Yelvington
	ED	Anthony Pidala, M.D.
St. Mary's Medical Center	CEO	Peter Marmerstein
	TPM	Tracy Mahank, R.N.
	TD	Robert Borrego, M.D.
	PTD	Anthony Bufo, M.D.
	PTPM	David Summers,R.N.
	CFO	Joel Dalva
	ED	David Soria, M.D.
Shands Jacksonville	CEO	Otis Story
	TPM	Terri Murphy, R.N.
	PTPM	Pam Pieper, R.N.
	CFO	William Ryan
	TD	Joseph Tepas, M.D.
	ED	David Vukich, M.D.
Tampa General Healthcare	CEO	Ronald A. Hytoff
	TPM	Celest Kallenborn
	TD	Lewis Flint, M.D.
	APM	John Scott, R.N., EMT-P
	CFO	Steve Short
	ED	David Orban, M.D.
West Florida Regional	CEO	Jerald F. "Mitch" Mitchell
Medical Center	TPM	Patricia Kyzar, R.N.
	TD	Jeffrey Comitalo, M.D.
	CFO	Randy Butler
	ED	Michael Dupuis, M.D.
OTHERS		
Walton Co. Emergency Med. Services		J. Matthew Douglass,
Maitland Fire Department		Ken Neuhard, Chief
American Medical Response		Jamie Caldwell
State EMS Medical Director		Richard Slevinski, M.D.
Florida Association of County EMS		Diane Flagg, President
EMS Providers of Florida		Bill Godfrey, President
Agency for Healthcare Admin.		Scott Hopes
FHA-Tallahassee		Wayne Nesmith
Palm Beach Health District		Jeff Davis
Air Ambulance Operator		Johnnie Delgado
Air Ambulance Operator		Walter Kopka, II

APPENDIX D: SURVEY TOOL

TRAUMA COST METHODOLOGY STUDY

DATA REQUEST

MDContent:
Paul A. Taheri, MD, MBA
David A. Butz, PhD

Summary: This document includes the data that MDContent proposes to collect from each trauma center hospital. The request includes general information about the trauma center hospital and trauma service, as well as specific data on four categories: i) compensation for physician sub-specialists for taking trauma call; ii) trauma center verification costs, iii) outreach and prevention costs, and iv) other non-recoverable expenses.

In collecting these data, our goal is both to provide the Florida Legislature with a rigorous and transparent analysis of the direct and uncompensated costs of providing inpatient trauma care at verified trauma centers, and also to provide the Legislature with details and context.

All data can be provided anonymously to MDContent and will remain anonymous. Neither the Department of Health nor MDContent will report any hospital-level detail without first soliciting input and feedback from the Executive Council of the Trauma Cost Methodology Study.

Instructions: This file is a "locked" spreadsheet that is best filled out on a computer using Microsoft Excel. To fill out the form, tab through the questions and enter answers in the boxes & spaces provided. Please mark an "x" for yes or no questions and be sure to provide additional comments when necessary.

The second workbook in this file calculates summary data from the data request form.

Please complete the survey and return to MDContent by close of business March 15, 2002. Please email the completed form (spreadsheet & summary data) to: datarequest@mdcontent.com

0. BACKGROUND INFORMATION

0.1) For each of the past three years, how many patients have been admitted to your *hospital* ?

_____ 1998 _____ 1999 _____ 2000

0.2) Please fill out the grid below as completely as possible. Note that the term "trauma admission" refers in this document and all other documents to patients admitted under the State of Florida's criteria for a trauma admission.

All Trauma Admissions	Patient Count	Total Charges	Adult Count (Age ≥ 18)	Count: Adult ISS Score > 15	Pediatric Count (Age < 18)	Count: Pediatric ISS Score > 15
2000						
1999						
1998						
1997						

0.3) In each of the past three years, how many of your trauma admissions have arrived via aeromedical transportation?

_____ 1998 _____ 1999 _____ 2000

0.4) In each of the past three years, how many of your trauma admissions have been transferred in from other hospitals?

_____ 1998 _____ 1999 _____ 2000

0.5) Please answer yes or no to the following questions about your hospital:

	Yes	No
a.) Does your hospital have an MD surgery/anesthesia residency program?		
b.) Does your hospital have a medical school affiliation?		
c.) Does your hospital perform solid organ transplants?		
d.) Does your facility provide pediatric critical care?		
e.) Does your facility provide pediatric surgical services?		
f.) Does your radiology service provide significant interventional radiology support?		
g.) Do you have a designated cancer center or regional spinal cord treatment center in proximity to your institution?		
h.) Do you perform high-risk obstetrical care?		
i.) Does your facility have a designated re-implantation team?		
j.) Does the volume of ED based admission in your institution merit in house radiology and anesthesia?		

I. THE COSTS TO TRAUMA CENTER HOSPITALS OF PHYSICIAN CALL COVERAGE

The costs of compensating physicians to stand willing and able to take call are among the most significant unreimbursed expenses surrounding trauma care, and often the proximate cause of trauma center shutdowns. To determine the costs of providing trauma care, please answer the following questions:

I.1) Does your hospital provide stipends to individual physicians or physician groups to provide trauma call coverage?

_____ Yes _____ No

If your answer is no, please skip to question I.9.

I.2) Does your hospital have an established policy regarding trauma call coverage stipends? If yes, please explain.

_____ Yes _____ No

I.3) If you answered yes to the first question, please indicate in the table below, which physicians receive such stipends for trauma call. Please check all that apply.

☐ General Surgery	☐ OMFS	☐ other
☐ Neurosurgery	☐ Plastic Surgery	☐
☐ Orthopedic Surgery	☐ Radiology	☐
☐ Anesthesia	☐ other	☐
☐ ENT	☐ other	☐

I.4) If you answered yes to the first question, please indicate in the table below the average *daily* stipend or compensation that each physician specialty receives for covering trauma call:

_____ General Surgery	_____ OMFS	_____ other
_____ Neurosurgery	_____ Plastic Surgery	_____
_____ Orthopedic Surgery	_____ Radiology	_____
_____ Anesthesia	_____ other	_____
_____ ENT	_____ other	_____

I.5) Which of these stipends is directly tied to the provision of trauma care, meaning that the hospital would not have to incur this expense if it could somehow shed its clinical obligation to provide trauma care? Please check all that apply:

☐ General Surgery	☐ ENT	☐ other
☐ Neurosurgery	☐ OMFS	☐ other
☐ Orthopedic Surgery	☐ Plastic Surgery	☐ other
☐ Anesthesia	☐ Radiology	☐

I.6) Is the stipend physicians receive designed primarily or exclusively to compensate them for trauma call coverage? If not, what other services or costs is it designed to remunerate?

_____ Yes _____ No

I.7) Do the physicians retain the right to bill for professional fees for their trauma patients?

_____ Yes _____ No

I.8) Is the stipend paid to physicians covering trauma call tied in any specific way to the costs to physicians of medical malpractice insurance? If yes, please explain.

_____ Yes _____ No

I.9) Does the hospital directly underwrite the cost of medical malpractice insurance for any physicians taking trauma call? If the answer is yes, please indicate which physicians are covered, along with the annual expense to the hospital of assuming this cost.

_____ No, the hospital does not underwrite the cost of medical malpractice insurance.

_____ Yes, the annual cost to the hospital is: _____

Physicians covered (please check all that apply):

☐ General Surgery	☐ ENT	☐ other
☐ Neurosurgery	☐ OMFS	☐ other
☐ Orthopedic Surgery	☐ Plastic Surgery	☐ other
☐ Anesthesia	☐ Radiology	☐

I.10) Beyond staffing the on-call schedules, are any of these physicians' activities governed by specific trauma job descriptions, formal trauma performance metrics, or explicit trauma service expectations? If yes, please identify the physicians who are subject to such job standards, checking all that apply.

_____ Yes _____ No

☐ Trauma Director		
☐ General Surgery	☐ OMFS	☐ other
☐ Neurosurgery	☐ Plastic Surgery	☐
☐ Orthopedic Surgery	☐ Radiology	☐
☐ Anesthesia	☐ other	☐
☐ ENT	☐ other	☐

I.11) Are any physicians asked to participate in the periodic state verification process, outreach and prevention programs, or other trauma service activities and obligations? If yes, please briefly describe the nature and extent of their participation.

_____ Yes _____ No

I.12) Part A: Does your hospital provide any other supplemental payments (e.g., for indigent care) tied directly to trauma activity?

_____ Yes _____ No (Skip Parts B & C)

Part B: If the answer to Part A is yes, briefly describe the hospital's policy or formula for extending such payments.

Part C: How much has the hospital paid out in supplemental payments during each of the past three years?

_____ 1998 _____ 1999 _____ 2000

I.13) Are there other inpatient trauma services that the physicians provide to the trauma service for which they are *not* reimbursed? If yes, please be as specific as possible.

_____ Yes _____ No

I.14) Do any of the physician specialties have specific clinical, administrative, or financial obligations for the pre-hospital or post-discharge care of trauma patients admitted to your hospital? If so, please describe these briefly, identifying specifically which physicians are involved and to what extent, and explaining how these physicians are compensated.

_____ Yes _____ No

I.15) Are physicians generally satisfied with the level of their compensation? If not, please describe the nature of the dissatisfaction.

_____ Yes _____ No

I.16) For each of the physician specialties listed below, please identify whether the hospital contracts with individual physicians for call coverage, whether it contracts with a group practice:

Specialty	**Contracts with Individual Physicians or Physician Groups? (Check one for each specialty)**			
General Surgery	Individual			Group
Neurosurgery	Individual			Group
Orthopedic Surgery	Individual			Group
Anesthesia	Individual			Group
ENT	Individual			Group
OMFS	Individual			Group
Plastic Surgery	Individual			Group
Radiology	Individual			Group
other	Individual			Group
other	Individual			Group
other	Individual			Group
	Individual			Group
	Individual			Group
	Individual			Group
	Individual			Group

I.17) Does the hospital have long-term or exclusive contracts (trauma or non-trauma) with any physician group practices? Please check all appropriate boxes:

☐	General Surgery	☐	OMFS	☐	other
☐	Neurosurgery	☐	Plastic Surgery	☐	
☐	Orthopedic Surgery	☐	Radiology	☐	
☐	Anesthesia	☐	other	☐	
☐	ENT	☐	other	☐	

I.18) For each physician specialty listed below, approximately how many physicians participated twice or more each month in providing trauma call coverage? Were there temporary or chronic shortages?

Specialty	**# of physicians regularly taking call**	**Temporary shortages? (check one)**		**Chronic shortages? (check one)**	
		Yes	***No***	***Yes***	***No***
General Surgery					
Neurosurgery					
Orthopedic Surgery					
Anesthesia					
ENT					
OMFS					
Plastic Surgery					
Radiology					
other					
other					
other					

I.19) For those specialties where shortages in trauma call coverage have been problematic, does the hospital perceive that compensation was a proximate cause? Were there other contributing factors (e.g., a local or regional shortage of these specialists)? Please explain:

I.20) If your hospital is not currently experiencing temporary or chronic shortages in trauma call coverage, have there been shortages in the past three years, and if so, what were the causes of those shortages and how have they been mitigated or resolved?

I.21) For each of the physician specialties listed below, please estimate as precisely as possible the number of trauma consults provided in each of the past three years (1998/1999/2000):

Specialty	***1998***	***1999***	***2000***
General Surgery			
Neurosurgery			
Orthopedic Surgery			
Anesthesia			
ENT			
OMFS			
Plastic Surgery			
Radiology			
other			
other			
other			

I.22) Have the physicians who provide trauma coverage expressed dissatisfaction with the level of professional fee reimbursements for the trauma care they provide? Is there a sense among the physicians that trauma care is less remunerative than other types of care? Please explain:

I.23) For each physician specialty listed below, please estimate the fraction of each group's clinical activity (whether or not it is trauma) that takes place outside the domain of the hospital's inpatient and outpatient activities:

Specialty	**How much of these physicians' clinical activity takes place outside the domain of the hospital's inpatient and outpatient activities? (For each specialty, check one.)**		
	Less than 15%	***15% to 40%***	***More than 40%***
General Surgery			
Neurosurgery			
Orthopedic Surgery			
Anesthesia			
ENT			
OMFS			
Plastic Surgery			
Radiology			
other			
other			
other			

I.24) Continuing from question I.23, would you estimate that physicians taking trauma call derive a greater or lesser fraction of their clinical activity from the hospital than they derived a decade ago?

Specialty	**Compared to one decade ago, how much of these physicians clinical activity takes place outside the domain of the hospital's inpatient and outpatient activities? (For each specialty, check one.)**			
	Greater	***Lesser***	***About the same***	***Don't Know/NA***
General Surgery				
Neurosurgery				
Orthopedic Surgery				
Anesthesia				
ENT				
OMFS				
Plastic Surgery				
Radiology				
other				
other				
other				

I.25) How much does your hospital compensate your trauma director for the director's administrative workload? What is the nature of the compensation?

I.26) Are there other costs incurred by the hospital to support these physician specialists that are both unreimbursed through patient charges and directly (and incrementally) attributable to the trauma service? Please enumerate these costs, being as specific as possible. Examples might include recruiting, continuing medical education, and travel and entertainment.

Activity	Annual Cost

II. THE DIRECT, INCREMENTAL COST OF TRAUMA CENTER VERIFICATION

II.1) Is your hospital a Level I, Level II, or Pediatric Trauma Center? (Check all that apply.)

_____ Level I _____ Level II _____ Pediatric

II.2) On what date was your trauma service most recently verified?

_____

II.3) What is the cost to your hospital of the application fee?

_____

II.4) What is the estimated cost to your hospital of the actual two-day site visit?

_____ Honoraria or consulting fees _____ Entertainment

_____ Visitors' expenses _____ Miscellaneous

II.5) Are the job descriptions and responsibilities of your trauma program manager (TPM) related primarily to meeting the clinical and regulatory standards necessary to be verified?

_____ Yes _____ No

II.6) On an ongoing basis, what commitment of the TPM's time (0-100% of FTE) is devoted to meeting the clinical and regulatory standards necessary to be verified?

_____ %

II.7) Are the job descriptions and responsibilities of your trauma registrar related primarily to meeting the clinical and regulatory standards necessary to be verified?

_____ Yes _____ No

II.8) On an ongoing basis, what commitment of the registrar's time (0-100% of FTE) is devoted to meeting the clinical and regulatory standards necessary to be verified?

_____ %

II.9) What is the annual compensation (1998 – 2000) of your TPM and trauma registrar, including wages and benefits?

	1998	1999	2000
Trauma Program Manager			
Trauma Registrar			

II.10) If your hospital uses Tracs trauma software or other commercial trauma registry software, what is the annual expense?

_____ 1998 _____ 1999 _____ 2000

II.11) How much office space (in square feet) is devoted specifically to the needs of trauma verification? What is the imputed rent per square foot? (Note: Other trauma service office space is accounted for elsewhere.)

	1998	1999	2000
Office Space (square feet)			
Rent per square foot ($/year)			
Total direct cost:	$0	$0	$0

II.12) What is your estimated annual expense for computers, office supplies and equipment, and other ancillary expenses necessary for the TPM and trauma registrar to carry out their responsibilities, and for other similar expenses specifically linked to the verification process. (Note: Other similar expenses not related to verification are accounted for elsewhere.)

_____ 1998 _____ 1999 _____ 2000

II.13) How far in advance does your trauma service begin preparing for the site visit, and during this preparation period, which individuals are involved in the preparations, and how much of their time is devoted to them?

_____ Advance Preparation (Weeks)

Individuals involved	% of FTE
Hospital CEO	
Hospital CFO	
Trauma Director	
Trauma Registrar	
Trauma Program Manager	

Other individuals involved	% of FTE

II.14) During this period of preparation, and during the site visit or its aftermath, does the hospital incur any additional personnel costs (e.g., overtime, temporary help, etc.)? If the answer is yes, please estimate the cost, including any additional compensation to the trauma director, TPM, or trauma registrar.

_____ Yes _____ No

II.15) If there are other costs specifically linked to the trauma verification process that are omitted here, please use the space below to describe and estimate those costs:

_____ 1998 _____ 1999 _____ 2000

Activity	Annual Cost

III. THE DIRECT COST OF TRAUMA OUTREACH AND PREVENTION PROGRAMS

III.1) On an ongoing basis, what commitment of the TPM's time (0-100% of FTE) is devoted to trauma outreach and prevention programs?

_____ %

III.2) What other FTEs are budgeted for trauma outreach and prevention programs, what is the percentage of their time spent on these programs, and what is the budgeted cost (salary and benefits)?

		Budgeted Salary and Benefits		
Individuals involved	**% of FTE**	**1998**	**1999**	**2000**

III.3) How much office space (in square feet) is devoted specifically to the needs of your hospital's trauma outreach and prevention programs? What is the imputed rent per square foot? (Note: Other trauma service office space is accounted for elsewhere.)

	1998	1999	2000
Office Space (square feet)			
Rent per square foot ($/year)			
Total direct cost:	$0	$0	$0

III.4) What is your estimated annual expense for computers, office supplies and equipment, and other ancillary expenses necessary to carry out these trauma outreach and prevention programs. (Note: Other similar costs not related to outreach and prevention are accounted for elsewhere.)

_____ 1998 _____ 1999 _____ 2000

III.5) Does your trauma service purchase software, program materials, or other content to use in its trauma outreach and prevention efforts? If so, please identify the expense in each of the past three years and briefly describe the purchases.

_____ 1998 _____ 1999 _____ 2000

III.6) Has your trauma service incurred direct and specific costs tied to the internal development of trauma outreach and prevention programs during the past three years? If so, please identify the expense in each of the past three years and briefly describe the nature of the costs.

_____ 1998 _____ 1999 _____ 2000

III.7) For each of the past three years, please estimate the cost to your trauma service of travel and presentation costs surrounding these trauma outreach and prevention programs.

_____ 1998 _____ 1999 _____ 2000

III.8) For each of the past three years, please estimate the expense your trauma service has incurred in direct marketing expenses (purchases of mailing lists, consulting services, advertisements, etc.):

_____ 1998 _____ 1999 _____ 2000

III.9) If there are other costs specifically linked to trauma outreach & prevention programs that are omitted here, please use the space below to describe and estimate those costs:

_____ 1998 _____ 1999 _____ 2000

Activity	Annual Cost

IV. OTHER DIRECT, INCREMENTAL, AND NON-CHARGEABLE TRAUMA EXPENDITURES

IV.1) **Office space** – Questions II.11) and III.3) specifically addressed office space dedicated to the trauma verification process and trauma outreach and prevention programs. How much other office space (in square feet) is devoted specifically to your trauma service? What is the imputed rent per square foot?

	1998	1999	2000
Office Space (square feet)			
Rent per square foot ($/year)			
Total direct cost:	$0	$0	$0

IV.2) **Utilities** – What is the estimated annual cost of utilities for administering the trauma service?

_____ 1998 _____ 1999 _____ 2000

IV.3) **Other direct overhead** – Questions II.12) and III.4) specifically addressed direct overhead costs (e.g., computers, office supplies and equipment, and other ancillary expenses) allocated to the trauma verification process and outreach and prevention programs. How much other overhead has the trauma service incurred in each of the three previous years?

_____ 1998 _____ 1999 _____ 2000

IV.4) **Other** – Please take the opportunity to review this data request to determine if there are other extraordinary, non-chargeable expenses incurred by your trauma service that are not captured elsewhere. Use the space below to describe the underlying activities and to estimate the costs.

Activity	Annual Cost

V. LOCAL GOVERNMENT TRAUMA SUPPORT

V.1) Does your hospital receive local government funding specifically designated for the provision of trauma care? If the answer is yes, please identify the source of funding, and the amounts received in each of the last three years.

_____ Yes

_____ Funding Source

_____ Year 2000 Support

_____ Year 1999 Support

_____ Year 1998 Support

_____ No, we receive no government support

V.2) Do the physicians taking trauma call receive any direct, local government funding specifically designated for the provision of trauma care? If the answer is yes, please identify the source of funding, and the amounts received in each of the last three years.

_____ Yes

_____ Funding Source

_____ Year 2000 Support

_____ Year 1999 Support

_____ Year 1998 Support

_____ No, we receive no government support