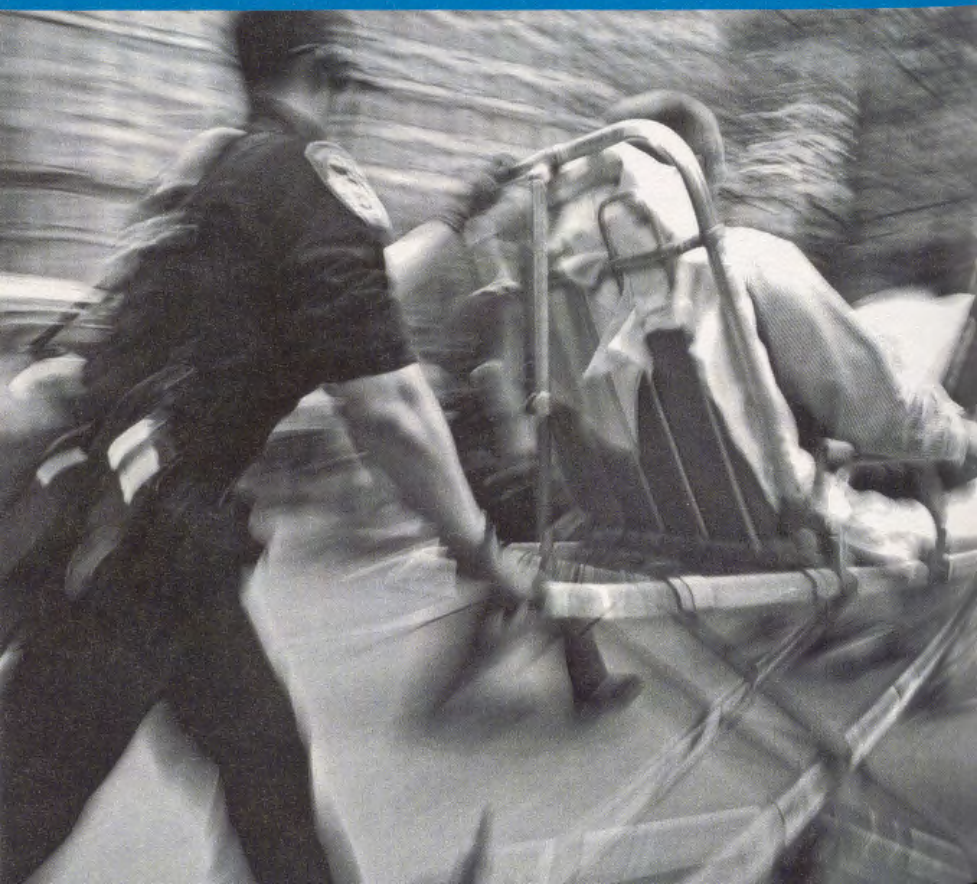
Strengthening the Illinois Trauma System



How Do We Reestablish Illinois as a National Leader in Trauma?

BY AKSHAYA KANNAN

Abstract

Illinois pioneered a regionalized trauma system in the 1970s that became the nationwide model for emergency medical services (EMS)/trauma systems. Yet the Illinois trauma system has changed little since the 1970s, and its policies are already outdated. Despite national trends of growing costs in health care, which put pressure on the system, Illinois has held onto an antiquated model and relied on the "goodwill" of hospitals to remain in the system. More recently, Maryland and Georgia have created trauma systems that consider trauma a "public service," and losses incurred by trauma centers are fully compensated by the state. The objective of this paper is to consider how the Illinois trauma system could meet its original goal of providing quality care to patients in emergency situations while also becoming financially viable.

Introduction

Illinois was the first state to design and implement a regionalized EMS/trauma system in the 1970s. Its initial goals were to provide comprehensive care to the critically injured, as quickly as possible, at hospitals categorized to treat different levels of injury. The system achieved these

goals and became a nationwide model for trauma care. Like many other fields of medicine, the early system focused on providing quality and necessary care to individuals, without much consideration of costs. Despite growing structural challenges in the interim, the system still relies on the "goodwill" of specialized hospitals. Trauma care is often presented as a civic or moral obligation. Since trauma care is often considered a "true" emergency, some proponents of trauma care argue that the system must be fully funded in order to provide quality care for the broader public.

Over time, however, the system faced rising costs and poor reimbursement. Emergency rooms became the front door of care for many uninsured or publically insured people who lacked primary care (P. Rosen, personal communication, November 28, 2012). These challenges were not unique to trauma care but were indicative of larger trends in the American health-care system. Yet these challenges put particular strain on trauma care, which is one of the most specialized and most expensive forms of health care. Trauma care requires a specialized team of physicians and top-notch medical technology and facilities. In addition to these larger trends, the Chicago trauma system was severely stressed in the late 1980s and 1990s by an increase of gang violence (Griffin, 1991). While the population of patients requiring trauma care rose, the vast majority of South Side trauma patients were uninsured or publically insured, leading to poor reimbursement for trauma centers.

Also in the late 1980s trauma centers abandoned the South Side of Chicago. Citing mounting losses, the University of Chicago Medical Center (UCMC), one of the busiest centers in the state and the South Side, closed its doors in 1988. Michael Reese Hospital and Medical Center closed for similar reasons in 1989. Critically injured patients from the South Side are now rushed to Northwestern Memorial Hospital (NMH), in downtown Chicago, or Advocate Christ Medical Center, in the southwest suburbs. One of these victims was eighteen-year-old Damien Turner, who was shot just a few blocks from UCMC but transported ten miles to NMH. His death shed light on the consequences of the "trauma desert" in low-income, primarily black neighborhoods of the South Side and the south suburbs of Chicago (Crandall et al., 2013; Friedman, 2011; Terry, 2010).

Financial losses for trauma care is not specific to one area of the city. In fact, financial viability is the biggest challenge that trauma departments face nationwide. In the 1980s in Chicago losses for private trauma centers ranged from $500,000 to $7 million (US General Accounting Office [USGAO], 1991). Despite high costs, however, the societal benefits of trauma care are high. Trauma is the leading cause of death for people ages one to forty-four and is responsible for more years of life lost than stroke, cancer, and cardiovascular disease (Centers for Disease Control and Prevention, 2013; Maggio, 2008). Trauma centers provide life-saving care for victims of car accidents, heart attacks, burns, and gunshot wounds. At one time the trauma system was the focal point of regional emergency care, establishing a model for the management of cancer, cardiac, and stroke patients.

The objective of this paper is to investigate how the Illinois trauma system can meet its original objective of providing quality care to patients in emergency situations while also becoming financially viable. My paper will be divided into two sections with two guiding questions. First, how has the current Illinois trauma-care system developed over time? Second, what do other statewide trauma systems look like and how are they supported?

In the first section I provide background on trauma care, describe its importance to society, and delve into the development of a trauma network in Illinois with a review of the scholarly literature, a note about my methodology, and a historical analysis. In the second section I discuss how the concept of a trauma network is still relatively young, how its policies are already inefficient and outdated, and how its original structure did not anticipate the rising costs of health care or the changing nature of injury. In Chicago and the south suburbs of Chicago these two factors collided, resulting in a gap of trauma care. Finally, I will look at policies and payment models that support trauma networks in other states. In Maryland and Georgia, for example, trauma is considered a "public service," like fire or police departments, and losses incurred by trauma centers are fully compensated by the state. Ultimately, I provide recommendations on measures that would encourage the redevelopment of trauma care in Illinois, thereby strengthening the state's trauma network.

Background

Definition of Trauma

Injury, or trauma, is a "biomedical disease caused by a fast acting, external force." Types of injury include road-traffic accidents, alcohol abuse, suicide attempts, violence-related wounds, etc. Its repercussions effect productivity and well-being in society (Branas, 2008).

Regionalization

Regionalization refers to the organization of emergency medical services under a standardized, centralized system of care for the critically injured patient. The trauma network, the basic unit of regionalization, is just one part of emergency medical services that include established geographic centers with designated levels of care, adequately staffed and equipped centers, streamlined care for the critically injured, communications and transportation, and epidemiologic and clinical data collection (Boyd & Flashner, 1971). In the 1970s trauma centers were conceptualized with an understanding that participating hospitals had a geographic responsibility to manage injured patients.

Current Illinois trauma legislation stipulates level I, II, and III centers in Illinois. In reality there are only level I and II facilities. The state is divided into eleven regions, based on population density and size, with urban regions 7, 8, 9, and 11 being the smallest (J. Albanese, personal communication, October 24, 2012). Within each region EMS directors and an EMS council, comprised of doctors, nurses, and administrators, meet quarterly. State trauma legislation describes prehospital (i.e., paramedics and ambulances) components of the trauma system and outlines the role and use of the state trauma registry. Although the American College of Surgeons has national guidelines about trauma, Illinois has developed its own set of rules. ACS has certified only Loyola University Medical Center's trauma center.

Trauma Systems

A trauma system is an "organized approach to patients who are severely injured," which occurs in a specific geographic area (McGwin, 2008).

The goal of a trauma system is to improve community health by treating mild, moderate, and severe injuries (Trunkey, 2008). A well-designed trauma system includes access to care, pre-hospital care, hospital care, critical care, and rehabilitative care.

Central to the trauma system is the trauma center, which provides specialized facilities and equipment, experienced surgeons, and other trained health-care professionals. Level I trauma centers, the most equipped centers in the system, must have an established trauma program, a trauma service, trauma team, medical director, multi-disciplinary committee, and program manager (Taheri, Butz, Lottenberg, Clawson, & Flint, 2004). The level I center must have in-house surgeons available twenty-four hours; provide community leadership in research, education, and prevention; and admit greater than one thousand two hundred patients or two hundred forty severely injured patients annually. Level II centers must have surgeons available twenty-four hours and subspecialties but are not required to have research and education components. Level III centers do not need to have all subspecialists and can have a surgeon on-call, rather than on-site. They generally stabilize severely injured patients or treat minor injuries (Maggio, 2008).

History of Trauma Care

Care for the critically injured dates to the Civil War and was the domain of the military (Trunkey, 2008). Trauma care proved invaluable during the Vietnam War, for example, where mortality rates remained low in combat due to rapid evacuation of severely injured soldiers by helicopter (Boyd & Flashner, 1971). R. Adams Cowley established the Shock Trauma Unit at the University of Maryland in 1964. Cowley coined the term, "golden hour," the idea that a patient has an increased chance of survival if treated within one hour of injury. The trauma unit at Cook County Hospital (CCH) was formed in 1966 and is considered the first trauma center in the nation (Boyd, 2010). The fields of trauma surgery and emergency medicine later sprung out of this pioneering work. The trauma unit at CCH centralized care on a single floor of the hospital. Immediately upon arrival severely injured patients were taken to the unit, which was fully staffed with surgeons, anesthesiologists, emergency

physicians, specialists, laboratory and radiology technicians, and other support personnel (Boyd, 2010). From 1966 to 1970 the trauma unit saw twenty-eight thousand patients. CCH developed the first computerized registry for research and educational purposes, which systematized and recorded trauma for the first time (Boyd & Flashner, 1971).

Despite gains in emergency hospital care, pre-hospital care remained underdeveloped in Illinois and the nation. In rural areas no consistent or reliable transportation vehicles existed. In Chicago city policy dictated that the police or fire department must take critically injured patients to the nearest hospital.[1] Many patients arrived dead or in poor conditions to hospitals that were usually not equipped to provide trauma care.

National Discourse

Injury has been a leading cause of death since the 1950s (Mehrotra et al., 2010). The development of emergency services and trauma care was in many ways a response to a growing body of literature that highlighted the number of injured patients as well as the deficiencies in emergency care. A 1966 white paper by the National Academy of Sciences/National Research Council presented the problem in emergency care and made a series of recommendations for improvement. The council proposed the concept of an emergency-department category to match critically injured patients with the appropriate health-care facility (Mehrotra et al., 2010).

In 1968 Daniel P. Moynihan, chairman of the Department of Health, Education, and Welfare's Advisory Committee on Traffic Safety, recommended a "federal aid program to establish medical transportation and care as an ongoing public service available to all persons everywhere

1. In Chicago only CCH could treat trauma injury properly. Patients without insurance could wait ten to twelve hours at the nearest hospital without care, only to be transferred to CCH the next morning (D. Boyd, personal communication). The Chicago Police Department, responsible for transporting injured patients in police vans, lacked the equipment or training to handle injured patients (Gibson & Anderson, 1970). Patients who made it to CCH had far better outcomes than their peers (Boyd, 2010).

and maintained at advanced levels of quality" (Boyd, 2010).[2] Key to Moynihan's recommendation was the idea of emergency medical services as a public service.[3]

In 1970 the National Safety Council reported eleven million injuries from all types of accidents. Wage losses, medical expenses, and administrative insurance costs resulted in $13.6 billion in expenditures. The total estimated cost per year in 1970 was $20 billion. The NSC estimated that about one hundred five thousand civilian deaths occurred annually, with forty-seven thousand of those due to vehicle injuries (Boyd & Flashner, 1971). These statistics highlighted the great need for emergency care that was coordinated, specialized, and efficient like CCH.

In 1971 Richard Nixon acted on advice from trauma advocates and approved a plan to develop regional emergency care. Numerous states were allocated money to expand clinical programs and to improve paramedic programs. The American Medical Association Commission on Emergency Medical Services began to develop guidelines for the categorization of hospital emergency capabilities (Mehrotra et al., 2010).

In 1973 Congress passed the Emergency Medical Service System Act. The act established a number of principles regarding emergency care, including regionalized and categorized systems of care, effective transportation and communication systems, and a "lead agency" for all state and urban health departments. The act granted money for capacity building and technical support for grantees (Boyd, 2010).

In 1980 the Joint Commission began to categorize emergency services into four levels in a manner that would benefit both community and hospital.[4] A categorized system clearly defines the resources and

2. Moynihan recommended that the Department of Health, Education, and Welfare be responsibility for medical emergencies and the Department of Transportation be responsibility for transportation and communications.

3. The idea of trauma as a public service such as fire or police departments did not take hold until recently in states such as Georgia and Maryland.

4. It is important to note that categorization doesn't "help" or "hurt" hospitals. It was used as a tool to set benchmarks for hospitals to recognize their own capabilities or to motivate hospitals to expand existing capabilities.

capabilities of each hospital (Mehrotra et al., 2010).[5] Over time, the National Trauma Data Bank was created, providing a database for evaluation, research, and education.

In the 1980s the trauma network underwent a period of turmoil. A study by the US General Accounting Office found that trauma centers were leaving the system at high rates because of enormous financial losses (1991). Congress passed a number of laws to support further development of emergency systems, including the Emergency Medical Services and Trauma Care Improvement Act of 1989, the Trauma Care Systems Planning and Development Act of 1990, the Trauma Center Revitalization Act of 1991, and others. But these measures were not backed by adequate funding.

Despite the framework of emergency services outlined at the national level, states have the primary responsibility for designing and implementing an EMS system based on their needs. States that developed lead agencies in trauma have created trauma policies, omnibus legislation, and funding.[6] States are at varying levels of development and need, making it hard to create blanket statements about policy instruments that could strengthen the system. Some states have statewide trauma systems, others have county systems, and others may have one or two trauma centers that serve the entire state. My discussion will focus on statewide systems.

Literature Review

Trauma studies range from the late 1980s to the present. The literature from the 1980s and 1990s effectively makes the case for why trauma is cost effective to society. More recent literature focuses on financial pressures, oftentimes arguing that public money must be improved to stabilize trauma centers.

5. Categorization can be vertical and general. Vertical categorization measures the hospitals capacity to care for disease, tracing the path of a patient from the hospital floor to rehab. General categorization judges whether hospital capacity can accommodate general care.

6. A lead agency is a critical to the success of a trauma system. Many states have suffered without the direction and advocacy of lead agencies.

The Case for Trauma Care

Injuries result in the loss of the more productive years of life than any other cause—more than four million potential years of life are lost prematurely each year from trauma (Christoffel & Gallagher, 1991). The costs of saving a life today must be outweighed by the benefits of how much that saved life will contribute to society in the future. A study conducted at Vanderbilt University over a fifty-three-month period concluded that 89.5 percent of high-cost trauma patients survive and 54.5 percent of survivors return to productivity in society (Morris, Sanchez, Bass, & MacKenzie, 1991). Another study investigated the cost effectiveness of trauma centers along three metrics: cost per life saved, cost per life-year gained, and cost per quality-adjusted life-year gained. The report concluded that the cost per life-year saved at a trauma center was $36,319 per year, or $790,931 per life (Johns Hopkins Bloomberg School of Public Health, 2010). These values are comparable to the threshold for other health-care procedures (i.e., renal dialysis) and show that investing in regional trauma centers benefits the community in the long run.

Trauma was estimated to cost society $26.0 billion annually in 1996, the same as cancer and heart diseases combined (Joint Legislative Audit and Review Commission [JLARC], 2004). National inpatient trauma costs are estimated at $37.5 billion annually in 2013 (Velopulos et al., 2013). Medical costs are only one facet of the greater financial

Table 1: Estimated Cost of Diseases and Number of Deaths
(JLARC, 2004)

Diseases/Condition	Years of Potential Life Lost before Age 75 per 100,000 people	Cost Estimate ($ billion) 1996	Number of Deaths (1996)
Traumatic Injury	1,919	260	147,126
Cancer	1,554	115	539,553
Heart Diseases	1,223	115	539,533
HIV/AIDS	1,223	145	733,361
Diabetes	161	32	61,767
Chronic Liver Disease & Cirrhosis	146	5	25,047

burden of trauma. The high costs of trauma can partly be explained because trauma injuries disproportionately affect the young, who lose more productive years to death or disability. Table 1 shows estimated costs of diseases and number of deaths from a 1989 study (JLARC, 2004).

A Florida study by Durham et al. found that trauma care not only results in a reduction in mortality, but also in positive marginal costs per life-year saved as compared to other major health-care problems (2006). The study found that treatment at a trauma center resulted in an 18 percent reduction in mortality. They found that the additional $2,800 charge incurred per year of life saved appears justified when compared to $26,000 per life-year saved for common interventions such as coronary bypass surgery (Durham et al., 2006). From a productivity standpoint, they found that for each trauma patient who returned to work, there is a five- to fifteen-fold return on investment.

Miller and Levy compared trauma-system costs nationally, questioning whether they reduce overall health costs (1995). The study examined whether better trauma care would increase the length of the hospital stay and subsequently the cost of care. In states with trauma systems, comparable hospitalized injuries cost on average between 10 percent to 18 percent less, an average of $1,025 per case. They conclude that extending trauma systems nationwide could lower annual medical care costs by $3.2 billion. They raise the issue of system standards, adding that standards are threatened by reimbursement disincentives built into the systems. Funding systems development and adequately reimbursing costs may lead to high start-up costs, but would provide considerable savings in the long term (Miller & Levy, 1995).

Shen, Hsia, and Kuzma found that urban trauma-center closures between 1990 and 2005 disproportionately hurt minority populations (2009). Even after controlling for the Medicaid uninsured load, these factors do not affect trauma-center closures as much as community and other financial and characteristics (Shen, Hsia, & Kuzma, 2009). Any national- or state-level legislation meant to combat racial health disparities must include measures to strengthen trauma.

Basic Trauma Finances

Trauma centers place serious demands on the finances and resources of

a medical center and on physicians. They have high overhead costs and low variable costs. Overhead is composed of two types of operational costs: fixed (physical plant and equipment) and indirect (administration). Variable costs differ for each individual patient and case. Overhead account for approximately 60 to 65 percent of all costs associated with the delivery of patient care (Taheri, 2008). One study, which compared ten trauma centers in Florida, estimated the median cost of readiness, medical personnel, and overhead at $2.7 million (Taheri et al., 2007). The largest expense was physician on-call stipends at $2.1 million.

Trauma centers thrive financially and clinically when high volumes of patients amortize overhead costs by making full use of all available fixed resources. The marginal cost per patient diminishes as costs are spread across a larger patient pool, assuming a favorable payer mix. Thus, having a large volume of patients in the system can optimize a trauma center (Taheri et al., 2004).[7] Additionally, large volumes of trauma cases can keep physicians clinically skilled.[8]

7. In order to amortize the costs in the long run trauma centers can invest in downstream trauma and emergency services. Patients return to the system for inpatient and outpatient care after initial treatment, thereby providing large and stable reimbursement for services. One study analyzed the direct margins and ratio of reimbursement, of the University of Michigan Health System and concluded that these values were substantial. Direct margins were at about 45 to 50 percent the original revenue, which indicate that downstream services contribute to amortizing the costs. Additionally, increased downstream resources benefit both non-trauma and trauma patients and help trauma centers' economic viability (Morris et al., 1991).

8. The question then becomes, how many trauma centers are needed in a region to meet local demands and to keep physicians skilled? The prevailing assumption is that market forces will produce the optimum number of centers (H. Vallier, personal communication, January 25, 2013). However, federal- or state-funding mechanisms may lead to over designation or over participation in trauma systems and a subsequent drop in quality of care (D. Boyd, personal communication, November 12, 2012). The challenge for trauma policies is to find the optimum balance. Policies that reimburse hospitals based on location, which is discussed later in the paper, could help alleviate this challenge.

Payer Mix and Trauma Care

Payer mix challenges reimbursement. As payer mix deteriorates, trauma centers' financial losses escalate (Thal & Rochon, 1991; USGAO, 1991). Poor reimbursement is due to the high cost of trauma care combined with high levels of uninsured or underinsured patients. This is most true of urban areas. Although trauma centers reduce morbidity and mortality rates, they concentrate a large number of patients at one institution, which can be viewed as an asset or a liability, depending on reimbursement and payer mix (Thal & Rochon, 1991). Selzer et al. found that the biggest disparity in pay comes from Medicaid, self-pay, and prisoner-patient groups (2001).

Increased violence adds to trauma-center losses.[9] Medical centers located in areas with high rates of violence receive many trauma patients who are uninsured. Oftentimes, viable trauma centers have a higher proportion of privately insured patients, who pay their own costs and subsidize the costs of uninsured patients. Morris et al. surveyed eleven trauma centers in urban areas and found that although privately insured patients accounted for less than a third of all patients, they generated over two-thirds of the centers' revenue. In contrast, the uninsured comprised over 40 percent of the trauma caseload but less than 10 percent of revenues (1991). The National Foundation for Trauma Care constructed a national trauma-center reimbursement profile, which shows that privately insured patients generate a surplus for the national trauma system (2004) (Fig. 1). Trauma centers in rural areas benefit the most. Few hospitals, particularly those who rely on helicopters, expect the trauma center to contribute to net revenue (H. Vallier, personal communication, January 25, 2013; Breedlove et al., 2005). Nevertheless, this surplus is usually not enough to recover losses completely from government-assisted and uninsured patients.

Velopulos et al. found that Medicare patients were the greatest users of trauma care nationwide and contributed more to the financial burden than self-pay and uninsured patients (2013). The study emphasizes

9. It is important to note that penetrating injuries are not necessarily more expensive to treat.

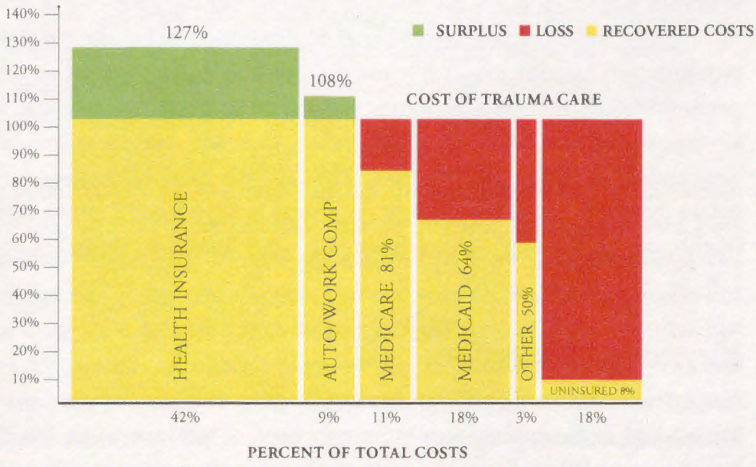


Figure 1. National Trauma Center Reimbursement Profile
(National Foundation for Trauma Care, 2004)

that with the aging of the population, more needs to be done to strengthen reimbursement from public payers covered by Medicare or Medicaid, a viewed shared by Shapiro, Keegan, and Copeland (1989). Disproportionate Share Hospital (DSH) money from the government could also improve financial stability of trauma centers at public hospitals (Selzer et al., 2001). However, DSH money has decreased in recent years.

Hospitals were enthusiastic about developing a trauma system in the 1970s and competed for designations.[10] Beginning in the 1980s

10. The historical section of this paper analyzes those early days in Illinois. Level I trauma centers are generally at universities and conduct research and outreach. They can also be large inner-city hospitals. Level II centers are the "backbone" centers that provide community resources. One study found that they handle about 95 percent of trauma cases. Thal and Rochon found that level I and II urban centers incurred financial losses but stayed in the system for the purpose of providing a community service or for the educational benefit of their staff (1991).

hospitals began to question whether trauma-center losses were worth the societal and clinical benefits (Thal & Rochon, 1991). The struggle is particularly acute for urban hospitals: "The inner-city hospital that sees predominantly indigent patients, victims of penetrating trauma, and overcrowding will face a financial deficit that will rapidly threaten its very existence" (Thal & Rochon, 1991). Hsia and Shen found that urban hospitals with negative profit margins have a 1.38 times higher likelihood of closing versus hospitals with positive profit margins (2011).

Physician Perception

Level I trauma centers, the most demanding category, must have an established trauma program, a trauma service, trauma team, medical director, multidisciplinary committee, and program manager (Taheri et al., 2004). The trauma team is the costliest unit to maintain within the center. Hospitals incur large "incremental" expenses because they must provide stipends for physicians for care which they would not have to do in the absence of a trauma center (Taheri et al., 2004). Furthermore, trauma cases may disrupt physicians' personal and professional lives at the expense of scheduled and profitable elective cases. Trauma cases can also put a strain on scheduled surgeries, available beds, and scheduled radiology services of the medical center as a whole (USGAO, 1991). As a result of these pressures many physicians avoid trauma, even if they support the further expansion of trauma services and increased public funding (Esposito, Maier, Rivara, & Carrico, 1991).

The American College of Surgeons (ACS) argues that emergency medicine overworks physicians and does not provide adequate incentives or compensation for physicians to enter the field. State insurance laws unintentionally add to this problem by not compensating surgeons (2006). Furthermore, state emergency or trauma funds, which are supported through traffic violation fines, driver's licenses fees, etc. are funneled to institutions rather than to physicians (ACS, 2006). They argue:

> The single most important factor shaping the surgical workforce issue today is declining reimbursement. Physician concerns

> center not only on reimbursement for the emergency services themselves, which frequently are uncompensated, but also on insurance payments for procedures that comprise a major component of elective practices (ACS, 2006).

Esposito, Maier, Rivara, and Carrico conducted a survey of physician perception (1991). They found that 39 percent of surgeons said they preferred not to treat trauma patients, 44 percent felt that trauma-call coverage had a negative impact on their practice, 30 percent would not take a call if it was not mandatory, and 68 percent reported that less than 25 percent of trauma patients they treated in the past year had compensated them, with only 17 percent reporting compensation greater than 50 percent (1991). Both the American College of Surgeons and Esposito et al. conclude that policy measures must be taken to expand young physician recruitment and improve reimbursement.

Methodology

Only a handful of sources describe the development of a regionalized emergency care system in Illinois or even the present system. Thus, in the background and historical sections I relied mainly on journal sources that discuss the theory behind regionalization, newspaper articles that describe early trauma care in Chicago, and key informant interviews with "veterans" of Chicago's emergency care system like David Boyd, the founder of the Illinois trauma network. In order to understand current policies about trauma care, I conducted key informant interviews with physicians, nurses, and policy makers, including Susan Avila, the chief trauma nurse coordinator at John H. Stroger Jr. Hospital of Cook County.[11] Informants were asked similar sets of questions adapted to their role in the system. For example, I asked Joseph Albanese, trauma coordinator at the Illinois Department of Health, about current policies on trauma care in Chicago. To gather specific information about

11. Cook County Hospital was renamed for Cook County Board President Stroger in 2001.

Chicago's region 11 trauma system, I relied on key informant interviews and newspaper sources like the *Chicago Tribune.* I used the Illinois Trauma Registry Database to determine the volume of patients seen per region. The registry does not describe how many patients individual hospitals see or where trauma patients are from (i.e., patients from Indiana, patients seen in region 8 but injured in region 11, etc.). Hospital audited financials did not have departmental breakdown of their operating costs. As such, I was unable to ascertain how much individual hospitals spent on trauma. The absence of these numbers limited the scope of my analysis. I used Google Maps and ArcGIS software to construct maps of trauma centers in Illinois, the Chicago metropolitan area, and Chicago.

Historical Analysis

Building a Statewide Plan for Trauma in Illinois

David Boyd, a surgeon at Cook County Hospital (CCH), began working on the concept of regionalizing emergency care in the late 1960s. His idea was to organize trauma-center care and emergency medical services in a standardized regionalized system for the critically injured patient. Under the umbrella of emergency medical services are pre-hospital, hospital, and rehabilitative care, along with education, training, and prevention measures. With the interest and support of Richard B. Ogilvie, governor of Illinois, Boyd and his colleague, Bruce Flashner, proposed a regionalized system of care for the entire state (Boyd, Flashner, Ogilvie, & Yoder, 1971). Although they created a complex, highly coordinated system from scratch, Boyd and Flashner's methods were simple. They developed a plan for regionalization that (1) identified the most capable institutions to provide care, (2) identified key components and players of the system, and (3) conducted frequent evaluation through a trauma registry. In this plan, a designated trauma center centralized the following components: adequate staff and

equipment, streamlined care for the critically injured, communications and transportation, and epidemiologic and clinical data collection (Boyd & Flashner, 1971). The strength of the trauma-center model was that it centralized services by region (Fig. 2). Boyd, fellow surgeons, and other hospital staff were enthusiastic. He wanted to develop the system as rapidly as possible, while they had the attention and support of political leaders like Governor Ogilvie (D. Boyd, personal communication, March 17, 2013). Boyd used the press to encourage other physicians, hospitals, and community leaders to support his cause.

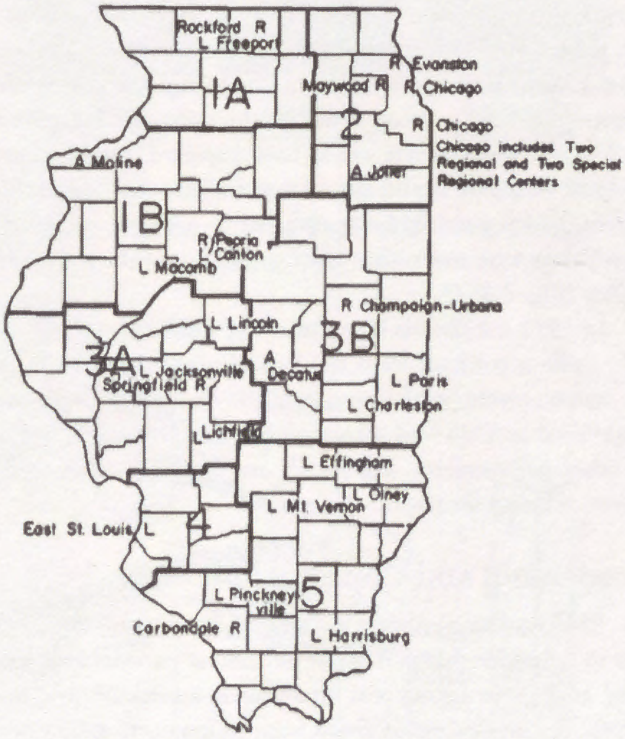


Figure 2. State of Illinois Administrative Regions and Trauma Center Locations

(Boyd, Dunea, & Flashner, 1973)

In September 1970 Public Act 76-1858 mandated the establishment of area-wide emergency-services committees to plan categorization of joint emergency-services programs (Forkosh, 1972). In July 1971 the trauma program became operational. It aimed initially to develop forty-five hospital centers throughout the state. The planning areas were twenty-five to fifty miles in diameter in rural areas (thirty to sixty minutes by ground transportation), with at least one facility with twenty-four-hour emergency coverage and a basic pre-hospital program. The act required that all acute-care hospitals join an area-wide plan and categorize their emergency capability into one of three levels of general emergency care: comprehensive, basic, or standby (Boyd, Dunea, & Flashner, 1973). These levels correlated with the three levels of trauma-care capacity and coverage area: regional, area wide, and local (Fig. 3). Level I regional centers would provide highly specialized care and have twenty-four-hour coverage as well as education and research components; level II area-wide centers would have standard intensive care; and level III local hospitals would have basic facilities for stabilization. In this system, patients would be transferred to a higher-qualified facility for care if they were not within close proximity of the right advanced-care facility (Fig. 3 & 4).

In 1972 the Illinois Department of Public Health (IDPH) received a $4 million contract from the federal government to further develop the trauma system at the state level (Boyd, 2010). Consequently, Boyd established an EMS lead agency within the IDPH, which was connected to other departments, like health and transportation, and acted as a licensure board for trauma centers.

Leadership and Coordination

The EMS lead agency provided leadership and central planning. Its goal was to represent the interests of all trauma patients and providers. The head of the lead agency was identified as a credible "traumatologist," a physician knowledgeable about both trauma care and systems development (Boyd, 1980).

The lead agency divided the state into regions and relied on local planning agencies to identify and categorize hospitals, develop pre-hospital

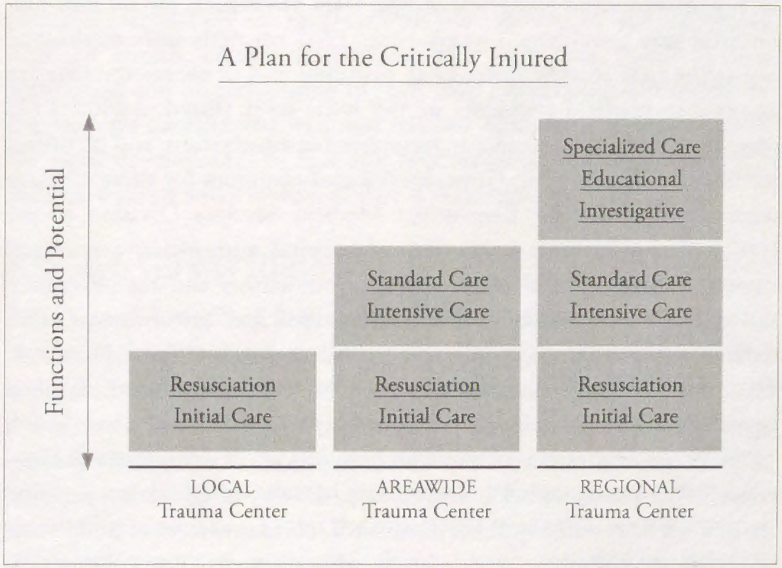


Figure 3. Description of Three Types of Trauma Centers
(Boyd et al., 1973).

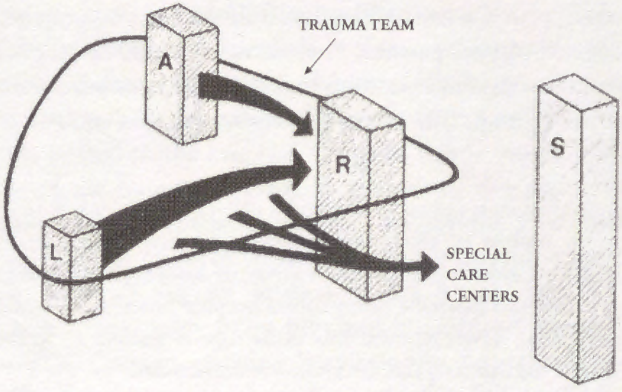


Figure 4. Rural–Metropolitan Trauma Center Transfer Model
(Boyd, 1980).

care, plan education and research, and train physicians, nurses, and prehospital care providers. Twenty-three EMS councils were established across the state to coordinate EMS planning and to encourage effective emergency-medical resources at the local level (Boyd, 1980). EMS councils coordinated resources, monitored categorization, and identified priorities in each region. Consultation and resources for these councils were provided by the Emergency Medical Services Division of the IDPH. Councils were comprised of hospital authorities, physicians, county and state health departments, ambulances and rescue organizations, fire and police departments, municipal governments, civil defense, military trauma coordinators, and consumers (Boyd, Dunea, & Flashner, 1973). Trauma coordinators led each of the local planning agencies. These individuals were highly skilled, motivated health professionals who in many cases had been officers in the military medical corps.[12] The coordinators collected data, developed education for both trauma staff and the public, facilitated communications and transportation development, and maintained equipment (Boyd, Dunea, & Flashner, 1973).

The system had multiple levels of autonomy and responsibility. Hospitals were allowed to self-categorize their emergency-care capacity through local councils, regions were allowed to pool resources the way they saw fit, and the state lead agency made the final decision based on the statewide plan for care. These levels of decision making were not bureaucratic (D. Boyd, personal communications, 2012 & 2013), but were meant to be flexible structures that facilitated smoother communication between groups (Boyd, 1980).[13] The most important and effective

12. "One of the greatest defects in our health delivery system is lack of adequate administrative staffing of emergency departments. The trauma coordinator, with his extensive military experience, is presently bringing the needed administrative expertise to a generally disorganized hospital function" (Boyd, Dunea, & Flashner, 1973). Given that the only experience in trauma up to this point was at CCH or the military, this distinction was necessary.

13. Boyd reports that none of these local committees came to him to referee local appointments.

part of the legislation was that hospitals were allowed to "self-categorize" into the system, consistent with the area-wide plan, based on their willingness and understanding of their own capabilities. On the whole, the agencies coordinated well and reached agreement, as evidenced by the rapid development of care and positive impacts of regionalization: lives were saved and a system of care was developed.

Chicago versus Illinois

Boyd's model assumed buy in from hospital physicians and administrators through facilitation of local EMS councils, the decision makers in each region. Yet, these officials were initially most resistant to a statewide system (Eisendrath & Glastris, 1986). Despite his agenda of rapid development, Boyd gathered medical community support slowly. While most hospitals wanted to become trauma centers, they were unsure about the finances and the experience level of their staff. Hospital administrators were concerned about categorization. For example, hospitals with a high category were afraid that ambulances and other hospitals would send too many trauma victims to them. Hospitals in lower categories were afraid that patients would equate a level II or III designation with inferior care (D. Boyd, personal communication, November 12, 2012).

To put pressure on administrators Boyd turned to the media. When he couldn't persuade any hospitals in Peoria to sign on to the trauma concept, he spoke to the press and community leaders and convinced the hospitals to join the system (Eisendrath & Glastris, 1986). This move was critical to the program's success. Peoria was one of the first locations of the trauma program. It was out of this region that early evaluations were conducted, showing how trauma care dramatically improved survival rates. Boyd admits in recent communications that Chicago hospitals showed interest in the system because of personal connections—they knew him and his mentor, Robert Freeark. Additionally, Chicago teaching hospitals felt that they were leaders in health care and wanted to be part of trauma system, which was considered cutting edge (D. Boyd, personal communication, November 12, 2012).

The Chicago and regional trauma system struggled after Boyd left Illinois in 1975 to work on national trauma policy.[14] Under the insistence of Chicago hospital administrators who were no longer interested in participating, the mayor exempted Chicago from the Illinois trauma system (Eisendrath & Glastris, 1986). Although Chicago hospitals were granted designations under Boyd's statewide plan, a practicing surgeon at the time explained that many hospitals were trauma centers in name only (P. Rosen, personal communication, November 28, 2012).

The other challenge in Chicago was legislative. The city's paramedic law required ambulances to take critically injured patients to the nearest hospital, not the hospital best equipped for care. This mandate opposed Boyd's proposed regional system. The Chicago mandate was not overturned until the mid-1980s when the city joined the regional trauma system after the death of Ben Wilson, a seventeen-year-old high-school basketball star from the South Side. Public outrage over his death, which many felt could have been prevented, prompted medical professionals to revamp the Chicago emergency medical system: hospitals were designated as trauma centers, and the Chicago paramedic ordinance was lifted (Eisendrath & Glastris, 1986).

Pre-hospital and Database Development

In 1972 Illinois passed Public Act 77-2295, the "Paramedic Law," which developed several mobile intensive-care programs (Pizzano, Romano,

14. Although the University of Chicago Medical Center never had a trauma mission, or interest in trauma, it was designated as a trauma center because it had the resources to be one (P. Rosen, personal communication, November 28, 2012). UCMC agreed to be in the system because they wanted to be involved with the new system of care (D. Boyd, personal communication, November 12, 2012). Boyd's personal goal was to establish research hospitals in Chicago (Loyola, Northwestern Memorial Hospital, Cook County Hospital, and UCMC) as leaders of trauma in the state. Although centers like Loyola and NMH, which had a good payer mix, were interested in leading this system, South Side hospitals like UCMC were not. The status of trauma centers in Chicago remained unclear until the city adopted its own trauma policy in the 1980s.

Nance, & Boyd, 1974). Hospitals now conducted pilot programs with the approval of the IDPH. At the state level, EMS and Highway Safety offered technical assistance through regional seminars and the *Trauma Center Newsletter* and distributed materials to interested groups and the media. In January 1975 Illinois established a statewide communications network, the Medical Emergency Radio Communications of Illinois (MERCI), to provide hospital-to-hospital and hospital-to-ambulance coverage in every region (Boyd & Pizzano, 1973). The EMS and Highway Safety developed critical-care vans at regional trauma centers and monitored helicopter evacuations to improve survival rates when patients needed to be transferred to a second hospital (Boyd & Pizzano, 1973).

Using Cook County Hospital's database as a prototype, Boyd established the Illinois Trauma Registry Database in 1971 to help his team conduct frequent evaluations and test the efficacy of their system (Nwomeh, Lowell, Kable, Haley, & Ameh, 2006). Within the first year of the program, region 3 experienced 27 percent decrease in auto accidents and a 15 percent decrease in the percentage of deaths. A steady decline in the percentage of deaths per person injured went from 2.8 to 2.1 percent for the study period (Pizzano et al., 1974). Thus, the system saved lives. Additionally, they found that physician coverage improved dramatically in rural hospitals (Fig. 5). By 1973, 118 hospitals had twenty-four-hour physician coverage (Boyd & Pizzano, 1973). Coupled

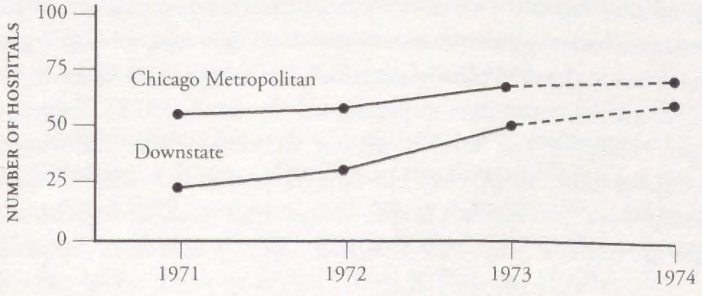


Figure 5. Annual Increase of 24-Hour Emergency Department Physician Coverage in Chicago Metropolitan and Downstate Hospitals *(Boyd & Pizzano, 1973)*

with advancements in the technology and communications sectors, the reach of the system expanded through hospital and pre-hospital coverage. Challenges still arose within regions, but the council system gave regions autonomy and flexibility to organize their own resources. In order to describe this process, I will provide a case study of one region of Illinois as an example of how a local council maximized its resources.

Case Study: North Side of Chicago

The state law set basic requirements for committees, centers, and administrators, but the system gave regional committees the flexibility to develop programs to meet the needs of their region. In 1971 the Chicago North Side Commission on Health Planning, with representatives from fourteen member hospitals, appointed an EMS planning committee. The committee was charged with preparing a comprehensive plan for emergency services that included hospital categorization, coordination with the Illinois trauma system, and coordination with community physicians (Forkosh, 1972). Unlike other Chicago hospitals, the committee incorporated its hospitals into the state trauma network. Evanston Hospital was designated as an adult trauma unit, Loyola University as a burn unit, and Children's Memorial as a pediatric unit.

The committee identified two areas for special attention. First, nurses wanted their own protocols and more autonomy over managing patients. The state law required doctor-to-doctor contact prior to inter-hospital transfer, but nurses felt that nurse-to-nurse contact was also necessary. Nurses who were committee members wanted nursing subcommittees to develop parallel protocols for nurses at the three levels of care, which the committee implemented (Forkosh, 1972). Taking this region's lead, as the trauma system developed, the trauma-nurse coordinator came to play an increasingly important role.[15] Second, a subcommittee on mental health found that area emergency-room personnel did not fully understand community resources for patients

15. Today, each hospital across the state has a nurse-trauma coordinator whose primary job is to manage patients, patient transfers, and data collection (S. Avila, personal communication, November 14, 2012).

with mental illness. They had sufficient resources to provide this type of emergency care, but information and education had to be dispersed. The subcommittee distributed information to ERs, educated personnel, developed a twenty-four-hour phone consultation system, and a central registry to record psychiatric bed availability (Forkosh, 1972). The regional system spurred health planning across the state by taking lessons learned in one region and applying them to the system as a whole.

Impact: System Success

Boyd conducted numerous evaluations of the system in its early years, showing the vast positive impact of the trauma system on survivability. The trauma system improved physician training, research, data collection, and a team approach. For example, the development of EMS planning and categorization led to an increase in twenty-four-hour physician coverage in southern Illinois hospitals (Boyd, Pizzano, Silverstone, & Romano, 1974).

The trauma system lowered highway fatalities:

• Regionalization and designation of a selected number of trauma centers reduced overall highway fatalities by 15 percent in 1971 and 29 percent two years later (Boyd & Pizzano, 1973).

• In Otten, reports showed a 50 percent decrease in deaths from the most serious highway injuries. Deaths per thousand victims went from ninety-three to forty-six deaths (Boyd & Pizzano, 1973).[16]

• The National Safety Council's Department of Statistics reported an 8 percent decline in highway fatalities in the state of Illinois for the first six months of 1972, compared to the same period in 1971. An increase in highway accidents of 8 percent as well as persons injured to 9 percent was reported for the same period (Boyd & Pizzano, 1973).

16. These evaluations were conducted before the training of paramedics and radio communications were in place, which shows just how great the impact of the system was.

Patient survival times also increased:

• The number of victims who died at the accident scene dropped from forty-two to twenty-six in the third period of implementation, a decrease of 38 percent.

• The number of "dead on accident scene" that arrived at the hospital decreased, and number of patients living beyond admission to a designated center increased.

• The number of those dying within the first hour once admitted to a trauma center decreased from 44.4 to 32.1 percent (Boyd & Pizzano, 1973).

All in all, the Illinois system for trauma care was an effective model that identified the importance of both regionalization and central planning. Evaluators concluded that the "success of the Illinois Trauma Program has been due, in part, to the classification of treatment centers based on a hospital's care capability and the distribution of selected trauma patients by the seriousness of their injuries" (Boyd et al., 1974). The evaluators concluded that the goal of the system should be the continual upgrade of trauma and emergency medical capability across the community. They predicted that successful and continual planning would lead to better cost effectiveness, improved resource utilization, and reduction of unnecessary efforts, monies, and medical manpower (Boyd et al., 1974).

Setbacks

The early successes of the system between 1970 and 1980 had much to do with Boyd's leadership and Governor Ogilvie's interest (Eisendrath & Glastris, 1986). After their departures trauma care was no longer a priority to the Illinois Department of Public Health. Thus, it has been hard to maintain or improve upon the original system. (Eisendrath & Glastris, 1986). Regional leadership, though, has remained strong up to the present. Local trauma-physician coordinators and nurse-trauma

coordinators continue to advocate for trauma care. Under guidelines of the original legislation, these administrators hold monthly meetings to discuss the needs of the system (S. Avila, personal communication, November 14, 2012). The local council model helped the system adapt to changes, such as the loss of two trauma centers to the South Side of Chicago in the late 1980s. At that time, the Chicago council reshaped trauma catchment areas and pooled resources so that coverage would continue smoothly. Today, however, physicians and nurses on local planning councils feel that their recommendations to improve the trauma system are not heard or given weight at the IDPH (S. Avila personal communication, November 14, 2012; J. Doherty, personal communication, 2013). Additionally, other members of the medical community, including paramedics, were never fully invested in the trauma-care system.

In the 1980s the system suffered financial setbacks; these pressures coincided with broader social changes occurring across the country. Initially, the trauma program relied heavily on federal and state funds. In absolute dollars, the amount of money provided in 1980 for EMS was half that of 1972, the year the program began (Eisendrath & Glastris, 1986). State funding declined from the mid-seventies onwards and the EMS staff at IDPH dropped from fifty to nineteen. In the 1980s eleven hospitals in the inner city of Chicago closed because of more uninsured patients using emergency rooms and the movement of middle-class insured patients into the suburbs (Ginzberg, 1994). Poor reimbursement from Illinois Medicaid along with broader federal-funding cuts, including a cut of $4 billion to Medicaid, disproportionately effected the poor, resulting in increased pressure on the health-care system (Ginzberg, 1994, Whiteis, 1992). The HIV epidemic, violence, rising infant mortality and morbidity rates, drug abuse, and homelessness put a strain on hospitals across the country. Deindustrialization also reduced the number of paying blue-collar patients—between 24 and 37 percent of people nationwide were uninsured or underinsured in the 1980s (Whiteis, 1992).

In 1993 Illinois created a trauma-center fund. Because of trauma care's relationship with Highway Safety, the fund pooled money from

throughout the state through a parking-ticket tax, highway tolls, and related items. The fund was originally collected at the state level and distributed across the state. The structure was altered later so that money collected in a region would be distributed to that region. This change occurred due to the advocacy efforts of downstate hospitals, who felt that money was being disproportionately distributed to Chicago hospitals. A mechanism was established for hospitals to be reimbursed a small additional percentage for caring for Medicaid and Medicare patients (J. Albanese, personal communication, October 24, 2012). Given that financial setbacks have been shown to hinder system development, the second challenge is to identify what types of economic incentives the government can provide to spur needed development.

Discussion

Hospitals across the country, including on the South Side of Chicago, have cited high costs and lack of resources as reasons to close trauma centers. The history of trauma-center development reveals the precedent for poor funding: in the original model of trauma care, the Cook County model, finances were not a concern. As Boyd explained in an interview, Cook County Hospital did not operate on an economic model, so it didn't have to rely on cost effectiveness. When Boyd developed the Illinois system, he intentionally overlooked funding because he was reluctant to engage with the politics that would arise out of it (D. Boyd, personal communication, November 12, 2012). Additionally, no one knew the price of trauma.

At the same time, trauma designation distinguishes hospitals as leaders of care. Some hospitals find trauma profitable while others find that it adds prestige to their hospital's reputation. In the suburbs surrounding Chicago, there is a high concentration of trauma centers (Fig. 6). Although population density is high, it may not be high enough to justify the number of level I or II centers in the region. For example, Rockford has three trauma centers, two level IIs and one level I (See Appendix A). As we have seen, if trauma centers are not receiving enough volume, they may not be able to maintain a high quality of care.

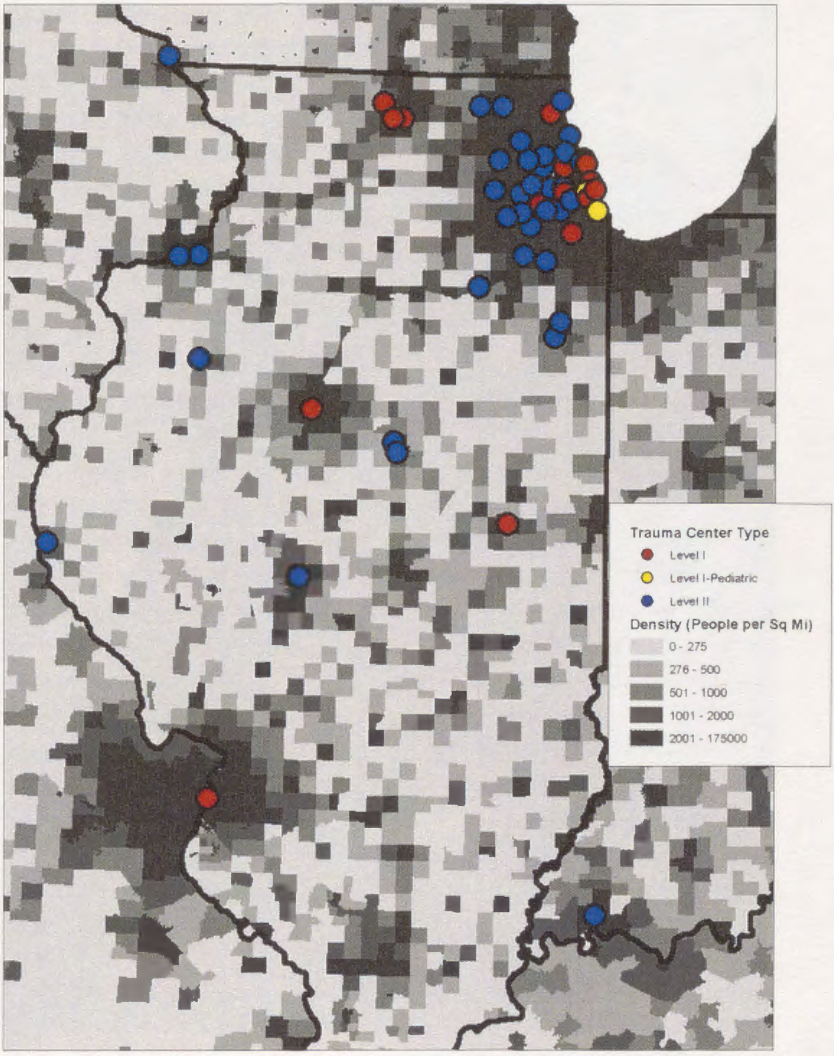


Figure 6. Population Density and Trauma Centers in Illinois
(Courtesy of Joe Kaplan)

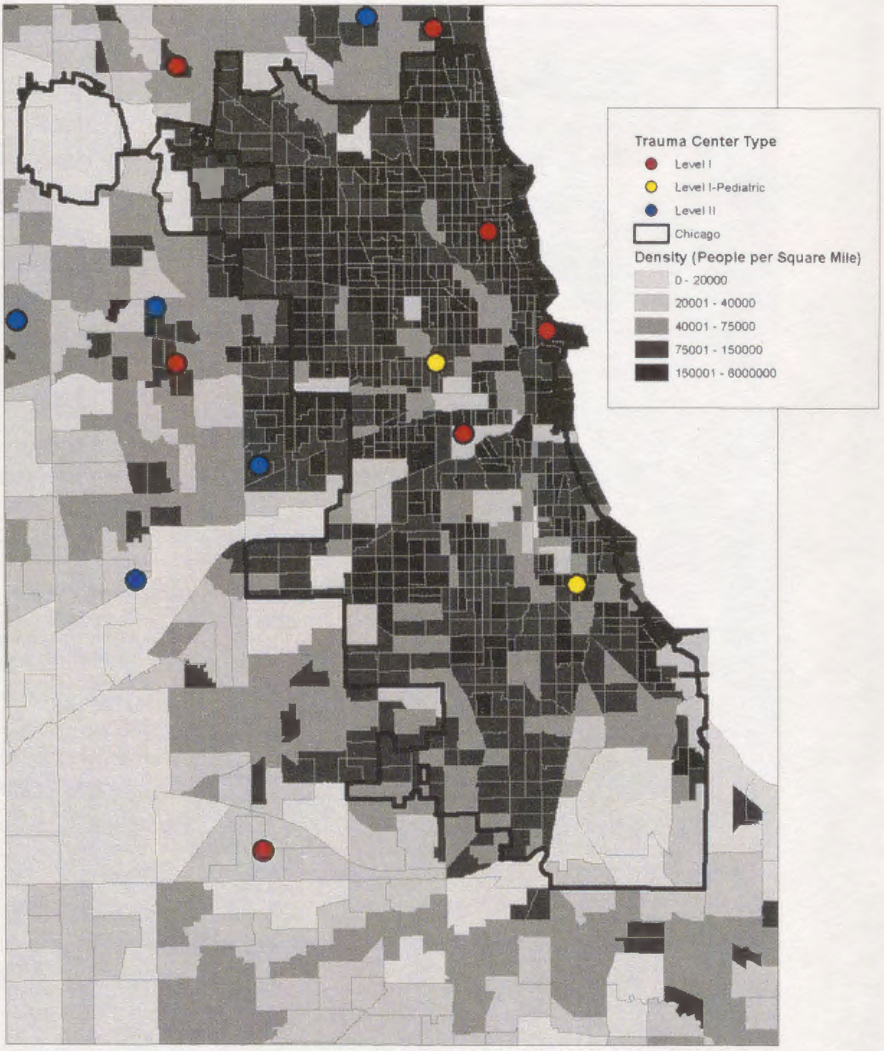


Figure 7. Population Density and Trauma Centers in Chicago
(Courtesy of Joe Kaplan)

According to the American College of Surgeons guidelines, both level I and II centers must admit greater than one thousand two hundred patients or two hundred forty severely injured patients annually (Maggio, 2008). Boyd called hospitals that participate in the system for prestige or reputation "pretenders" (D. Boyd, personal communication, November 12, 2012).

Although trauma centers are run by individual hospitals, trauma systems are regulated by the government and in many ways fit into a larger narrative of government services including police, fire, and EMS services. Thus, trauma center nurse coordinator Susan Avila raised the question in a personal interview: "[Do] we depend on the government or should we just have it where the private takes care of its own? This issue of trauma is an interesting issue because the EMS system and trauma's ability to survive really does depend on governmental regulations" (S. Avila, personal communication, November 14, 2012).

These political and financial battles between the public and private realms and the decline in trauma centers disproportionately affecting poor urban and rural areas. Hsia and Shen have shown that the rate of trauma-center closures has accelerated since 2001, with closures affecting poor and African American communities and rural residents. They suggest that trauma center closures could be combated if financial resources to support trauma centers were bolstered. Such measures could include improved reimbursement for injury treatment, especially for hospitals who see a higher proportion of disadvantaged patients (2011).

Crandall et al. finds that distance to a trauma center effects the mortality of gunshot-wound patients on the South Side of Chicago, which they describe as a "trauma desert," since many areas are more than five miles from a trauma center (2013). Although Chicago may have the correct number of trauma centers, four adult centers and two pediatric centers, Crandall et al. shows that they may not be distributed optimally throughout the city (Fig. 7). As such, policies on trauma need to find a balance between encouraging trauma-center development and making sure that the number and location of trauma centers are optimal.

Present Day Closures: Southern Cook County

Trauma-center closures in Illinois are increasing, and decreasing access raises new questions and challenges for policy makers and health-care providers. A report conducted last year by the University of Illinois at Chicago's School of Public Health and the Cook County Department of Public Health evaluated the impact of the July 2008 closure of Franciscan St. James–Olympia Fields' trauma unit, located in the south suburbs of Chicago (Friedman, 2011). Southern Cook County has undergone major demographic shifts, growing poverty, and high injury and homicide rates (Friedman, 2011). Minorities and the proportion of older adults have increased. The population living in poverty has increased by 34 percent and the near-poor population by 23 percent between 2000 and 2009 (Friedman, 2011). In 2009, 11 percent of adults in southern Cook County reported having no health-care coverage, 13.2 percent did not have a primary-care provider, and 16 percent reported not going to a physician for a routine checkup during the two years prior to the study (Friedman, 2011). The main cause of injury in this region was vehicle crashes. The areas surrounding St. James Hospital have the highest youth homicide and firearm mortality, reporting 148 intentional firearm deaths in 2007 (Friedman, 2011). Between 2005 and 2007 homicide was the leading cause of death for young men, and nearly 50 percent of deaths by the intentional use of a firearm were African American men (Friedman, 2011). In its recommendations, the report underscores the importance of demographic changes in health-care planning and recommends frequent evaluation.

For now, the results of this report are positive, showing no significant change in mortality due to St. James's closure, though travel times increased, depending on distance and location of the scene of injury (Friedman, 2011). The report found no evidence of increased in-hospital deaths, medical complications, or patients requiring immediate care after discharge. Of the proportion of traumatically injured patients who were treated across a number of area hospitals, hospital charges were higher among persons transferred after the closure of St.

James. Advocate Christ hospital, the only remaining trauma center in the region, did go on bypass[17] more frequently but for a shorter duration of time. The study notes that Advocate Christ increased its trauma staff by eight trauma surgeons, implying that bypasses would have been higher had Advocate's staff been further overwhelmed. However, the hospital pooled resources in anticipation of an increased trauma load due to the closure of St. James (Friedman, 2011).

The report offered a number of recommendations. A persisting challenge for emergency care in Illinois has been pre-hospital services. Ambulance coverage in southern Cook County is poor, and ambulances often have to make a two-hour round trip to Advocate and back. As a result, patients are dropped off at local emergency departments, many of which are not properly equipped to care for them (Friedman, 2011). Although this problem is not as large in Chicago, it does pose a serious challenge for suburban areas that may need to utilize services in Chicago. The report addresses the need for coordination and planning among hospitals and trauma units, independent of trauma region. If coordination is improved, selective trauma-center development across the state could have secondary benefits to other areas of the state. For example, this study shows that many south suburban patients, particularly the severely injured, were treated in Chicago hospitals. Finally, the report advocates for the development of level III and level IV trauma units,[18] which would act as stabilization facilities and are projected to cost less (T. Esposito, personal communication, November 27, 2012). Upgrading hospital departments could improve inter-hospital coordination, bringing more partners to the table in regards to emergency care, benefitting both policy makers and constituents (Friedman, 2011). However, the report adds that cost-sharing agreements and administrative support from the IDPH will be the deciding factor for level III and IV trauma-unit success.

17. When a hospital's emergency rooms are at or over capacity, it cannot admit additional patients, who are "bypassed" to the nearest hospital.

18. Keep in mind that level III and IV centers are generally only designated in rural areas.

Cost sharing has continually plagued the Illinois trauma system, particularly in Chicago. By the time the trauma system was implemented in Chicago, UCMC had been acting as a "de-facto County hospital" on the South Side (P. Rosen, personal communication, November 28, 2012). Its participation in providing care for the South Side was critical, but the hospital and its physicians never had a trauma mission or an emergency mission (P. Rosen, personal communication, November 28, 2012).[19] In fact, the emergency program was developed mainly to care for faculty and students. Without public support from the city and political will from physicians, the university began to take steps to change its payer mix by monitoring intake at the emergency department (Berger, 2009). Hospitals across the state began this practice, citing the need for financial survival.

"Pretenders": Do we have too many trauma centers?

In urban and rural areas, trauma-center viability is a challenge, leading to the formation of "trauma deserts." In suburban areas, however, prestige and competition often motivate hospitals to establish trauma centers. The regions surrounding Chicago have a high number of trauma centers (Fig. 8). For example, region 8 and 9 have eleven and twelve trauma centers respectively. Region 8 has two level I centers and nine level II centers, while region 9 has one level I center and eleven level II centers (Appendix A). In some cases, a high number of trauma centers in one region results in low volume of patients per center.

The literature is mixed on whether the volume of patients effects quality of care. One study, which looked at the entire National Trauma Data Bank, found that low trauma volume did not effect mortality (Glance, Osler, Dick, & Muckamel, 2004). However, two smaller studies, one which looked at Chicago and another which looked at

19. Despite this, UCMC was home to one of the first residency programs in emergency medicine in the country.

about thirty academic level I and II centers, found that there was an inverse relationship between volume and mortality (Nathens et al., 2001; Smith et al., 1990). Nathens et al. found significant improvements in mortality when volume exceeded six hundred fifty cases per year (2001). The question then becomes: what does volume look like in Illinois and can we justify the need for eleven or twelve trauma centers in one area?

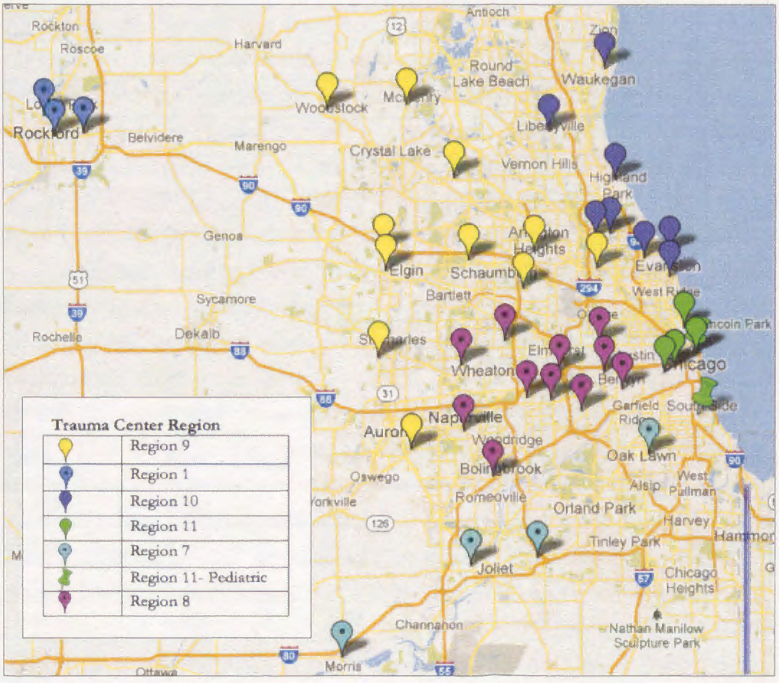


Figure 8. Trauma Centers by Region in Chicago Metropolitan Area

Table 2. Number of Trauma Admissions per Region, 2008–2010

(Illinois Trauma Registry Database, 2010)

Region	Number of Trauma Admissions 2010	Number of Trauma Admissions 2009	Number of Trauma Admissions 2008
Region 1	2761	2841	2872
Region 2	4126	4222	4271
Region 3	2011	2808	2473
Region 4/5	135	396	361
Region 6	959	1054	1014
Region 7	5330	5200	5789
Region 8	7492	7280	7189
Region 9	8447	7923	6674
Region 10	5412	4637	4635
Region 11	5524	5299	5388

Table 3. Patients per Center, 2008–2010

(Illinois Trauma Registry Database, 2010)

Region	Number of Centers	Patients per Center 2010	Patients per Center 2009	Patients per Center 2008
Region 1	5	552.2	568.2	574.4
Region 2	8	515.8	527.8	533.9
Region 3	3	670.3	936.0	824.3
Region 4/5*	2	67.5	198.0	180.5
Region 6	1	959.0	1054.0	1014.0
Region 7	6	888.3	866.6	964.8
Region 8	11	681.1	661.8	653.5
Region 9	12	703.9	660.3	556.2
Region 10	8	676.5	579.6	579.4
Region 11	6	1381.0	1324.8	1347.0

**Region 4/5, southern Illinois, is serviced by two trauma centers outside of the state.*

Tables 2 and 3 show the volume of trauma patients admitted to hospitals in various regions of Chicago. Regions 4 and 5, which are served by out-of-state trauma centers, are combined and the values only represent the number of Illinois patients seen by those trauma centers. For the purposes of our discussion, we will not discuss regions 4 and 5, although it is important to keep in mind that southern Illinois is an underserved rural area and that patients from these regions may be seen at a region 3 and 6 center. More research is needed to understand where patients in these regions are being sent, and, if the patient volume is high enough, should the state encourage at least one hospital in those regions to become a trauma center. The Illinois Trauma Registry Database alone does not tell us where patients are coming from, but it is safe to assume that the vast majority are from within the region. Advocate Christ, in region 7, however, does see a sizable chunk of region 11 trauma from the South Side of Chicago, because there are no trauma centers on the South Side despite the high volume of trauma cases.

Although regions 8 and 9 have a seemingly high density of trauma centers (Fig. 8), they all take over six hundred fifty patients. Nevertheless, these regions certainly stand out in terms of number of centers. More evaluations need to be done by the IDPH to assess whether regions 8 and 9, adjacent to each other, need eleven and twelve trauma centers (Fig. 9). If the state had more control over designation, it could designate a smaller number of hospitals in this region so that each hospital received about one thousand patients. In this way, each hospital would benefit from a greater portion of the state trauma-center fund, and it would ensure that quality of care remained high in these centers.

The only centers which take below six hundred fifty patients are located in regions 1 and 2 (Fig. 10). Region 2 serves a wide area with low population density (Fig. 6). Peoria, located in this region, has two level II centers. Hospitals in this region might benefit from more volume if there was one less trauma center. Region 1 also serves a wide area. All trauma centers in this region are located in relatively populated areas, but still see less than six hundred fifty trauma cases each. Rockford has two level II centers and one level I center. This is an example of a city where trauma designation may have more to do with prestige and

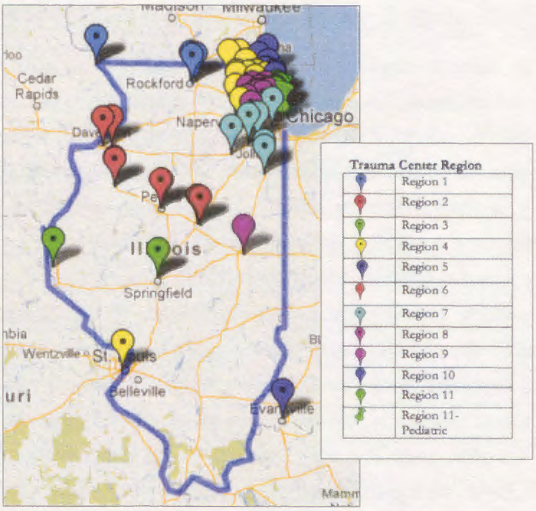


Figure 9. Trauma Regions in Illinois

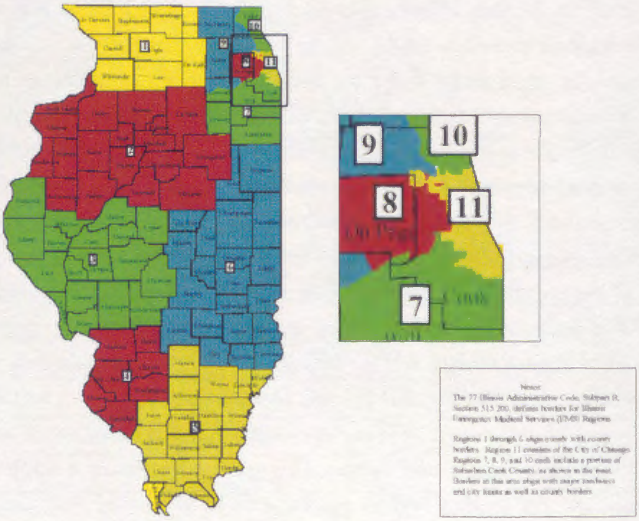


Figure 10. Trauma Centers by Region in Illinois
(Loyola Medicine, 2008)

competition. One hospital in Rockford should be enough. This hospital could serve as the trauma hub for the region and physicians interested in trauma could rotate at that hospital.

Since the Illinois trauma system has been around for quite some time, however, it is hard to simply say that centers without volume exceeding six hundred fifty patients result in poor outcomes. Well-established programs may provide quality care regardless of volume. However, if the six-hundred-fifty cut point is true for Illinois, it would effect how and where trauma centers were designated. This could have implications for the state trauma-center fund. If fewer centers are in each region, each hospital within that region would receive more money. Thus, if Illinois became a fully funded system (which will be discussed further in policy recommendations) or a system with more administrative control over designation, trauma-center volume would be a key consideration in determining which hospitals are designated.

Current State of Trauma Care in Illinois

The Illinois trauma-center fund has been in existence since the early 1990s and has undergone a few major changes over the years. The IDPH collections money for the fund from DUIs, traffic violations, and firearm charges (JLARC, 2004).[20] Fifty percent of the money collected goes to the Department of Healthcare and Family Services (HFS), and 50 percent goes to IDPH's trauma department (J. Albanese, personal communication, October 24, 2012). From that amount, 97.5 percent of the money is distributed to Illinois trauma centers based on a formula which takes into account the number of patients treated, length of stay, severity of injury, etc. (Joint Committee on Administrative Rules, 2012). Since there are no in-state trauma centers south of Springfield, the IDPH originally redistributed funds to trauma centers in Chicago. However, due to pressure from southern Illinois legislators a change in the law stipulates that money collected in each region would stay within the region (J. Albanese, personal communication, October 24, 2012).

20. Other states use a variety of different sources, which will be discussed later in the paper.

In regions without a trauma center money would go towards EMS. Ultimately, the trauma-center fund provides roughly $100,000 per hospital, which is not enough to pay for one physician's salary (J. Doherty, personal communication, 2013; T. Esposito, personal communication, November 27, 2012). Furthermore, the money is given to hospitals rather than to trauma centers directly. James Doherty, the head of trauma at Advocate and director of region 7 trauma, says that the fund barely scratches the surface, given the millions of dollars needed to run a trauma center (J. Doherty, personal communication, 2013). This is a statewide concern.

The money given to HFS is used to reimburse the care of patients on public assistance, which pays higher reimbursement (2 to 3.5 percent increase) to hospitals designated as trauma centers (J. Albanese, personal communication, October 24, 2012). Despite this, trauma centers still rack up high volumes of unreimbursed care, due in part to the already low Medicaid reimbursement rate. Richard Fantus, a trauma surgeon at Advocate Illinois Masonic who has been involved in the Illinois trauma system since the 1970s, says that he sees a large number of illegal immigrants, who have no insurance. Since all patients must be seen for trauma, hospitals have to eat the costs that they lose on these patients (R. Fantus, personal communication, January 16, 2013). In many ways, the biggest weaknesses of the national health-care system—poor reimbursement, lack of coverage, and high health-care costs—are all magnified in trauma.

Thomas Esposito, a trauma surgeon at nationally registered Loyola University and a leader in national trauma policy, described what he sees as the "myths" of trauma care:

1. Trauma care requires high spending and large resources.

2. Penetrating injuries are vastly more expensive to treat than blunt-force injuries.

3. Trauma surgeons face higher medical liability (T. Esposito, personal communication, November 27, 2012).

Esposito says that many hospitals, including Loyola, treat the same payer

mix in their trauma unit as in the rest of the hospital. This means that a trauma unit should not add a disproportionate burden on a hospital's resources. Furthermore, most hospitals do not account for costs in their hospitals, let alone in their trauma centers:

> I don't think there are many places that can tell you whether the trauma center makes or loses money, because nobody is doing cost accounting related to a cost center and a revenue center. They say that the emergency department makes money or it doesn't make money...that has nothing to do with downstream revenue [to pay for cardiologists, orthopedics, specialists, etc.]... This whole concept of cost accounting and revenue center or loss center, nobody can do because there are so many people with their fingers in the pot (T. Esposito, personal communication, November 27, 2012).

From his own research and professional experience, he has found that treatment for penetrating injuries is not necessarily more costly than for blunt-force injuries (Esposito et al., 1991), a hypothesis also supported by David Boyd (D. Boyd, personal communication, March 17, 2013). Esposito believes these myths are spread by physician "traumaphobes," who, for whatever reason, do not value trauma care and need a way to justify their decisions. Finally, he says trauma surgeons are not sued at any higher rate than other surgical specialties, especially considering the high volume of cases they treat (T. Esposito, personal communication, November 27, 2012). Esposito argues that these myths have impeded trauma-center development. While additional studies are needed on financial viability, subsequent policy measures should seek to better inform professional and public opinion and generate incentives for physicians and hospitals. When asked what could strengthen Illinois's trauma system physicians from every single trauma hospital in Chicago emphasized improved funding.

Fantus explained that the governor of Illinois has discretionary access to the trauma-care fund, which has been used for other purposes in light of the growing budget crisis in Illinois (R. Fantus, personal

communication, January 16, 2013). He proposed that removing the governor's access to the fund could be one measure for improvement. Doherty, the director of trauma at Advocate Christ, echoed his support for this measure (J. Doherty, personal communication, 2013). Samir Fakhry, chief of surgery at Medical University of South Carolina, underscored the dual purpose of trauma funding: improving trauma centers and establishing trauma's importance as a health issue that effects everyone in society (S. Fakhry, personal communication, January 27, 2013).

Not all doctors agree that funding should be increased, and they point to existing revenue sources. For example, teaching hospitals, like Northwestern or Advocate Christ, are reimbursed for postgraduate training if they provide a substantial amount of care to Medicare patients. For example, if it costs $70,000 to train medical residents, the federal government reimburses the teaching hospital close to, and sometimes more than, that amount in "Direct Graduate Medical Education" payments (G. Merlotti, personal communication, March 15, 2013). This type of policy measure should be maintained.

Another consideration is a hospital's payer mix. If a hospital sees a high proportion of privately insured patients, it will generally have little trouble supporting a trauma center. (T. Esposito, personal communication, November 27, 2012). Heather Vallier, an orthopedic surgeon at Metro Health in Cleveland, finds that the trauma center is the profit center of her hospital (H. Vallier, personal communication, January 25, 2013). Metro Health is home to Cleveland's only level I trauma center. As such, although the hospital as a whole is located in an area with a poor payer mix, it receives a large proportion of Cleveland-area insured patients or patients with worker's compensation at its trauma center (H. Vallier, personal communication, January 25, 2013). Vallier added that there are two level II centers on the East and West sides of the city. Because of good communication with EMS patients are taken to the hospital with the right level of care. While there have been other level Is in Cleveland over the years, these hospitals closed due to their inability to handle volume and poor payer mix (H. Vallier, personal communication, January 25, 2013). This example supports the idea that having too many centers in one region actually hurts rather than helps

the system. The current trauma system, across Illinois and in other states, relies mostly on market forces to determine location of trauma centers rather than need. In the case of Cleveland, Vallier believes that market forces have correctly determined the number of trauma centers. However, she adds, the efficacy of market forces varies from city to city and state to state (H. Vallier, personal communication, January 25, 2013).

In Chicago, Gary Merlotti, the chief of surgery at Mt. Sinai Hospital, believes that market forces have determined the right number of trauma centers, but that they are unevenly distributed (G. Merlotti, personal communication, March 15, 2013). For example, Northwestern, Cook County, and Mt. Sinai are clustered downtown and on the West Side. Revamped policy measures for trauma need to go beyond identifying which hospitals bear the brunt of poor reimbursement, they also need to factor in location. Creating this type of policy measure is tricky, in part because policy makers do not make trauma policy in a vacuum; they are joined by hospital administrators, surgeons, and local politicians, all weighing in at the same time. While this is certainly true of all types of health-care policy, trauma myths and the lack of recognition for trauma have burdened systems across the nation.

Although the field of trauma surgery has rapidly developed, trauma policies lag behind (i.e., only thirteen states have trauma systems). However, in states like Maryland and Georgia, which introduced the idea of trauma as a public service, trauma care began to be seen as critical and essential to the health needs of society. In the following sections I will describe Georgia's relatively new system and Maryland's more established system.

Georgia Trauma Care Network

The belief that trauma care should be a public service prompted Georgia to create a publicly funded system in 2008. At the time, Georgia's trauma system was under financial stress, resulting in poor coverage and poor quality of care throughout the state, particularly in southern Georgia. Unlike Illinois, Georgia lacked a centralized trauma plan and several trauma centers were considering dropping out of the network. In response, the state formed the Georgia Trauma Care Network

Commission (GTCNC) to stabilize the trauma system and to strengthen remaining trauma centers (Georgia Trauma Care Network Commission [GTCNC], 2009). The most immediate objective was to obtain permanent funding for the trauma system, including hospital development and physician and EMS involvement. Georgia has five level I centers, seven level II centers, two level III centers and two level IV centers. There are also two pediatric centers.

GTCNC's 2009–2015 strategic plan outlines short-term objectives for 2009–2010, five-year objectives, and organizational objectives. The strategic plan upholds the trauma system as a "new public service" that will bring value to the state, a plan that will "lead the nation": "Georgia generally takes police and fire services for granted, and it is time for the state to have the same expectation of its trauma and emergency services" (GTCNC, 2009). In 2008 the state provided $59 million in pilot funds to strengthen existing level I and level II trauma centers and to support patient care and transport by EMS. These centers received an additional $36 million to help with costs incurred due to their trauma status and $12 million for their trauma medical staff. A grant program of $4.2 million supported critical equipment purchases (GTCNC, 2009).

With this strong foundation, Georgia aims to develop a sustainable network that will strengthen and expand in future years. Additional objectives are to build a trauma telemedicine system, develop a statewide trauma-transfer system, build trauma-system infrastructure under the Department of Health, strengthen physician support in rural areas, establish mechanisms to assure exceptional quality, and expand and integrate acute emergency care needs with disaster and terror preparedness (GTCNC, 2009). The Georgia plan is ambitious, aiming to tackle some of the biggest challenges for trauma care over a five-year period.

It is important to note that the Illinois system, given its duration, is more comprehensive than the Georgia system was before 2009. Many of the basic objectives outlined in the Georgia plan are well established in Illinois. For example, the Illinois system was built upon a strong trauma registry and an advanced pre-hospital communication system (MERCI). However, the Georgia plan goes beyond Illinois by establishing a stronger trauma fund. The intended source of funding was the

addition of ten dollars to vehicle registration fees, which would have raised $80 million annually for the program; however, voters rejected the measure. Since 2010 the program has instead received around $15 million per year from "super speeders," which penalizes highway drivers for going more than twenty miles per hour over the speed limit (Jones, 2013). In relative terms, Georgia's funding scheme is strong. In additional to super speeders, in 2010, 2011, and 2012 the trauma program received $1.3 million, $4.6 million, and $6.4 million, respectively, from the state, and in 2012 it received about $2.5 million in federal money (GTCNC, 2012). The GTCNC also established a fund for uncompensated care, contributing about $683,125 in 2012 (GTCNC, 2012). In 2012 the trauma agency at the Department of Community Health requested $37,295,032, although the governor's recommendation that year was for $36,866,410 (Deal & Alford, 2012). EMS receive 20 percent of funds and trauma centers and physicians receive 80 percent (GTCNC, 2012, January 27).

The Georgia Department of Audits and Accounts for the House of Appropriations Committee noted that the system has achieved much over the past five years, but warned that a lack of leadership has prevented more progress (Jones, 2013). The report shows that 52 percent of emergency patients are treated by trauma centers, up from 49 percent five years ago, but "there is currently no strategic plan for the desired number and type of trauma centers and where they should be located. [The GTCNC] intends to have criteria in place by June 2013" (Jones, 2013).

Maryland: The Nation's Model System

Like Illinois, Maryland's trauma system began with a strong leader, R. Adams Cowley, and top-down interest from the governor. Like Boyd, Cowley came from the military. His trauma work started as a small project at the University of Maryland in the 1960s. The governor passionately supported trauma after a friend's death in an accident in the 1970s, and Cowley received the green light to form a statewide system (Holler, Johnson, & Doyle, 2010).

The administrative structure of Maryland's system is important to

MIEMSS Organizational Structure

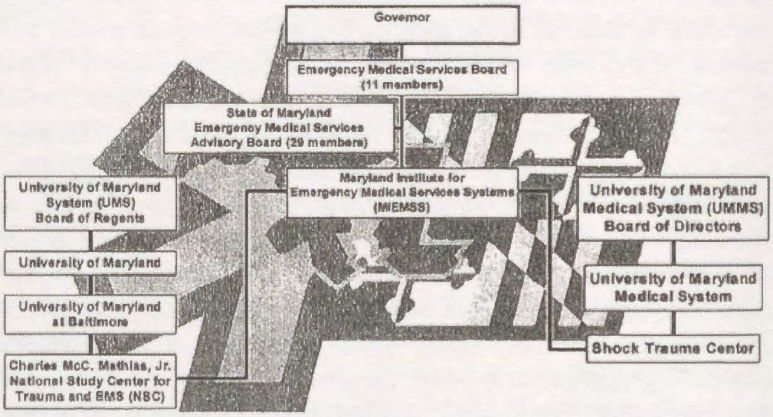


Figure 11. Maryland Trauma Organizational Structure
(Sette & Alcorta, n. d.)

its success (Fig. 11). An Emergency Medical Services Board of eleven members reports directly to the governor (Sette & Alcorta, n. d.). A newly established agency, the Maryland Institute for Emergency Medical Services Systems (MIEMSS), oversees and coordinates all components of the statewide EMS system, providing leadership and medical direction, educational programs, a statewide communications system, trauma-center designation, ambulance licensing, and more (Holler et al., 2010). MIEMSS is considered a public service and works well with other public-service agencies, including local police and fire departments.

In the 1990s Maryland's system faced challenges similar to Illinois in the 1980s: leadership changes, funding cuts, and a growing number of underinsured or uninsured patients (Holler et al., 2010). Funding sources were limited. Yet, as a critical part of the health system, the Maryland trauma system—including MIEMSS, the Maryland Fire Rescue Institute (MFRI), the Maryland State Firemen's Association, the Maryland State Police Aviation Command, and the R. Adams Cowley Shock Trauma Center at University of Maryland—advocated for increased funding. Maryland's legislature subsequently passed a measure which levied

an eleven dollar surcharge on vehicle registrations (Holler et al., 2010).

The R. Adams Cowley Shock Trauma Center (STC) in Baltimore is one of the nation's leaders in trauma care and aimed to attract external funding to the state by developing a reputation for excellence. STC secured funding sources through a partnership with the US Air Force, and the Department of Defense has contributed $2.4 million towards a new facility for the National Trauma and Emergency Medical Training Center (Holler et al., 2010).

The most serious and persistent problem was the burden on physicians due to uncompensated and under-compensated care and rising malpractice premiums (MacKenzie, 2008). As was mentioned in the literature review, physicians in level II and III centers who have private practices incur additional losses when they forgo elective cases to do trauma calls. Trauma centers must subsidize physician income, mainly through on-call stipends, which cost Maryland's individual trauma centers between $362,000 and $876,000 annually (MacKenzie, 2008). MacKenzie, a professor of health policy at Johns Hopkins, outlines a number of solutions: reducing the amount of uncompensated care (through universal health insurance and expanding Medicaid), increasing rates of reimbursement for trauma care (increase Medicaid from 33 to 100 percent of Medicare), and paying for physician on-call coverage (2008).

In 2001 the Maryland legislature recognized the role of physician participation in trauma-center success and took steps to improve on-call reimbursement by mandating that health maintenance organizations reimburse trauma services at 140 percent of the Medicare fee schedule (Pollak, 2006). This measure improved reimbursement from private insurance, thereby offsetting losses incurred by publically insured patients. Two years later, the legislature created the Maryland Trauma Physicians Services fund, which collected money by raising the annual vehicle registration fee by two and half dollars (Pollak, 2006). The fee was later increased to a five dollar surcharge (Moon, Young, Cowdry, & Murray, 2008). The fund pays Medicare rates to certain trauma specialists for care of uninsured trauma patients and reimburses hospitals for their on-call stipends. As a result, if a patient is uninsured and a full payment

(100 percent of the Medicare fee or more) is not received, the service can be written off as uncollectible and eligible for uncompensated-care reimbursement (Moon et al., 2008). Due to a surplus in the fund in 2006 the legislature expanded the number of specialists who were eligible for benefits (Pollak, 2006).

The efficiency of the fund can be summarized by a report conducted by the Maryland Health Care Commission (MHCC), which looked at collections and spending for the trauma-center fund:

> During FY 2008, the Maryland Motor Vehicle Administration (MVA) collected $12.9 million from the $5 surcharge on motor vehicle renewals. Payments for uncompensated care and on-call increased in FY 2008 to $12.7 million for uncompensated care, Medicaid under-compensated services, trauma on-call expenses, and administrative expenses. The balance in the Trauma Fund remained at approximately $20 million at the end of FY 2008, or $17 million if incurred but not paid obligations were netted against the Fund. The MHCC estimates MVA collections through the $5 fee should increase by about 2 percent per year in 2008 and 2009. Projected spending under current law will be approximately equal to collections from the MVA. The Fund is projected to be in balance over the next several years (Moon et al., 2008).

The report goes on to describe the allocation of money (Table 4). The sizable starting balance developed because (1) the initial eligibility criteria of the fund was intentionally limited, (2) thresholds for on-call payments only partially covered on-call expenses, and (3) the MHCC overestimated the money needed to raise Medicaid payments to 100 percent of Medicare. The trauma-care fund is responsible for 50 percent of the difference between the Medicare rate and the standard Medicaid rate for trauma care provided to Medicaid patients. As such, Medicaid patients are reimbursed for 100 percent of the Medicare Baltimore locality rate (Moon et al., 2008). This measure significantly addresses the issue of under reimbursement for treating publically insured patients.

Maryland has adapted to poor reimbursement, funding cuts, and physician willingness by establishing itself as a nationwide leader in trauma, diversifying its funding sources, and finding ways to cover low reimbursements. Neither the Maryland nor Georgia plans disclose how many additional lives were saved due to the implementation of statewide programs. As such, I was not able to compare inputs to outputs. Such data could help elucidate the impact of the system and justify the state's expenditure.

Table 4. "Trauma Fund Status on Cash Flow Basis" from Maryland Trauma Physician Fund Report

(Moon et al., 2008)

CATEGORY	AMOUNT
Fund Balance Start of FY 2008 (July 1, 2008)	$20,804,949
Collections in FY 2008 from the $5 Registration Fee (and Interest)	$12,919,892
Total Fund Balance before FY 08 Expenditures and Credits	**$33,724,840**
– Uncompensated Care Payments	(6,751,938)
– Credit Recoveries	453,508
– On-Call Expenses	(5,258,097)
– Medicaid Payments through 06/30/08	(273,003)
– Children's National Medical Center Grant for Standby Expenses	(490,000)
– Administrative Expenses	(467,892)
Total Expenditures	**($12,787,422)**
Transfer of Interest to MHCC*	(124,047)
Applied to 2007 Deficiency**	(259,273)
Trauma Fund Balance FY End June 30, 2008	**$20,554,098**

* The Fund was charged interest on its operating account. Funds were not transferred until year end.

** In 2007, the disbursement exceeded the appropriation. Funds to close the deficiency were withdrawn from the Fund balance in FY 2008.

Policy Recommendations

A 2005 nationwide Harris poll found that eight in ten Americans felt that having a trauma center nearby is as or more important than having a fire or police department (Harris Interactive, Inc., 2005). The poll found that most Americans were not aware that injury was the leading cause of death for children, youth, and adults under the age of thirty-four. About one in three Americans believed that the hospital nearest to them was a trauma center, where, in fact, less than 8 percent of hospitals have a trauma center.[21] After hearing a description of a trauma center, the poll found that Americans value them highly, and felt that it was "extremely or very important" to be treated at a trauma center in the event of life-threatening injury (Harris Interactive, Inc., 2005). About two in three Americans responded that they would be extremely concerned or very concerned if they learned that their state trauma system did not meet recognized standards. However, a 2002 survey by the US Department of Health and Human Services found that only eight states have fully developed trauma systems (Harris Interactive, Inc., 2005).[22] One of the most interesting conclusions of the poll was that Americans were willing to spend their own money, in the form of fees or taxes, to have trauma centers and systems in place.

Given such strong public support of trauma care and funding states should make trauma a political priority. The biggest challenge for trauma centers in Illinois (and nationally) is financial viability. The second biggest challenge is weak administrative structure at the state

21. This doesn't necessarily mean that we need more trauma centers. As studies have shown, trauma centers need to maintain a base level of cases to maintain clinical excellence. Additionally, the need for trauma depends on the region, the population size, and the magnitude and type of injury the region sees.

22. These states may still have individual trauma centers, but may not have a comprehensive system. Additionally, a system may be currently developing but may not be fully completed.

level, which has not been able to gain full control over the trauma-center fund and has not effectively designated hospitals across the state. Recommendations below are in no particular order, but have been divided into "administrative" and "financial" solutions.

Administrative

1. Increase State-level Trauma-care Staff

Currently, a trauma coordinator works at the Illinois Department of Public Health (IDPH) within the division of Emergency Medical Services and Highway Safety. The coordinator reports to the head of the EMS and Highway Safety, who then reports to the head of IDPH. The coordinator administers the Illinois trauma system and supervises the registrar of the Illinois Trauma Registry Database, the Illinois Head and Spinal Cord Injury Registry, and the Illinois Violent Injury Registry. The registrar compiles and edits these registries and reports data to the National Trauma Data Bank. The coordinator relies heavily on the regional committees across the state to inform his or her decisions. Each region has an EMS director.

The strength and number of trauma staff at the state level has decreased over time (Eisendrath & Glastris, 1986). Until 1974 the system had a strong and effective leader in Boyd and his staff, and the state-level lead agency keep the trauma system running, but also gave trauma care legitimacy. Illinois needs a committed trauma director at the state level who will increase support staff and effectively advocate for trauma as a key public health issue to the IDPH. Additionally, this trauma director should report directly to the director of the IDPH, rather than to EMS and Highway Safety.[23]

2. Designate More Level II and III Centers

Illinois has eleven regions with about sixty hospitals designated as level I or level II centers (Appendix A). There are currently no level III centers

23. In Maryland, where trauma care is a public service and heavily funded, the trauma director reports directly to the governor.

in Illinois. Chicago has no level II centers. Adding level II centers, which can take about 95 percent of trauma cases, could offset the load on level I centers in the region.

The two trauma centers in regions 4 and 5 are both out of state. Designating even one level II or III center in these regions could help patients. As seen with the case of St. James Hospital in the south suburbs of Chicago, this would alleviate the burden on ambulance drivers who hesitate to take patients out of area because of long round-trip travel times (Friedman, 2011).

Regions currently make recommendations for trauma designation. However, a stronger trauma team at IDPH could designate centers with regional equity and find ways to equip hospitals with resources. The challenge is deciding how money from the weak trauma-center fund will be allocated among new level IIs and IIIs. If the trauma-center fund is strengthened, the central agency would have more leverage over designation and would prevent the designation of extra trauma centers in regions that already have a high number of centers and low volume (i.e., regions 1 and 3).

Rural areas struggle to staff their centers with the necessary surgeons. Designating level IIIs in rural regions would eliminate stringent staff requirements, but it would not eliminate the ever-present staffing challenge for departments in these regions. Incentivizing doctors through fellowships and grants is another way to attract specialists. This will be discussed as a financial recommendation.

Financial

3. Change the Medicaid Reimbursement Rate

Illinois could adopt Maryland's funding scheme. Currently, hospitals with trauma centers are reimbursed 2 to 3 percent more for Medicaid patients (J. Albanese, personal communication, October 24, 2012). However, this isn't enough. In Maryland, Medicaid is reimbursed at the same rate as Medicare, which generally pays hospitals more per procedure. The state trauma fund pays 50 percent of the difference between the Medicaid and Medicare reimbursement rates, while the federal government

pays for the other 50 percent (Moon et al., 2008). Improving the reimbursement rate for trauma centers acknowledges that trauma centers have high operational costs, which are aggravated by high levels of unreimbursed care.

The majority of physicians I spoke with suggested that a national or statewide single-payer health-care system could solve the issue of poor reimbursement for trauma centers. Many feel that the Patient Protection and Affordable Care Act (ACA) alone may not be enough to support trauma centers. ACA will expand Medicaid, increasing the number of insured patients. While this may minimize the number of uninsured patients that trauma centers see, it does not eliminate the problem of poor reimbursement. Very few studies discuss the impact of the ACA on trauma centers. One study suggested that given predictions that employer-based private insurance is expected to decrease with the ACA (because it is cheaper for some employers to pay a fine than provide health benefits), trauma centers will lose privately insured patients who help bolster their viability (Shafi et al., 2012). Thus, for a trauma center's financial viability, Medicaid expansion must be coupled with improved reimbursement.

4. Reinstate Victims-of-Crimes Funding

Doherty, director of region 7 trauma and director of trauma at Advocate Christ, suggested reinstating the victims-of-crime funding, by which victims receive money to pay for hospital care or rehabilitative care. Doherty mentions that this funding could equal up to $50,000 and that a substantial portion could go towards trauma care (J. Doherty, personal communication, 2013).

5. Create Rehabilitative and Outpatient-care Grants

The trauma team at IDPH could work with other departments in IDPH and the Department of Healthcare and Family Services (HFS) to create grants for hospitals or community centers to build better rehabilitative and outpatient care. Getting patients out of the trauma center, where the cost of care is high, and into outpatient care, where the cost of care is lower, would lower hospital costs.

6. Distribute Grants Based on Location

Region 11, Chicago, has six adult level I centers and two pediatric level I centers. Although Chicago has the right number of trauma centers for its population, its centers are not distributed equally. The South Side is a trauma desert, and longer travel distances to a trauma center for gunshot-wound patients increases mortality (Crandall et al., 2013), especially for minority populations (Hsia & Shen, 2011). Providing grants to hospitals who establish trauma centers in areas with high minority populations could encourage hospitals to join and could also reward hospitals who already serve those areas. Grants could also be provided to hospitals in rural areas.

7. Establish a Trauma Fellowship

Part of the challenge with trauma is incentivizing doctors, particularly in underserved or rural areas. Across the nation, there are only about sixty trauma fellowships (ACS, 2006). Creating a state-sponsored fellowship at an exceptional hospital in one of the rural regions or a South Side hospital could serve the dual purpose of strengthening trauma programs and incentivizing doctors.

8. Require Emergency Room Bypass Fines

When hospitals go on bypass, they "close" their emergency room to incoming patients, who are taken to the nearest available ER. The University of Chicago Medical Center is on bypass nearly every day of the year for an average of six hours per day. In comparison, Mt. Sinai Hospital, which is located on the West Side, goes on bypass once a year. Hospitals that go on bypass should pay a fine which will be distributed to other hospitals.

9. Remove Governor's Access to Trauma Center Fund

Reports and key informant interviews show that the trauma-center fund has decreased (J. Doherty, personal communication, 2013; R. Fantus, personal communication, January 16, 2013; Eisendrath & Glastris, 1986). Only 50 percent of the money collected by the trauma-center fund goes directly to IDPH's trauma fund, while the other 50 percent is

given to the Department of Healthcare and Family Services (HFS). One hundred percent of the money collected should go to the trauma-center fund, and the governor should no longer have access to the fund.

10. Direct Funds to Trauma Centers, not Hospitals

Currently, money from the trauma-center fund goes directly to hospitals with trauma centers, but hospitals are not required to put the money towards trauma-center costs. Revamping the fund will only be effective if it is guaranteed that trauma centers will be the beneficiaries of the fund.

11. Diversify Funding Sources

Others states generate trauma money from various sources (Table 5). Illinois could add additional fines to collect more money for the trauma fund. They could also employ methods like those proposed in Georgia and Maryland of adding a small amount (as low as two dollars or two dollars fifty cents) to vehicle registration fees.

12. Apply for ACA Funds

The Patient Protection and Affordable Care Act (ACA) provides about $225 million for trauma care across the county. This money is split into two $100 million programs called the Trauma Care Center Grant and the Trauma Service Availability Grant. The latter is specifically for the development of trauma centers in underserved urban or rural areas. The ACA also reauthorizes the Trauma Care Systems Planning and Development Act in the form of two smaller grants of $12 million each. These grants will go towards regionalization and trauma-care systems planning (McDonald, n. d.). Illinois should apply for these grants.

Figure 5. Sources of Trauma Funding
(JLARC, 2004)

SOURCES	Arizona	California	Florida	Georgia	Illinois	Maryland	Mississippi	Nebraska	Oklahoma	Pennsylvania	Texas	Virginia	Washington
STATE FINES													
DUI					■				■			■	
Traffic Infractions		■			■		■		■	■	■		■
Firearm Discharges					■								
Dangerous Substances									■				
Open Container									■				
Unknown													
STATE FEES													
Registration						■					■		■
Issue License									■				
Reinstate License									■				
911 Surcharge													
OTHER SOURCES													
Local Fines and Fees			■										
State Taxes	■												
Local Property Taxes		■	■								■		
Tobacco Settlement							■				■		
Unclaimed Lottery											■		
Gaming Initiative	■												
General Funds		■	■	■				■					
Activation Fee		■											

Conclusion

Illinois has been historically a leader in trauma care. Chicago was home to the nation's first trauma center and Illinois was home to its first trauma system. The state trauma system pioneered regionalization, which identified geographic catchment areas of health care, and categorization, which specified the abilities of hospitals. The idea of centers of excellence, so common today, originated from the concept of level I trauma centers. The practice of coordinated care—spanning from pre-hospital, hospital, and rehabilitative/outpatient care—made trauma care comprehensive and effective.

Trauma is the leading cause of death for Americans under the age of forty-four. The reality of injury is that is can happen to anyone, anywhere, and at anytime. Unlike some emergency-room patients, trauma patients do not choose to seek out care. To go without immediate care can result in death. Treatment for these injuries can sometimes be more complex than the cause of the injuries themselves. As a result, treatment can be costly. The problems in our nation's health-care system at large are exacerbated in trauma care. Cost of care is high and the reality of uninsured or underinsured patients is serious. Until we find a solution for our national health-care system, trauma systems across the nation will continue to struggle. Yet, injuries remain a daily occurrence and lack of access will harm millions of Americans, particularly those in minority, low-income, or rural areas.

States like Maryland and Georgia have faced this reality by making trauma care a public-health priority. By inserting trauma care into the narrative of public services, these states are funding trauma centers in the hopes that lives will be saved and financial losses will be eliminated.

But money isn't the only solution. Without vision and leadership, Illinois's trauma system will not progress. Illinois needs another committed leader like Boyd, who can organize support at the state and national levels. Additionally, the trauma team at the Illinois Department of Public Health needs to increase. A strong state-level staff can designate level II and III centers in areas that are in need. Additionally, they can advocate for diversified sources of funding and work with hospitals to

develop fellowships or teaching opportunities. Under strong leadership, every dollar given to the Illinois trauma system could multiply.

Thus, Illinois can strengthen its trauma system by improving funding and building trauma leadership. In this way, areas such as the South Side and south suburbs of Chicago will become more attractive places for hospitals to create trauma unites and more of a priority for the state. The state as a whole will benefit from better coordination and resource allocation. Ultimately, the capabilities, and more importantly, the value, of trauma will be recognized when it is established as a public service, similar to EMS, fire, or police departments. If Illinois can do this, it will once again be a national leader in trauma care. ❍

Epilogue, April 2015

This paper was submitted in April 2013, prior to Medicaid expansion in Illinois and the first round of open enrollment for health insurance on the Federally Facilitated Marketplace. Prior to the Patient Protection and Affordable Care Act of 2009 (ACA) most Americans received insurance through their employers or enrolled in plans directly with insurers. Patients with preexisting conditions were oftentimes charged exorbitant unaffordable insurance premiums, and many opted to forgo coverage and care, except for emergencies. Prior to the ACA states strictly limited Medicaid eligibility, such as to working mothers far below the poverty line or the disabled. The number of uninsured people was extremely high, particularly in low-income and minority communities. The ACA has made care affordable by (1) directing federal money towards states that opt to expand Medicaid, (2) removing preexisting-condition clauses from insurance plans, (3) mandating that everyone purchase health insurance or incur a fee, and (4) creating a market where people can purchase insurance with the assistance of federal subsidies. Many Americans still obtain insurance through their employers, but now millions of self-employed individuals or individuals without coverage have a source of insurance.

In my conclusion, I hinted at the broader challenges of our health-care system—rising costs, underinsurance, and lack of insurance—which put pressure on the entire system, including trauma care. While the rising costs of health care continue to be a challenge, costs are rising more slowly than anticipated after implementation of the ACA (Holahan & McMorrow, 2015). Through Medicaid expansion, thousands of people across Illinois and in Chicago have gained access to insurance for the first time. Hospitals across the country are seeing their number of uninsured drop and welcome expansion in the face of other payment reforms in the ACA, which propose cuts to hospital reimbursement (Dorn, Buettgens, Holahan, & Carroll, 2013). Nationwide, the number of people without insurance has dropped to historically low levels (Levy, 2015).

While the ACA is an important step, many people may still find health insurance unaffordable, despite subsidies from the federal

government. Some people have opted to pay a penalty because they think they will not use health coverage. The 2014 tax period is the first year that people will face a penalty for being uninsured. Its impact on enrollment will only be observed in the subsequent year.

Undocumented immigrants and prisoners do not have access to insurance. In certain states Medicaid eligibility is suspended once an individual is incarcerated and remains suspended even after release. Coverage to these populations, for now, is likely to be achieved through state policies (Seipel, 2015). Thus, while the ACA has reduced the number of uninsured, hospitals and trauma centers will continue to provide uncompensated care.

It still remains to be seen how and to what extent individual trauma centers benefit from lower rates of uninsured patients. However, the fact that hospitals are benefitting gives hope that as hospital systems are bolstered, their trauma centers will be, too. Additionally, it is important that rates of reimbursement from public payers like Medicaid and Medicare remain viable for trauma care. The ACA proposes numerous cuts to reimbursement to hospitals, in an attempt to lower costs. If hospitals lose significant reimbursement through these measures, some may cut their trauma programs in order to focus on expanding more sustainable departments. Thus, it is important that support for trauma programs continue to occur through multiple funding sources. All of this can only succeed if carried out with purpose and leadership at the state level. Hopefully Illinois will capture the momentum created through the ACA and strengthen its trauma program.

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Appendix A: List of Trauma Centers in Illinois

REGION	TRAUMA DESIGNATION	NAME OF HOSPITAL	CITY
1	Level II	Finley Hospital	Dubuque
1	Level II	Mercy Medical Center	Dubuque
1	Level I	OSF St. Anthony Medical Center	Rockford
1	Level I	Rockford Memorial Hospital	Rockford
1	Level I	Swedish American Health System	Rockford
2	Level II	BroMenn Regional Healthcare	Normal
2	Level II	Galesburg Cottage Hospital	Galesburg
2	Level II	Illini Hospital	Silvis
2	Level II	Methodist Medical Center	Peoria
2	Level I	OSF St. Francis Medical Center	Peoria
2	Level II	OSF St. Joseph Medical Center	Bloomington
2	Level II	OSF St. Mary's Medical Center	Galesburg
2	Level II	Trinity Medical Center	Rock Island
3	Level II	Blessing Hospital	Quincy
3	Level I	Memorial Medical Center	Springfield
3	Level II	St. John's Hospital	Springfield
4	Level I	St. Louis University Medical Center	St. Louis, MO
5	Level II	Deaconess Hospital	Evansville, IN
6	Level I	Carle Foundation Hospital	Urbana
7	Level I	Advocate Christ Medical Center	Oak Lawn
7	Level II	Morris Hospital	Morris
7	Level II	Provena St. Joseph Medical Center	Joliet
7	Level II	Provena St. Mary's Hospital	Kankakee
7	Level II	Riverside Medical Center	Kankakee
7	Level II	Silver Cross Hospital	Joliet
8	Level II	Adventist Bolingbrook Hospital	Bolingbrook
8	Level II	Adventist LaGrange Memorial Hospital	LaGrange
8	Level I	Advocate Good Samaritan	Downers Grove
8	Level II	Central DuPage Hospital	Winfield
8	Level II	Adventist Hinsdale Hospital	Westmont
8	Level II	Edward Hospital	Naperville
8	Level II	Elmhurst Memorial Hospital	Elmhurst
8	Level II	Glen Oaks Medical Center	Glendale Heights
8	Level II	Gottlieb Memorial Hospital	Melrose Park
8	Level I	Loyola University Medical Center	Maywood

REGION	TRAUMA DESIGNATION	NAME OF HOSPITAL	CITY
8	Level II	MacNeal Hospital	Berwyn
9	Level II	Advocate Good Shepherd	Barrington
9	Level I	Advocate Lutheran General Hospital	Park Ridge
9	Level II	Alexian Brothers Medical Center	Elk Grove
9	Level II	Centegra Memorial Medical Center	Woodstock
9	Level II	Centegra Northern Illinois Medical Center	McHenry
9	Level II	Delnor Community Hospital	Geneva
9	Level II	Northwest Community Hospital	Arlington Heights
9	Level II	Provena St. Joseph Hospital	Elgin
9	Level II	Rush Copley Medical Center	Aurora
9	Level II	Sherman Hospital	Elgin
9	Level II	St. Alexius Medical Center	Hoffman Estates
10	Level I	Advocate Condell Memorial Hospital	Libertyville
10	Level I	Evanston Hospital	Evanston
10	Level II	Glenbrook Hospital	Glenview
10	Level II	Highland Park Hospital	Highland Park
10	Level II	Lake Forest Hospital	Lake Forest
10	Level II	Rush North Shore Medical Center	Skokie
10	Level I	St. Francis Hospital	Evanston
10	Level II	Vista Medical Center East	Waukegan
11	Level I	Advocate Illinois Masonic Hospital	Chicago
11	Level I, PEDIATRIC	Children Memorial Hospital	Chicago
11	Level I	John H. Stroger Jr. Hospital	Chicago
11	Level I, PEDIATRIC	John H Stroger Jr. Pediatric Trauma Center	Chicago
11	Level I	Mt. Sinai Hospital Medical Center	Chicago
11	Level I	Northwestern Memorial Hospital	Chicago
11	Level I, PEDIATRIC	Comer Children's Hospital	Chicago