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Evaluation of the Inland Counties trauma patient data collection, management, and analysis

Jenny P. Thayer

EVALUATION OF THE INLAND COUNTIES TRAUMA PATIENT DATA COLLECTION, MANAGEMENT, AND ANALYSIS

A Thesis

Presented to the

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In Partial Fulfillment

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in

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ABSTRACT

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The purpose of the study was to examine the status of hospital record-keeping methods in the Inland Counties Emergency Medical Authority service area and their applicability to evaluation. A conceptual framework of the entire emergency system is presented for orientation. From this framework a survey was developed, the results of which are presented in a series of tables. Attention focused on the need for valid data collection. Analysis of the data generated several recommendations.

The first recommendation is to develop and implement standardized regionwide forms to record patient data. The second is to include an injury severity scoring system in patient records. Information should be channeled to one centralized agency for storage, management, and evaluation. Such a Trauma Registry would provide a means for thorough investigation of epidemiologic, socioeconomic, and clinical aspects of trauma victims. Further research should also

include development of a patient outcome classification.

TABLE OF CONTENTS

CHAPTER

LIST OF TABLES

CHAPTER I

INTRODUCTION

It is generally agreed that public concern for emergency care was greatly stimulated by the report Accidents, Death and Disability: The Neglected Disease of Modern Society. The report was prepared by the National Academy of Science, National Research Council, and published in 1966.[1]

The report stressed the fact that survival rates among critically injured persons could be improved by better initial emergency care, transporting systems, and emergency care at health facilities. It identified the need to integrate these three aspects of the emergency care delivery process. The report recommended that emergency departments be classified and categorized, specifying the kinds of personnel, services, and equipment that should be available at each level.

In addition, the 1966 Highway Safety Act, Standard 11, directed states to demonstrate intent to develop effective emergency medical service programs or lose up to 10 percent of their federal highway construction funds. The major emphasis was on the improvement of transportation services, assuming faster response to emergency situations.[2]

In 1973 Congress passed the Emergency Medical Service Systems (EMSS) Act and authorized $175,000,000 to be spent

in improving emergency medical services and delivery. It provided assistance and encouragement for the development of areawide emergency systems.[3] By the end of 1979, Emergency Medical Services (EMS) funding reached a total of $451,800,000.[4]

The Act of 1973, extended by the amendments of 1976, provided funds for the development of numerous components of the EMS system.[5] Listed were: manpower, training, communication, mutual aid, public information and education, transportation and access to facilities, critical care plans, evaluation, disaster planning, public safety agencies, coordinated patient record keeping, consumer participation, and periodic comprehensive review. The major contribution of the EMS Act and its later amendments has been to promote the concept of the emergency medical services as a system; the fulfillment of its final objective is dependent on the adequate planning and operation of each one of its 15 components.

Early Trauma Systems

Despite the alarming rate of accidental injuries and deaths, the civilian sector is just now starting to develop trauma care systems. The military made the most advances in the care of critically injured persons, with significant improvement during World War II. Care of trauma patients was further refined during the Korean and Vietnam conflicts.[6]

A marked decrease in battlefield mortality was credited to 1) well-trained paramedical personnel in the field, 2) good communications, 3) rapid transportation systems, and 4) physician specialists in well-equipped trauma-center hospitals (MASH units). In Vietnam, 97.5 percent of patients reaching U.S. medical facilities alive were able to survive, compared with 95.5 percent in World War II and the Korean War.[7] The military application of Emergency Medical Services offered a model for the early regional trauma systems.

As early as 1961, a pioneering clinical shock-trauma unit at the University of Maryland began studying the pathophysiologic, immunobacteriologic, and biochemical response to shock in humans.[8] The early emergency care systems were designed by physicians and surgeons in order to respond to specific types of emergency patient needs. By organizing specialized personnel, equipment, and technology, pre-hospital programs were developed and refined. The first civilian trauma unit was established in 1966 in the Cook County Hospital in Chicago. During 1971, a statewide system of trauma centers was implemented in the state of Illinois.[9] Most recently, several states and local regions have developed systems of trauma care. The number and availability of such services are, however, insufficient in both rural and urban communities.

The Inland Counties Region

The Inland Counties region is geographically diverse, covering 40,607 square miles of southwestern California, with vast stretches of sparsely-populated desert and mountain areas, ranging from Mt. Whitney to Death Valley.[10] (See Map, Appendix A-1.) The need for a trauma system in this region was based in part on the high rate of motor vehicle accidents occurring here. The rate was higher than both the rate for California and the United States as a whole. Furthermore, it was found that 18 percent of all deaths from motor vehicle accidents in this region occur during the pre-hospital phase.[11] Statistics have shown that the ratio of mortality to injury was the highest in the state, as well as in the country as a whole.

With a population of approximately 1.5 million people, there were 324 deaths in 1979, or 2.69 percent of the 11,726 injuries. In comparison, Los Angeles County, with an approximate population of seven million people, had 1,323 fatalities, 1.2 percent of the 109,077 injuries.[12]

The fatalities in the Inland Counties region were not concentrated in particular cities or areas but were evenly distributed throughout the region. In 1978, the Inland Counties Emergency Medical Authority (ICEMA) identified reduction of the high level of accidental injuries and deaths in the region as a major priority, and this priority was endorsed by the funding agency.[13] Ensuring that quality

emergency medical care be available to 1.5 million residents and the massive transient population vacationing and/or traveling within these boundaries was a complex but essential undertaking. The Inland Counties Emergency Medical Authority is the lead agency established under the Joint Powers Agreement by the counties of Inyo, Mono, Riverside, and San Bernardino to be responsible for planning, developing, and managing a comprehensive, coordinated system of emergency medical care throughout the four-county region.[14]

Development

To date a number of steps have been taken to define and implement the trauma system. In the early stages, Dr. James McMullen, a Riverside surgeon, became the trauma consultant for this region. He researched the Seattle Trauma System and other systems in the United States. After formation of a Trauma Advisory Committee, the next step was to identify and designate hospitals in the region which are equipped and committed to provide care for the severely traumatized patient.

The committee established criteria for Level I and Level II Trauma Care facilities based upon criteria published by the American College of Surgeons (Appendix A-2). In June 1980, Loma Linda University Medical Center was designated the Regional Trauma Center (Level I), and Riverside General Hospital, Riverside Community Hospital, Desert Hospital in Palm Springs, the San Bernardino County

Medical Center, and San Antonio Hospital in Upland were named Area Trauma Centers (Level II). The Trauma Advisory Committee appointed an ad hoc committee to develop criteria and procedures for the identification of trauma patients who would be treated within the context of the system.[15]

In September 1980, Governor Brown signed SB 125, the Garamendi-Torres Emergency Medical Services System and Prehospital Emergency Medical Care Personnel Act. Under the new Act, approval and monitoring of EMT-I training programs in accordance with statewide regulation became the responsibility of the County Health Officer, who must issue a certificate to graduates of such programs, provided they meet all requirements. A county-issued certificate is now a prerequisite for service as an ambulance attendant and is valid statewide.

The Inland Counties Region is first in the nation to have implemented the Trauma Score System, which was adopted by the American Trauma Society in 1980 (Appendix A-3). The Regional Trauma System, after two years of planning, became operational on January 2, 1981.[16]

Statement of the Problem

The problem involved in this investigation is the determination of current record keeping related to trauma patients admitted to hospitals in the ICEMA service area.

Significance of the Problem

At the present time, there is no single, uniform method for evaluating the quality of medical care. For the most part, emergency medical care evaluation methods have been considered in terms of structure-process-outcome paradigms advanced by Donabedian.[17] However, the evaluation of these systems that has taken place has been accomplished almost entirely on the basis of the structure and process measure, and not on outcome measures.

The EMSS Act established EMS system evaluation as not just a desirable by-product of federal funding, but as a major pre-condition for such initial awards and subsequent renewal. Specifically, Section 1206 of the EMSS Act, outlining the minimum set of components for fundable EMS projects, states that an EMS system must

> provide for periodic, comprehensive and independent review and evaluation of the extent and quality of the emergency health services provided in the system's service area; and submission to the Secretary of the U.S. Department of Health, Education and Welfare of the reports of such review and evaluation.[18]

With the passage of the EMSS Act of 1973, however, a significant inadequacy was addressed--the absence of suitable quality regarding medical care evaluation methodologies. Without proper evaluation of the quality of the care provided by EMS systems, it is not possible to determine whether improvements have actually been made.

Purpose of the Study

The purpose of the study is to identify strengths and weaknesses in record-keeping methods of hospitals in the ICEMA service area so that an assessment of the consistency and application of trauma evaluation can be determined.

Hypothesis

The Inland Counties Trauma System was implemented with adequate data collection procedures for the measurement and evaluation of the program's outputs, as well as for retrospective evaluation of the system's effectiveness.

Definition of Terms Used

Base Station Hospital: a hospital which, upon designation by the local Emergency Medical Service agency, is responsible for directing the advanced life support systems. There are 19 base station hospitals in the Inland Counties region.[19]

Categorization of Facilities: the institutional capacity to deal with the broad spectrum of traumatic emergency conditions and a statement specifying the kinds of personnel, services, and equipment to be available at each of the two levels.[20]

Emergency Medical Services (EMS): this group consists of communication, transportation, medical, and related services rendered in response to the perceived individual need for immediate care in order to prevent suffering and

disability and reduce the incidence of death.[21]

Glascow Coma Scale: as assessment of the patient's eye opening and verbal and motor responses (Appendix A-3).[22]

Injury Severity Score (ISS): a method for numerically describing the overall severity of an injury. It is derived by grading injuries to the various body systems (respiratory, cardiovascular, central nervous system, abdominal, musculoskeletal, skin, and subcutaneous) on a scale from one to six (Appendix A-4).[23]

Lead Agency: the agency responsible for coordinating the emergency medical service care programs of the region and performing the common administrative functions of those programs. In San Bernardino County, the lead agency is the Inland Counties Emergency Medical Authority (ICEMA).[24]

Mobile Intensive Care Nurse (MICN): registered nurse who is certified in Advanced Cardiac Life Support and who has demonstrated proficiency in performing the skills of directing the emergency care activities of the pre-hospital care team.[25]

Paramedic: an individual who practices only in advanced life support field care according to prescribed standards.[26]

Regionalization: the coordination and delivery of care based on a designated geographical area.[27]

Trauma: "any physical insult to the patient" (American College of Surgeons). Trauma implies a sudden

onset of serious injury, often multiple, requiring successive treatment and triage through a system where escalation of care will parallel patient needs.[28]

Trauma Center Designation: Level I, Regional Trauma Center--resuscitation and initial care, standard operative procedures, and intensive care management; specialized care, such as burns and limb replacement; education and research of trauma problems within the region. Level II, Areawide Trauma Center--resuscitation and initial care, standard operative areas, and intensive care management.[29]

Trauma Score System: system for measuring five simple variables related to trauma: systolic blood pressure, respiratory effort, respiratory rate, capillary refill, and the Glascow Coma Scale. It is a measure of injury severity.[30]

Trauma System: arrangement of personnel, facilities, and equipment for the effective and coordinated delivery of trauma care.[31]

Triage: the process of sorting those patients who will receive treatment immediately. The process involves decisions that relate to both the transport and facility to which the patient is taken for initial and definitive care. The purpose of field (pre-hospital) categorization of patients is to attempt to get the right trauma patient to the right hospital at the right time.[32]

CHAPTER II

RELATED RESEARCH

Introduction

Accidents are currently the fourth most common cause of death in the United States, exceeded only by deaths from cardiovascular diseases, cancer, and cerebrovascular diseases.[33] Trauma is the leading cause of death in persons under the age of forty.[34] Between the ages of fifteen and twenty-five years, accidents claim more lives than all other causes combined, nearly five times more than the next leading cause of death.[35] Trauma is the leading killer of the most vigorous and promising segment of our population, the young and productive.[36]

In 1982 there were about 165,000 deaths from trauma in the U.S., and for each death there were at least two cases of permanent disability.[37] About half of the trauma-related deaths in this country involve motor vehicles. In 1979 there were 51,900 deaths related to the use of motor vehicles. Approximately 78 percent of the deaths involved automobiles, trucks, and motorcycles; 18 percent involved pedestrians; 2 percent involved bicyclists; and 2 percent involved collisions with trains.[38]

Because trauma primarily affects people at or near

the beginning of their most productive work years, its cost measured in lost productivity from both death and disability is high, more than 63 million dollars per day in lost wages from accidental trauma alone, according to recent estimates by the National Safety Council. The total annual cost of accidental trauma, including lost wages, medical expenses, and indirect work losses, comes to approximately 50 billion dollars.[39]

Recognizing this problem, the civilian sector is just now starting efforts to develop trauma care systems, to organize specialized designated care facilities, and to support public service programs for the improved care of accident victims. Federal funding initiatives and media exposure have created a tremendous momentum for improved trauma care, particularly in the area of developing trauma centers.

Trauma centers specialize in the treatment and care of the critically ill and injured patient. This effort requires a concentration of highly specialized and expensive manpower, equipment, and supplies. Increased coordination of information systems is necessary to provide feedback, insuring quality of patient care and overall system effectiveness.

Medical Care Evaluation

In order to determine whether EMS systems developed under the auspices of the EMSS Act have, in fact, improved

the quality of emergency patient care, it is necessary that these EMS systems be subjected to thorough evaluations. Although most, if not all, of the evaluations of these EMS systems have been carried out on the basis of structure and/or process measures, it has been agreed that evaluation on the basis of outcome measures is potentially a much more revealing measure of the quality of medical care provided.[40] In order to evaluate meaningfully the quality of medical care on the basis of outcome measures, however, the severity of the injury of incoming emergency patients must be considered.

Additionally, in order to conduct a detailed evaluation of a particular EMS system, not only is it necessary to have injury severity information, but it is also necessary that information regarding the specific type and body location of the injury be available for use.[41] It will, therefore, be basic to the evaluation of the quality of emergency medical care provided that a precise, standardized recording method of identifying the body location and type and severity of the injuries of incoming emergency patients exist and be available for use. It is further proposed by Brook that if outcome information is used for both prospective monitoring of care and for quality assessment, the time window chosen must be as close to the intervention of care as possible, so that problems can be identified and rectified quickly.[42]

The provision of quality medical care has in past

years become a subject of much discussion. Much has been written regarding the "right to receive it" (Kennedy[43] and Ribicoff[44]), and many programs have been developed with the goal of assuring it (Fisher, Jelense, and Perry[45]; Sauer[46][47]; and Lockwood[48]). Considerable debate has also arisen about the capability of the existing medical care system to treat critically injured patients (Cowley and Scanlan[49]), while Schleuter [50] notes that inadequate emergency medical care is a national problem that has only recently come into the limelight.

Since regionalized trauma care originated in Illinois, many studies have been conducted on the evaluation of trauma systems in that state. Willemain[51] has critically reviewed the studies of the Illinois Trauma System and raises serious questions regarding its success. He states that proof of the System's effectiveness rests on three findings: one, patient redistribution; two, change in the time and place in patient deaths; and three, a declining number of deaths per injury. Willemain's reinterpretation of these results is revealing. First, the increase in the number of accident victims taken to trauma centers "should be interpreted as a measure of compliance rather than as a measure of success." Second, the increase in occurrence of deaths in ambulances and hospitals as opposed to deaths at the scene is of little or no advantage if the outcome is death in either case. Third, Willemain objects to the claim

that deaths per person injured decreased, noting that researchers failed to control for the severity of injury. He offered the following comments:

> Input measures are of limited usefulness for EMS evaluation since they reveal nothing of system performance, offering only hints of system potential. Process measures are measures of systems efficiency. If one accepts as given the value of an EMS system, process measures can be quite useful in monitoring performance. However, if one cares not only "that something be done" for emergency patients but that the care be effective, then one would like to use the more expensive but more meaningful outcome measures.[52]

Based on Donabedian's pioneering efforts, evaluation procedures for health care services can be categorized according to the types of measures upon which assessment is based: 1) structure, 2) process, and 3) outcome.[53]

Structured Measures

Structured measures are concerned with descriptive, innate characteristics of facilities or providers. Examples are the number of ambulances, training of emergency medical technicians, types of support, technology, and specialty physicians. Evaluation of the structure of the medical care system consists of the study of the setting in which the care takes place. It is concerned with such things as the administrative structure and the operations of programs, the adequacy of facilities and equipment, and the qualifications of the medical staff. It does not monitor the performance of a single hospital over time, nor does it evaluate performance.

Process Evaluation

Another approach to evaluation is to examine the process of medical care rather than its structure. This is justified by the assumption that one is interested not in the setting and instrumentalities of a medical care system, but whether in what is known to be "good and proper" medical care has been applied. Judgments, using this approach, are based on considerations such as justification of diagnosis and therapy; technical competence in the performance of diagnosis and therapeutic procedures, including surgery; evidence of preventive management of both health and illness; coordination and continuity of care; acceptability of delivered care to the patient, etc. This approach requires that a great deal of attention be given to specifying the relevant standards, values, and dimensions to be used in evaluation.

Although process and quality of care have been expected to be more highly correlated than structure and quality of care, few positive relationships have been established. For instance, Fessel and Van Brunt[54] evaluated the quality of care for acute appendicitis and acute myocardial infarction through process criteria abstracted from medical records at three different hospitals. They could establish no significant relationship between the frequency of documentation of signs or symptoms and outcome, an indicator of quality of care.

Romm and Hulka[55] conducted a study on diabetic patients to determine if a relationship exists between process of medical care and outcome. In this study they concluded that there was only one significant association between a process measure (communication) and an outcome (satisfaction). Since the analysis provided an opportunity to demonstrate relationships among a number of process measures and two different outcomes, they surmised that the process measures in this study were inadequate predictors of patient outcomes.

A number of other studies indicate that process measures cannot be used reliably or consistently as proxies for predictors of patient outcomes. If this is generally true, then process and outcome measures should be considered independent, perhaps equally important, measures of quality of care.[56]

Evaluation of Outcomes

There are four major uses of outcome measures. They include examining the efficiency of treatment, measuring the effectiveness of care, developing policy guidelines, and monitoring quality assurance activities. As Donabedian noted:

> The validity of outcome as a dimension of quality is seldom questioned. Nor does any doubt exist as to the stability and validity of the values of recovery, restoration and survival in most situations and in most cultures.[57]

The measurement of outcomes of medical care must include assessment of mortality and morbidity, but it should also

include days of disability, degree of disability, days of hospitalization, etc.[58] Meaningful measurement of outcomes of emergency medical care requires a means of comparing the results of treatment for patients with a similar degree of trauma.

In order to conduct in-depth, comparative evaluations of EMS systems based on outcome measures, differentiation among incoming patient severity levels has been indicated as being necessary. Therefore the measures used in such evaluations must be specific in categorization of injuries. The use of valid indices of illness and injury severity is vital to assessment of health outcome and may be useful for triage, for epidemiological studies, for comparative evaluation, and for prediction of outcomes.[59]

In an attempt to compare process and outcome measures based on evaluation methodologies, Brook and Appel conducted a study involving Baltimore City Hospital patients who had one of three selected medical conditions. They found that process evaluation, the most widely-used method, was the most severe method and, consequently, indicated that low quality of care was being provided. This is in contrast to the relatively high percentage of cases in which the care was considered acceptable when judged on the basis of outcome. In addition, it was found that judgments based on process evaluation correlated only weakly with actual patient outcomes.[60]

In England, Lipworth et al. [61] studied the death rates of patients admitted with various conditions to both teaching and non-teaching hospitals. They found that the death rates in teaching hospitals were always lower than those in non-teaching hospitals. In over half of the patient conditions studied, they found that the difference was statistically significant.

One of Brook's conclusions regarding quality assessment methods was that the major reason for the focus on outcomes in assessing the quality of care is the recognition that use of structural and/or process variables alone may be invalid and the belief that outcome measures have more face validity in that they focus directly on health status.[62]

Evaluation Measures for EMS Systems

As earlier stated, the goal of the EMSS Act of 1973 was to improve the quality of emergency medical care and reduce morbidity and mortality. Indicating the need for EMS evaluation, Gibson[63] notes "that we lack adequate knowledge of which EMS intervention strategies have the greatest potential in reducing morbidity and mortality." Considering this, it could be expected that research into the use of outcome measures in evaluating EMS systems would be the highest priority. Gibson, however, in his review of the 24 EMS research projects presented at the November 1973 American Public Health Association meeting, pointed up a major cause for concern in this area--not one of the 24

presentations dealt with EMS systems evaluation from the viewpoint of patient outcome.

The necessity that patient mix be taken into consideration was addressed by Baker et al.[64] in their development of a trauma severity index. Specifically, they note that

> Mortality rates for a trauma unit such as the Maryland Institute for Emergency Medicine, where the typical patient has sustained multiple injuries, cannot be compared meaningfully with mortality rates for all admitted injured patients at another hospital.

Only through careful consideration, or control, of the body locations and types, or severity levels, of injuries of patients entering a particular EMS system can an outcome measure be used to provide a valid reflection of the medical care delivered by that EMS system. As the severity of injuries and the level of care necessary become greater, the probability that adverse outcome will result also increases. This fact was alluded to by Baker et al.[65] in their statement regarding the differences in mortality rates between the Maryland Institute for Emergency Medicine and the other Baltimore area EMS facilities. This difference was also considered by Roemer et al.[66] In their study of the quality of hospital care, as measured by patient outcome, they established that crude death rates must be "corrected to take into consideration the fact that certain types of hospitals have a larger proportion of seriously ill patients than others."

Evaluation Tools

Meaningful measurement of outcomes of emergency medical care requires a means of comparing the results of treatment for patients with a similar degree of trauma. Therefore, indices of severity are essential for describing and evaluating the variable quality of emergency medical care. Since the end result of mortality and morbidity from emergency medical care is a function of both quality of care and severity of the patient's illness, one must control for patient severity before comparing the survival rates of two EMS systems and facilities or for one system or facility at two points in time. This section presents the rationale for the development of severity indices and the role such indices can play in various research and evaluation situations.

Uses of Indices

Indices used for pre-hospital triage should include data elements which can categorize patients at the scene and direct the right trauma patient to the right hospital at the right time. At the scene of the crisis, triage decisions focus on both the means of transportation and the hospital to which the patient is taken.[67]

Indices used for epidemiological studies require detailed anatomical diagnosis and are based on more extensive information. For indices to be used for comparative evaluations, the information on which they are based must

be collected reliably on a routine basis. The criteria Gibson used in evaluating the indices were reliability, validity, and data requirements.[68]

Status of Existing Indices of Severity

The Committee on Medical Aspects of Automotive Safety of the American Medical Association designed the Abbreviated Injury Scale (AIS) to provide researchers with accurate methods for rating and comparing injuries received in automotive collisions and to standardize the language used to describe the injuries. The AIS is made up of brief statements illustrating common injuries of varying severity associated with the body systems, head and neck, chest, abdomen, and extremities and/or pelvic girdle. The injuries are combined according to their severity into nine categories: 1) minor, 2) moderate, 3) serious, 4) severe, 5) critical, 6-9) maximum injury, virtually unsurvivable.[69]

Since its development, the AIS has been adopted for use worldwide by collision research investigators; however, it was soon realized that scientific investigation teams require a more comprehensive injury scale. The Committee on Medical Aspects of Automotive Safety developed the Comprehensive Research Injury Scale (CRIS) to meet this need.[70] It is designed to be used primarily by persons who tabulate and evaluate data as opposed to investigators in the field. Its design forces the investigator to be precise in categorization, as it separates the criteria used to scale injuries into five

separate categories: 1) energy dissipation, 2) threat to life, 3) permanent impairment, 4) treatment period, and 5) incidence. However, the CRIS does not include detailed information regarding the body location and type, or severity, of injuries.

The Injury Severity Score (ISS) was developed by modifying and extending the AIS and to provide a numerical description of the overall severity of trauma in persons who have sustained injury to more than one area of the body.[71] Each injury is categorized by body area and severity. After grading all injuries for the emergency patient, each body area is categorized by the most severe injury in that area. The grades for each of the three most severely injured areas are squared and the results added together. The resulting figure is the Injury Severity Score of the patient.

Devised with the goal of providing researchers with the means to compare groups of patients classified by overall injury severity, the ISS was to be used to evaluate methods of treatment, identify problem areas, and document progress in the area of emergency medical care. The ISS appears to be a valuable EMS systems evaluation instrument because it allows the grouping of patients on the basis of overall injury severity and the score is determined directly from the injuries sustained by the emergency patient.

Headrick developed an index measure that is said to be highly correlated with emergency patient outcome and that

contains information relating to body location and type or severity of injuries.[72] The System Input Severity Measure (SISM) was developed as an outcome-based measure designed for use in the detailed evaluation of EMS systems, including assessment of the effectiveness of specific treatment regimens. It includes information regarding body location and type and severity of injuries incurred.[73] The validation of the applicability of the SISM demonstrated that a detailed outcome-based evaluation measure can be used to evaluate the quality of care being provided by an EMS system.

Kirkpatrick and Youmans[74] noted that a serious defect in the present system of emergency medical care is in the triage techniques used to determine which facility is best suited for a particular accident victim and to establish the type of medical personnel required at the scene of an accident. In an attempt to correct that defect, the Trauma Index was devised.

The Index has five parameters (region, type of injury, cardiovascular status, central nervous system status, and respiratory status), each with four categories of severity. It relies on the subjective judgment of clinicians and does not meet the other reliability criteria.

In attempt to demonstrate the usefulness of Trauma Index developed by Kirkpatrick and Youmans, Ogawa and Sugimoto of the Osaka (Japan) University Hospital conducted a one-and-one-half month field research project.[75] An adapted Trauma

Index Score was determined by an ambulance attendant at the accident scene or en route to the hospital for each of 1,297 patients who were not dead on arrival. The status of each of those 1,297 emergency patients one week after the occurrence of their trauma was determined. This status was then compared to the original Trauma Index score. The results of these comparisons showed a significant relationship between the Trauma Index computed during the pre-hospital period and the status of the emergency patient one week later.

The authors concluded from this study that in the performance of pre-hospital triage, a device like the "Trauma Index would be one of the simplest and most reliable devices for use by non-physicians without elaborate equipment."[76] However, the body location and type and severity of injuries are not incorporated into the development of the Trauma Index score in sufficient detail to allow it to be used in an in-depth evaluation of EMS systems.

Trauma Registry

A major barrier to improving trauma care is the lack of cumulative knowledge and experience in the complex management of severely injured trauma patients. The general inadequacy of the present medical record system further compounds the problem.

The National Academy of Sciences/National Research Council suggested that regionally oriented trauma data collection systems be devised and implemented. This trauma

registry should be programmed for general basic questions and should be flexible enough to evaluate the efficacy of projected major health care adaptations.[77]

In response to this obvious deficiency, a computerized Trauma Registry has been developed at the Trauma Unit of the Cook County Hospital, the Department of Surgery of the Abraham Lincoln School of Medicine, and the Research Laboratory of the University of Illinois in Chicago.[78]

The Registry was developed as the principal evaluation tool for the comprehensive set of medical programs and designed to store a vast amount of significant data to allow for the multifactorial analysis of traumatic events. The Illinois Trauma Registry became operational in 1971. Continuously-gathered information from forty statewide trauma centers includes demographic, diagnostic, and outcome data on each emergency patient.[79] Up to twenty diagnoses, using ICDA numbers, can be indicated for each trauma incident. Outcomes included in this data base are life and death, with an indicator of time of time-to-death. As the type or severity and body location of injuries are directly identifiable from most ICDA numbers and the outcome data are well defined and readily obtainable, the Registry appears to be suitable for research purposes.[80]

In 1979 Charters and Bailey presented a simplified computer-based trauma registry at the University of California Hospital Medical Center in San Diego. The

registry is reported to have a well-defined limit of data capture with the advantage of being relatively inexpensive.[81] It can utilize the hospital's existing computer and data services, provide simplicity of operation with forms which accurately define the limits of data capture, and provide a potential for growth and additional data capture.[82]

The disadvantages reported are limitations to specific categories of information that are likely to be recorded in the clinical record. It is also difficult for data capture personnel to make interpretive observations. In summary, the authors state that they found the ISS to be a useful scale that can be used to indicate the severity of injury.[83]

A study conducted by Goldberg, Gelfand, Levy, and Mullner examined the Illinois Trauma Register (ITR). Their analysis revealed that cases were drastically underreported, showing a median 44.4 percent of incompleteness.[84] With so great a percentage of cases missing, the utility of the ITR is severely limited. Mortality and admittance to intensive care units were found to be overreported, while hospital stay was underreported. The ITR gives the impression that mortality is higher and a greater proportion of patients is admitted to the intensive care unit than is the case.[85]

The authors suggested guidelines for future registers and indicated that such registers should be established only when the required information cannot be obtained by other means. Selected specialized evaluative studies, such as a

yearly sample survey of both Trauma Center and non-Trauma Center hospitals was said to be an effective and less costly method of evaluation. Other suggestions were to state the precise target population, to collect the smallest data set which answers the most important questions, and to properly train personnel responsible for data ascertainment.[86]

Data Collection in Orange County

The objectives of the Orange County EMS office are to develop and standardize automated data collection systems which will provide information from the patient's entry into the system to his return to pre-hospital status. Since the program's inception, the office has developed a new Paramedic Report, a Paramedic Hospital Tracer form, a MIC Nurse form, and a final Trauma Registry Report that is the combination of all other reports. The data have not yet been computerized so that they can be fed back into the system.

The first page of the trauma registry is filled out by the base station medical intensive care nurse whose facility may or may not be designed as a trauma hospital. This page of patient information includes patient indentification, access, timing of ambulance service, condition, and treatment at the scene. This portion is then sent to the trauma nurse coordinator at the hospital treating the patient. The trauma nurse coordinator, after reviewing the patient's hospital chart, scores the severity and

completes the remainder of the form.

The validity of the data in the trauma registry that pertains to mortality and morbidity is determined by the severity score. The severity score index used by Orange county nurse coordinators was developed by Baker, O'Neill, and Haddon for blunt injuries.[87] The ISS is the sum of squares of the highest Abbreviated Index Score (AIS) rating for each of the three most severely injured body parts. All of the trauma nurse coordinators in Orange County were originally trained by Richard Gales (past Medical Director) to score for severity using the Baker et al. scoring process but in a slightly modified form. The Baker et al. score was originally developed for blunt injuries, but in Orange County it is also being used for penetrating and other trauma injuries.[88]

The reports are forwarded to the EMS office, and an internal evaluation of the data is done on a monthly basis for trauma hospitals and on a quarterly basis for non-trauma hospitals. Outcomes evaluated are life or death only.

Summary

With the passage of the EMSS Act of 1973, substantial sums of money have become available for use in developing improved EMS systems. Evaluation of these newly developed systems have been less than adequate. Even in those cases where genuine efforts were made at evaluation, they have been accomplished almost entirely on the basis of structure

and process measures. Although numerous studies were made of evaluation, they have been undertaken with the purpose of establishing predictable relationships between structure and/or process of medical care and the quality of medical care, very few such relationships have been identified. As there seem to be few identifiable relationships between structure and the quality of medical care or between the process and quality of medical care, little progress toward adequate evaluation of the EMS systems appears possible using these measures.

Evaluation of the EMS systems on the basis of outcome measures, on the other hand, has many advantages. Outcomes tend to be fairly concrete; they are amenable to relatively precise measurement; and the quality of care provided by an EMS system should be reflected in the outcome of its patients. It becomes readily apparent that an EMS system which specializes in patients with multiple severe injuries will have a lower rate of favorable outcomes than will one which treats only those patients with minor injuries. In order to conduct in-depth comparative evaluations of EMS systems based on outcome measures, differentiation among incoming patient severity levels has been indicated as being necessary.

It appears that the development of severity indices is essential in order to describe the effectiveness of emergency care. It also appears that this effort should be accompanied by the development of appropriate outcome measures by which

indices of severity could be validated.

In general terms, if a scale is to be useful in emergency medical situations, then it should be reflective of the degree of functional limitations of the patient. In addition, since an index is only as good as the data on which it is based, careful attention must be directed to the development of quality data bases.

A review of the literature pertaining to evaluation tools revealed that there are many guidelines but no clear-cut rules for processing raw input into meaningful systems. There is no foolproof method which would consistently provide the most valid information to evaluate system effectiveness in relation to mortality, morbidity, and outcomes.

CHAPTER III

RESEARCH MODEL

Introduction

The Inland Counties Trauma System is currently in a developmental state. Therefore, in order to design this study, extensive system research was necessary in order to analyze its inputs, interrelationships, and scope. Chapter II presents the magnitude of the task and explains why attention was focused on understanding the environment of evaluation and data collection.

Current Status of Data Collection in California

Fifty-four counties in California (93 percent) have some method for collecting patient data although the methodologies used and amounts of information collected vary greatly. Some of the emergency patient data recommended for uniform collection regionwide is already being recorded on patients' records. However, the specific items as they relate to trauma victims vary considerably, making the information difficult to retrieve for management purposes.

Data that are presently available and which relate to probable demand for EMS include data compiled by the

Department of Health on mortality by cause of deaths and data available from the County Coroner's office. Additional data are provided by the California Highway Patrol (CHP) and the U.S. Bureau of the Census.

Importance of the Problem

An editorial note in a recent report to the California legislature stated that

> until improved emergency medical services system data management systems are instituted throughout California, it will be essentially impossible to evaluate the magnitude of the impact of EMS systems development.[89]

Preliminary data provided by three northern California EMS agencies that have automated data management systems seem to indicate a benefit in having an organized EMS system in these areas. Despite improvements in the availability of trauma patient data, data that are uniform regionwide are still lacking and are not systematically collected.

Several questions have been raised with regard to the status of data collected in the Inland Counties Trauma System Region:

1. What are the reporting requirements placed on the program and do they adequately measure the program's outputs?

2. Is enough data being collected and is it useful or necessary?

3. Are the results being fed back into the system?

4. Is the information now collected uniform and suitable for tabulation?

5. Would the data now being collected be applicable to future computerization on a regional or statewide level?

The Emergency Medical Service System is currently funded by federal, state, and local governments. The EMSS Act had as its stated goal the improvement of the quality of emergency patient care and the reduction of morbidity and mortality associated with accidental injuries. The review of the EMS outcome measures can be useful preparation for more careful thought about the nature and limits of personal and public responsibility, including unavoidable choices society makes among the problems competing for public resources.

Theory

Systematic collection and centralized storage of trauma patient data will make it possible to evaluate the system, provide feedback into the EMS system, and provide easy access to data for research purposes. The Office of Emergency Medical Service Administration has the responsibility for evaluating the trauma system. Ideally, outputs should emerge as a result of system processes and flow from the system into its environment. Objectives are then transformed by the processor into outputs. By review and assessment, these outputs can be measured throughout the system to

monitor the objectives. Monitoring the system involves periodically reviewing the system operation, its outputs, and its outcomes to acquire feedback for use in steering the system.

The use of a standardized trauma index and maintenance of a trauma log would enable physicians to compare mortality and morbidity in various patient groups. This could lead to improvement in emergency, postoperative, and rehabilitative care within the hospitals serving the critically injured.

Hypothesis

The Inland Counties Trauma System was implemented with adequate data collection procedures to allow for the measurement and evaluation of the program's outputs, as well as retrospective evaluation of the system's effectiveness.

Significance of Hypothesis

If the hypothesis can be verified and there is adequate data collected to accomplish evaluation and monitoring of the system's effectiveness, then there will have been significant progress made toward solving major problems in that area.

Evaluation of the hypothesis involved in this investigation will allow a determination to be made regarding the adequacy and effectiveness of the method of data collection in the EMS under consideration.

If evaluation indicates that the trauma system is

inadequate to address the impact upon mortality rates among the critically injured, one will be able to focus upon alternatives into which funds could be shifted, such as prevention and education.

Population

The population for this study will come from trauma and non-trauma hospital emergency room departments located within the Inland Counties region. This includes the counties of San Bernardino, Riverside, Mono, and Inyo.

Sample Selection

At this time, the Health Systems Agency lists thirty-five hospitals providing emergency care, ranging from standby to Level I trauma centers. Since trauma patients are treated at all hospitals regardless of designation, all emergency departments in this region will be contacted and asked to respond to the survey-questionnaire.

Acquisition of Data

The sample frame of selected hospital emergency departments will be contacted by mailing out a survey-questionnaire, complete with a cover letter, explaining the reason for the study and making an appeal for their cooperation in compiling data for this study (Appendix B-1, 2).

Data Elements Under Study

The State of California Emergency Medical Services Agency states that it is necessary to maintain and report some minimal information regarding utilization and effect of the trauma system.[90] This is the purpose of the Monthly Trauma Service Report. In addition, the American College of Surgeons Committee on Trauma developed a Hospital Trauma Index in an attempt to standardize and quantify the degree of injury to patients.[91] These data elements will be used in this study as a guideline for comparison with the actual data collected by hospital emergency departments within the ICEMA service area. These Trauma Patient Data Elements are outlined below.

Hospital Emergency Department/Room

Data Elements	Comments
Name	Linkage of records for special studies
Sex	
Age	Analysis of utilization patterns
County of Residence	
Case Number	
Time	
Patient Arrival	Analysis of system response time patterns
Seen by Physician	
E.R. Care Provided	
Mode of Arrival	
Police	Analysis of system dynamics
Fire Vehicle	
Basic Life Support	
Advanced Life Support	
Air	

Data Elements	Comments
Injury Information	
Cause of Injury Distance from Accident	Identification of types of problems generating the need for service
Diagnostic Category	
Trauma Burn Surgical	Analysis of utilization patterns; correlation with patient disposition; identification of diagnostic categories for special studies
Trauma Score	
Field Confirmed in E.R. Systolic B.P. Respiratory Effort Respiratory Rate Capillary Refill Glascow Coma Scale	Analysis of pre-hospital assessment
Injury Severity Score (ISS)	
Respiratory Cardiovascular Nervous System Abdominal Extremities Skin and Subcutaneous	Numerical description of overall severity of injury
Disposition of Patient	
DOA Expired in E.R. Transferred Admitted to Hospital Expired in Hospital Released Duration of Stay	Analysis of follow-up procedures; analysis of ER utilization by correlation with diagnostic category and urgency of condition
Disability	
None Temporary Long-Term Permanent	Evaluation of patient outcomes

Conclusion

There is no record of any comprehensive research having been accomplished in the State of California in this area of the health field. This researcher feels that this is a well-planned and much overdue research study. The data and methods used will make the validity easy to verify, and replication will be easy to accomplish.

CHAPTER IV

ANALYSIS

Introduction

The purpose of the study was to identify strengths and weaknesses in record keeping methods of hospitals in the ICEMA service area so that an assessment of the consistency and application of trauma evaluation could be determined. The ability to evaluate depends upon hospitals recording pertinent, uniform data elements, storing the data so it is easily retrievable, and sending the relevant data elements to a centralized evaluation agency to establish a trauma registry.

Hypothesis

The hypothesis considered in this investigation was that the Inland Counties Trauma System was implemented with adequate data collection procedures to allow for the measurement and evaluation of the program's outputs as well as retrospective evaluation of the system's effectiveness.

Presentation of Data

For the purpose of evaluating the validity of the study hypothesis, data were evaluated in three major categories: 1) patient data recorded in sample hospital emergency

department, 2) sample hospitals reported relevant data to the regional EMS office, and 3) data stored in a trauma patient log in the emergency room.

Demographic Data

Thirty-five survey questionnaires were mailed out and twenty-five completed questionnaires were returned (71 percent). Of those responding, eleven, or 44 percent, requested copies of the final report of this study.

The distribution and type of facility responding and included in this study are presented in Table 1.

TABLE 1

FACILITIES INCLUDED IN THIS STUDY

Facility Classification	Total No. in Region	No. Responding to Survey	% Total
Regional Center Level I	1	1	100
Trauma Centers Level II	5	4	80
General Acute Hospitals	29	20	69
Total	35	25	

Participating hospitals were asked to identify the number of trauma patients treated during the years 1983 and 1984;

Eighty percent of respondents had difficulty stating the numbers for these years. Comments such as "unable to determine due to time constraints," "not readily obtainable," "separate trauma log not kept," or simply question marks were substituted by a majority of the hospitals.

Examination of results of the portion of the survey dealing with patient demographics indicated that 15 percent of the general hospitals and 20 percent of trauma centers were able to supply trauma patient counts for those years. Table 2 presents results of the estimate of trauma patient load reported by participant hospitals.

TABLE 2

ESTIMATED FREQUENCIES OF TRAUMA PATIENT LOAD

Patients Seen	General Acute Hospitals	Trauma Centers
Routinely	3 (15%)	5 (100%)
Occasionally	9 (45%)	
Rarely	8 (40%)	
Total	20	5

While trauma centers are designed and equipped to treat severely injured patients, this survey counted twenty of the general hospitals that also treated some of the most severely

injured patients (trauma scores 6 or less) with some regularity.

Trauma Patient Log

An index in the form of a trauma patient log makes it possible to provide a patient count, to access medical records for further information, and to provide data for internal evaluation by the department. Results of this study indicate that 40 percent of trauma centers and 30 percent of general hospitals maintained a trauma patient log. The type of information stored, however, varies greatly from one facility to another, and it was found that only one E.R. department maintained a record of the ISS describing the overall injury to the victim.

Reporting of Data

The purpose of forwarding data reports to a centralized agency is to make it possible to provide an overview of the EMS system as a whole and to provide feedback to health care providers. It was found that eleven general hospitals (55 percent) and two trauma centers (40 percent) submit some data reports to the regional EMS office, although the specific items as they relate to trauma victims vary considerably.

Descriptive Data

A detailed presentation of the major data categories is presented in Tables 3, 4, 5, and 6.

Patient Information, Time, and Mode of Transportation

Patient information provides linkage of records for special studies and analysis of utilization. The key process measures are incidence and items of first aid rendered by E.R. and ambulance personnel and total response time from initial call to ambulance arrival at the hospital.

Table 3 illustrates the findings within this category. The results indicate that as a group, E.R. departments record the data with a frequency between 55 to 100 percent for the listed elements. The findings indicate that forwarding of the information to the regional EMS office was reduced to a range between 15 and 50 percent, with only minimal differences between general and trauma hospitals.

Injury Information and Diagnostic Category

To identify types of problems requiring trauma center services, it is necessary to establish the cause of injury and the distance to the hospital. The Diagnostic Category permits analysis of utilization patterns, correlation with patient disposition, and identification of diagnostic categories for special studies. The key process measures are accuracy of diagnosis, adequacy of treatment, and appropriate utilization of consultative resources.

Presented in Table 4 is the distribution among general hospitals and trauma centers. The rate of reporting this information to the regional office ranged between 30 percent

TABLE 3

PATIENT INFORMATION, TIME, AND MODE OF ARRIVAL

Data Elements	General Acute Hospitals (20)			Trauma Center (5)		
	Recorded in E.R.	Reported to EMS Office	Stored in Trauma Log	Recorded in E.R.	Reported to EMS Office	Stored in Trauma Log
Patient Information	%	%	%	%	%	%
Name	90	25	25	100	40	40
Sex	100	50	30	100	40	40
Age	100	50	30	100	40	40
County of Residence	55	20	10	80	20	20
Case Number	65	30	30	100	20	40
Time						
Patient Arrival	95	25	30	100	20	40
Seen by Physician	85	15	15	100	20	40
E.R. Care Completed	100	10	25	100	0	40
Mode of Arrival						
Police	90	30	25	80	20	20
Fire Vehicle	80	30	15	80	20	20
Basic Life Support	85	50	20	80	40	20
Advanced Life Support	90	45	20	80	40	20
Air	85	25	25	80	20	20

TABLE 4

INJURY INFORMATION AND DIAGNOSTIC CATEGORY

Data Elements	General Acute Hospitals (20)			Trauma Centers (5)		
	Recorded in E.R.	Reported to EMS Office	Stored in Trauma Log	Recorded in E.R.	Reported to EMS Office	Stored in Trauma Log
Injury Information	%	%	%	%	%	%
Cause of Injury	100	50	15	80	40	40
Distance from Accident to Hospital	25	30	10	60	40	40
Diagnostic Category						
Trauma	75	40	20	80	40	40
Burn	70	45	25	80	40	40
Surgical	70	35	20	80	40	40

and 50 percent for the general hospitals, and 40 percent for the trauma centers. A greater percentage of trauma centers stored this information in a trauma log, providing better capability for retrieval.

Trauma Score System and Injury Severity Score

The trauma score is a measurement of injury severity based on data obtained by paramedical personnel using non-invasive techniques and without resorting to instrumentation. The numerical grading system that quantifies field categorization is useful not only in triage, but also for comparative purposes in subsequent outcome studies.

The degree to which E.R. departments record and report this information is presented in Table 5. While trauma scores of victims were recorded by all trauma centers and by 55 to 80 percent of general hospitals, the reporting rate ranged between 40 to 55 percent for both types of facilities.

The findings within the I.S.S. category indicate that as a group the recording of information was 20 percent, and reporting between 5 and 20 percent. The results reveal that the Injury Severity Score was being utilized by one trauma center and by four general hospitals.

Disposition of Patient and Disability

Evaluation of end results constitutes the definitive measure of effectiveness of personal health services, of a treatment, or of a program as determined by the consequences

TABLE 5

TRAUMA SCORE SYSTEM AND INJURY SEVERITY SCORE

Data Elements	General Acute Hospitals (20)			Trauma Centers (5)		
	Recorded in E.R.	Reported to EMS Office	Stored in Trauma Log	Recorded in E.R.	Reported to EMS Office	Stored in Trauma Log
Trauma Score System	%	%	%	%	%	%
Field Report	80	55	20	100	40	40
Confirmed in E.R.	55	50	20	100	40	40
Systolic B.P.	85	55	15	100	40	40
Respiratory Effort	80	55	15	100	40	40
Respiratory Rate	80	55	15	100	40	40
Capillary Refill	70	45	15	100	40	40
Glascow Coma Scale	60	45	15	100	40	40
Numerical Description of Above	60	20	100	100	40	40
Injury Severity Score						
Respiratory	20	10	0	20	20	20
Cardiovascular	20	10	0	20	20	20
Nervous System	20	10	0	20	20	20
Abdominal	20	5	0	20	20	20
Extremities	20	10	0	20	20	20
Skin/Subcutaneous	20	10	0	20	20	20
Numerical Description of Above	15	10	0	20	20	20

for the individual patient or population.

Table 6 illustrates two categories dealing with patient outcomes. Results show that Disposition of Patient information was being recorded by a majority of hospitals, ranging from 70 to 100 percent for various elements. Hospitals were forwarding this data to the regional EMS office at a rate of 10 to 20 percent. In the category of disability, recording of information ranged between 5 and 40 percent, with no reporting to ICEMA by either type of facility.

TABLE 6

DISPOSITION OF PATIENT AND DISABILITY

Data Elements	General Acute Hospitals (20)			Trauma Centers (5)		
	Recorded in E.R.	Reported to EMS Office	Stored in Trauma Log	Recorded in E.R.	Reported to EMS Office	Stored in Trauma Log
Disposition of Patient	%	%	%	%	%	%
DOA	100	15	25	100	20	20
Expired in E.R.	100	20	25	100	20	20
Transferred	100	15	25	100	20	20
Admitted to Hospital	100	15	25	100	20	20
Expired in Hospital	80	10	15	100	20	20
Released	95	10	25	100	20	20
Duration of Stay	70	10	25	80	0	40
Disability						
None	20	0	0	40	0	0
Temporary	20	0	0	40	0	0
Long-Term	10	0	0	40	0	0
Permanent	5	0	0	40	0	0

CHAPTER V

DISCUSSION

Introduction

This chapter delineates the major areas of significance of this research. Conclusions drawn are based on the review of quality of care evaluation and injury severity index literature. Specific recommendations for research into further development and refinement of EMS data recording and trauma-related data bases are presented.

Implications of the Findings

In the operation of the ICEMA trauma system, it was found that there is an unworkable data collection system. Data that are available are not systematically collected, analyzed, or utilized. Information criteria and methods for estimating the need for and assessing the availability and capability of services and resources should be developed. Many of the critical evaluation elements are lacking or incomplete. For example, only 20 percent of hospitals within this region utilize and record the Injury Severity Score. Surveying the sources of data, it becomes apparent that there is a definite lack of standardization of data elements to be included in a trauma data base. Of particular

interest are those data elements associated with scoring the overall injury of the trauma patient and patient outcomes.

Emergency departments, like other hospital departments and other organizations, can be managed best if good information is available about workload, performance, patient volume by day and week, shift, and type of patient. This information can be used in determining requirements for staff, equipment, and supplies. Moreover, these departments receive frequent requests from outside agencies for information about the volume and epidemiologic characteristics of their patients, so they require data that can be used to answer these questions. This study revealed that 80 percent of trauma centers and 85 percent of general hospitals are not able to sort out trauma patients and supply counts of victims treated in their departments.

The maintenance of a separate trauma log makes it possible to retrieve, sort out, and select data for purposes of internal evaluation, research studies, and utilization of facilities by trauma patients. Some uniformity in what information should appear on the record is necessary if the review includes comparisons of geographically-dispersed providers or institutions. Results of this study indicate that trauma logs were maintained by less than half of the hospitals under study; however, the type of information stored varies from one facility to another.

This survey indicates that between 40 and 55 percent of all hospitals submit some data report to the regional EMS office. The lack of uniformity in reporting specific items would make it difficult, if not impossible, to provide an overview of the system as a whole and to provide feedback to participating health providers.

Analysis of system response time patterns can be derived from information listed under the Time category and analysis of system dynamics from the Mode of Arrival grouping. Although some field providers file their own reports, not all trauma patients are transported by paramedics, resulting in loss of information in this category. It was found that as a group E.R. departments reported this data in the range of 15 to 50 percent. Retrieval of this information becomes problematic because of a low rate of storage in a trauma log.

Ability to compare groups of patients classified by overall injury severity makes it possible to evaluate methods of treatment, identify problem areas, and document progress. Further improvement in ability to evaluate the effectiveness of emergency response systems and medical care of the injured depends upon developing the ability both to classify the injured patient before and after admission and to measure his outcome.

In the performance of pre-hospital triage, a device such as the Trauma Score System was found by Ogawa and Sugimoto in 1974 to be the most simple and reliable device

to use by non-physicians without elaborate equipment. However, the body location and type or severity of injuries are not incorporated in enough detail to allow the System to be used in an in-depth evaluation of the EMS systems.

Results of this study indicate that a majority of hospitals do record the findings within this category but report them at a lower rate, resulting in a loss of this very valuable information in the evaluation process on a regional basis.

The Injury Severity Score is a valuable EMS systems evaluation instrument because it allows the grouping of patients on the basis of overall injury severity, and the score is determined directly from the injuries sustained by the emergency patient. It was devised to be used to evaluate methods of treatment, identify problem areas, and document progress in the area of emergency care.

One issue in the EMS is that the regionalization and categorization of emergency care entails the creation and specification of highly specialized critical care units. If these attempts are aimed at reducing mortality and morbidity, indices of severity are necessary to compare a trauma center with a non-trauma center. To be more specific, indices of severity are essential for describing and evaluating the variable quality of emergency medical care. Since the end result of mortality and/or morbidity from emergency care is the function of both quality of care and

severity of patient illness, one must control the patient severity before comparing the survival rates of two EMS facilities or for one system or facility at two points in time.

Without information regarding the type or severity and body location of the injury, detailed EMS systems evaluation cannot be accomplished. Because of the low rate of recording and reporting of these data, the frequency distribution of multiple associated organ injuries is not readily accessible without repeated and exhaustive medical chart review. It was found that only one trauma center recorded this information in the E.R. and reported it to ICEMA. Since trauma centers treat the greater number of severely injured patients, accumulation of these data would provide an important contribution of this most important information. From this data base a correlation could be established as to how many people with various trauma scores arrive at a hospital, how many hours they survive, and how many are eventually discharged.

Combining patients into groups on the basis of severity of injury requires the use of scales such as the AIS, CRIS, or ISS. The ISS makes possible a valid numerical description of the overall severity of injury in persons who have sustained injury to more than one area of the body. This scale can easily be added to data recorded in the E.R., the hospital record, and data coded for research purposes. This

description of injury severity would enhance the value of the patient records, from the simplest to those in the trauma registry. After grouping patients on the basis of overall injury severity, any given E.R., hospital, region, or county could describe the proportion of its trauma population that is injured to a specific extent.

Evaluation of the quality of care being based on criteria other than patient outcome has been shown to be unsatisfactory. Patient outcome identification data elements suffer from a lack of standardization. At present the information they contain ranges from a simple indication of whether the patient survived until admitted to the emergency room to indications of the types of discharge from the hospital. As a result, patient outcomes would be most difficult, if not impossible, to evaluate on a regional basis.

The impact of the manner in which outcome information is used for efficacy research and prospective monitoring of development of criteria and standards of quality assessment became evident during the literature review. Absence of information as to what outcomes might result if average care were delivered to the population makes the choice of appropriate outcome criteria and standards problematic.

When studies of the efficacy of medical care processes are funded, consideration should be give to designing these studies so that their results are more useful in assessing

the quality of care. This will require the determination of the benefit of the procedure when used under average (non-trauma hospitals) as well as ideal circumstances (trauma hospitals). Basic descriptive studies are needed to determine variations in monitoring of outcomes by individual hospital emergency departments.

Recommendations

During the course of this study, it has become evident that even though numerous EMS system standards have been developed, there is considerable disagreement regarding the exact composition of and weight given to the many system attributes. Despite improvements in the availability of trauma patient data, data that are uniform regionwide are still lacking. Data that are available are not systematically collected, analyzed, and utilized.

The following recommendations were derived from this study:

1. It would be useful to develop and implement standardized regionwide forms to record patient data. An injury severity scoring system, such as the ISS, should be implemented and included in the patient record.

2. Further research should be directed toward the development of a patient outcome classification system that encompasses the entire spectrum of outcome. This information should be channeled to one centralized agency for purposes of storage, management, and evaluation.

3. Future computerization of data would allow continuous monitoring to take place and provide feedback to providers of care.

Ideally such a trauma registry would provide a means for thorough investigation of the epidemiologic, socioeconomic, and clinical aspects of the trauma victim. The uniformity of data retrieval in a readable and comprehensive style would be one of the most important rewards.

Summary

The ICEMA Trauma System is in an experimental state, and there is no one source that provides information on the entire system. This study contains the history of the overall emergency medical system and a history of the ICEMA system.

The impacts that improved emergency medical care would have on trauma patient fatalities and outcomes cannot be accurately estimated on the basis of information currently available. The review of EMS performance measures can be useful preparation for more careful thought about the nature and limits of personal and public responsibility and about unavoidable choices society makes among the problems competing for public resources.

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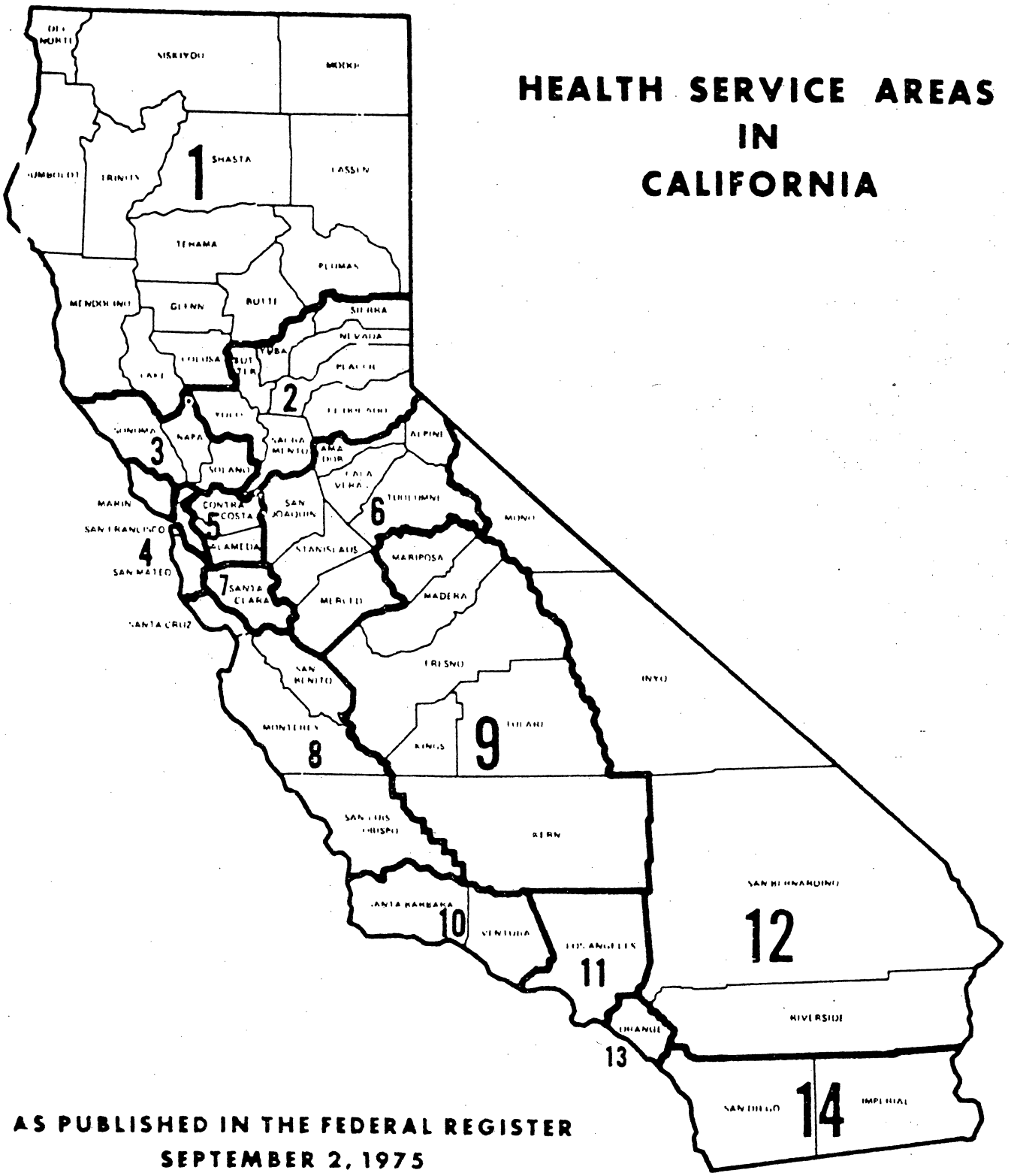
APPENDIX A

HEALTH SERVICE AREAS IN CALIFORNIA



AS PUBLISHED IN THE FEDERAL REGISTER
SEPTEMBER 2, 1975

The following table shows levels of categorization and their essential (E) or desirable (D) characteristics.

	LEVELS I	II	III
A. HOSPITAL ORGANIZATION			
1. Trauma Service	**E**	**E**	**D**
2. Surgery Departments/Divisions/Services/Sections (each staffed by qualified specialists)			
Cardiothoracic Surgery	**E**	**D**	
General Surgery	**E**	**E**	**E**
Neurologic Surgery	**E**	**E**	
Obstetrics-Gynecologic Surgery	**D**	**D**	
Ophthalmic Surgery	**E**	**D**	
Oral Surgery—Dental	**D**	**D**	
Orthopaedic Surgery	**E**	**E**	
Otorhinolaryngologic Surgery	**E**	**D**	
Pediatric Surgery	**E**	**D**	
Plastic and Maxillofacial Surgery	**E**	**D**	
Urologic Surgery	**E**	**D**	
3. Emergency Department/Division/Service/Section (staffed by qualified specialists)	**E**	**E**	**E**
4. Surgical Specialties Availability			
In-house 24 hours a day:			
General Surgery	**E**	**E**[3]	
Neurologic Surgery	**E**[4]	**E**[4]	
On-call and promptly available from inside or outside hospital:			
Cardiac Surgery	**E**	**D**	
General Surgery			**E**
Neurologic Surgery			**D**
Microsurgery Capabilities	**E**	**D**	
Gynecologic Surgery	**E**	**D**	
Hand Surgery	**E**	**D**	
Ophthalmic Surgery	**E**	**E**	**D**
Oral Surgery (dental)	**E**	**D**	
Orthopaedic Surgery	**E**	**E**	**D**
Otorhinolaryngologic Surgery	**E**	**E**	**D**
Pediatric Surgery	**E**	**D**	
Plastic and Maxillofacial Surgery	**E**	**E**	**D**
Thoracic Surgery	**E**	**E**	**D**
Urologic Surgery	**E**	**E**	**D**

5. Non-Surgical Specialties Availability

In-hospital 24 hours a day:

Emergency Medicine	E[5]	E[5]	E
Anesthesiology	E[6]	E[7]	E[8]

On-call and promptly available from inside or outside hospital:

Cardiology	E	E	D
Chest Medicine	E	D	
Gastroenterology	E	D	
Hematology	E	E	D
Infectious Diseases	E	D	
Internal Medicine	E	E	E
Nephrology	E	E	D
Neuroradiology	D		
Pathology	E	E	E
Pediatrics	E	E	E
Psychiatry	E	D	
Radiology	E	E	E

B. SPECIAL FACILITIES/RESOURCES/CAPABILITIES

1. Emergency Department

a) Personnel

1. Designated Physician Director	E	E	E
2. Physician with special competence in care of the critically injured who is a designated member of the trauma team and physically present in the ED 24 hours a day	E	E	E
3. RNs, LPNs, and nurses' aides in adequate numbers	E	E	E

b) Equipment for resuscitation and to provide life support for the critically or seriously injured shall include but not be limited to:

1. Airway control and ventilation equipment including laryngoscopes and endotracheal tubes of all sizes, bag-mask resuscitator, sources of oxygen, and mechanical ventilator	E	E	E
2. Suction devices	E	E	E
3. Electrocardiograph-oscilloscope-defibrillator	E	E	E
4. Apparatus to establish central venous pressure monitoring	E	E	E
5. All standard intravenous fluids and administration devices, including intravenous catheters	E	E	E
6. Sterile surgical sets for procedures standard for ED, such as thoracostomy, cut-down, etc.	E	E	E
7. Gastric lavage equipment	E	E	E
8. Drugs and supplies necessary for emergency care	E	E	E
9. X-ray capability, 24 hour coverage by in-house technicians	E	E	E
10. Two-way radio linked with vehicles of emergency transport system	E	E	E
11. Pneumatic Anti-Shock Garment*	E	E	E
12. Skeletal Tongs	E	E	E

**Needed also as supply replacement item for EMS crews.*

2.	**Intensive Care Units (ICU) for Trauma Patients** *ICUs may be separate specialty units.*			
a)	Designated Medical Director	**E**	**E**	**E**
b)	Physician on duty in ICU 24 hours a day or immediately available from in-hospital	**E**	**E**	**D**
c)	Nurse-patient minimum ratio of 1:2 on each shift	**E**	**E**	**E**
d)	Immediate access to clinical laboratory services	**E**	**E**	**E**
e)	Equipment:			
	1. Airway control and ventilation devices	**E**	**E**	**E**
	2. Oxygen source with concentration controls	**E**	**E**	**E**
	3. Cardiac emergency cart	**E**	**E**	**E**
	4. Temporary transvenous pacemaker	**E**	**E**	**E**
	5. Electrocardiograph-oscilloscope-defibrillator	**E**	**E**	**E**
	6. Cardiac output monitoring	**E**	**E**	**D**
	7. Electronic pressure monitoring	**E**	**E**	**D**
	8. Mechanical ventilator-respirators	**E**	**E**	**E**
	9. Patient weighing devices	**E**	**E**	**D**
	10. Pulmonary function measuring devices	**E**	**E**	**E**
	11. Temperature control devices	**E**	**E**	**E**
	12. Drugs, intravenous fluids, and supplies	**E**	**E**	**E**
	13. Intracranial pressure monitoring devices	**E**	**E**	**D**
3.	**Postanesthetic Recovery Room (PAR) (surgical intensive care unit is acceptable)**			
a)	Registered nurses and other essential personnel 24 hours a day	**E**	**E**	**E**
b)	Appropriate monitoring and resuscitation equipment	**E**	**E**	**E**
4.	**Acute Hemodialysis Capability** (or transfer agreement)	**E**	**D**	**D**
5.	**Organized Burn Care**			
a)	Physician-directed Burn Center/Unit staffed by nursing personnel trained in burn care and equipped properly for care of the extensively burned patient, **OR**			
b)	Transfer agreement with nearby burn center or hospital with a burn unit.			
6.	**Acute Spinal Cord Injury Management Capability** In circumstances where a designated spinal cord injury rehabilitation center exists in the region, early transfer should be considered; transfer agreements should be in effect.			
7.	**Radiological Special Capabilities**			
a)	Angiography of all types	**E**	**E**	**D**
b)	Sonography	**E**	**D**	
c)	Nuclear scanning	**E**	**D**	
d)	In-house computerized tomography with technician	**E**	**E**	
8.	**Rehabilitation Medicine**	**E**	**D**	

C. OPERATING SUITE SPECIAL REQUIREMENTS

Equipment-instrumentation

1. Operating room adequately staffed in-house and immediately available 24 hours a day	E	E	D
2. Cardiopulmonary bypass capability	D	D	
3. Operating microscope	E	D	
4. Thermal control equipment:			
a) for patient	E	E	E
b) for blood	E	E	E
5. X-ray capability	E	E	E
6. Endoscopes, all varieties	E	E	E
7. Craniotome	E	E	D
8. Monitoring Equipment	E	E	E

D. CLINICAL LABORATORIES SERVICES-available 24 hours a day

1. Standard analyses of blood, urine, and other body fluids	E	E	E
2. Blood typing and cross-matching	E	E	E
3. Coagulation studies	E	E	E
4. Comprehensive blood bank or access to a community central blood bank and adequate hospital storage facilities	E	E	E
5. Blood gases and pH determinations	E	E	E
6. Serum and urine osmolality	E	E	E
7. Microbiology	E	E	E
8. Drug and alcohol screening	E	E	D

E. PROGRAMS FOR QUALITY ASSURANCE

1. Medical care evaluation including:			
a) Special audit for trauma deaths	E	E	E
b) Morbidity and mortality review	E	E	E
c) Trauma conference, multidisciplinary (see note 9)	E	E	
d) Medical nursing audit, utilization review, tissue review	E	E	E
e) Medical records review	E	E	E
2. OUTREACH PROGRAM: telephone and on-site consultations with physicians of the community and outlying areas	E	D	
3. PUBLIC EDUCATION: injury prevention in the home and industry, and on the highways and athletic fields; standard first-aid; problems confronting public, medical profession, and hospitals regarding optimal care for the injured	E	E	D

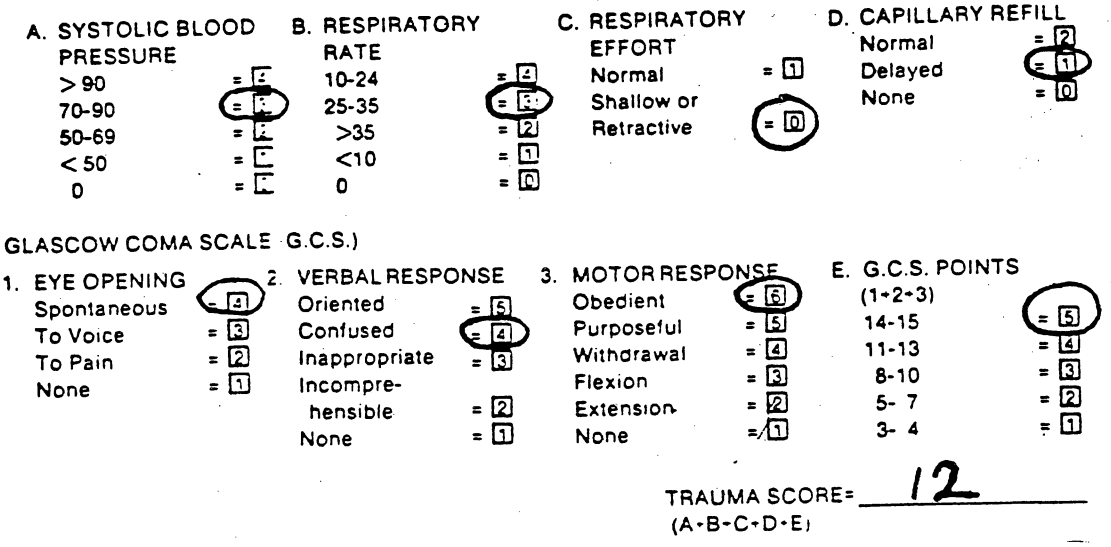
F. TRAUMA RESEARCH PROGRAM

E

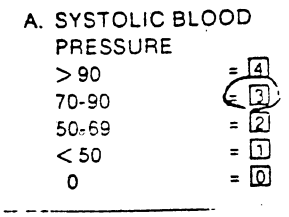
G. TRAINING PROGRAM

1. Formal programs in continuing education provided by hospital for:		
a) Staff physicians	E	E
b) Nurses	E	E
c) Allied health personnel	E	E
d) Community physicians	E	E

The following is a sample of a patient assessment and Trauma Score.

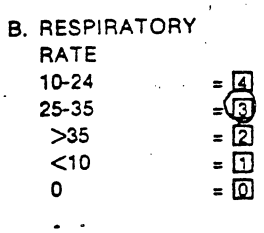


This example will now be discussed step by step in the order in which the field provider will be reporting assessments.



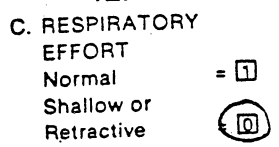
A. Systolic Blood Pressure

The blood pressure will have been recorded earlier with the vital signs in the box above. Use the systolic pressure as recorded previously. In the sample assessment the patient's systolic pressure was in the range 70-90 so a socre of 3 is circled.



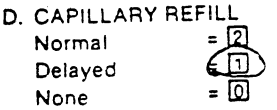
B. Respiratory Rate

The respiratory rate will have been recorded previously with the vital signs in the box above. Use the same measurement in the Trauma Score. In the example given, the patient's respiratory rate fell between 25 and 35 so a score of 3 is circled.



C. Respiratory Effort

The field person will report to you whether the patient's respiration is normal, shallow or retractive. In the example given, the respiratory effor was shallow (chest wall movement was barely perceptible) so a score of 0 is circled.

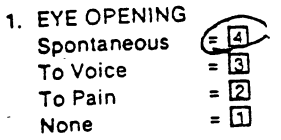


D. Capillary Refill

The field provider will next report an assessment of the patient's capillary refill - whether it was normal, delayed or not present at all. In the sample assessment capillary refill was delayed and therefore a score of 1 is circled.

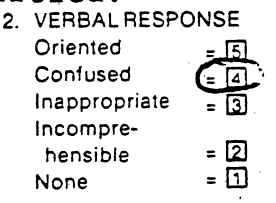
Glascow Coma Scale (GCS)

The ALS provider will next report in the following order an assessment of the patient's eye opening, verbal response and motor response. Together these three assessments make up the Glascow Coma Scale.



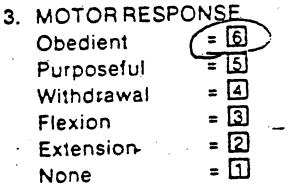
1. Eye Opening

The patient's eyes may open spontaneously, to voice, to pain or not at all. In this example the eye opening was spontaneous so a score of 4 is circled.



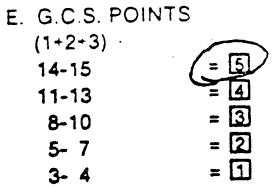
2. Verbal Response

The ALS provider will next report whether the patient's speech or verbal response is oriented, confused, inappropriate, incomprehensible or there is none at all. In our example the patient's speech was confused so a score of 4 is circled.



3. Motor Response

The field person will report an assessment of the patient's motor response, whether it is obedient, purposeful, withdrawal, flexion, extension or none at all. In the example given, the patient responded appropriately to instructions. Therefore, the response was obedient and a score of 6 is circled.



Total G.C.S. Points

You must now add the scores for 1, 2 and 3 above (eye opening, verbal response and motor response). This sum will be the total GCS points. Adding the scores for 1-3 in our example will give a total of 14 G.C.S. points, and so a score of 5 is circled under E.

Trauma Score Total

The final step in the Trauma Score System is to add the scores for A-E above. This total becomes the patient's Trauma Score and is recorded in the space provided. The decision as to what level facility the patient should be transported to will be determined primarily by the Trauma Score. The Trauma Score in our example was 12.

HOSPITAL TRAUMA INDEX

Name _____ Hosp. #_____

Date Adm. _____ Discharge _____

SYSTEM	initial impression	INJURY	final impression CLASS	INDEX
RESPIRATORY		NO INJURY	no injury	0
		chest discomfort—minimal findings	minor	1
		simple rib or sternal fracture (fx), chest wall contusion with pleuritic pain	moderate	2
		1st or multi-rib fx, hemothorax, pneumothorax	major	3
		open chest wounds, flail chest, tension pneumothorax normal (nl) blood pressure (bp), simple lac diaphragm	severe	4
		acute resp. failure (cyanosis), aspiration, tension pneumo. c̄ ↓ bp, bilateral flair, lac(s) diaphragm	critical	5
CARDIOVASCULAR		NO INJURY	no injury	0
		< 10% (<500cc) blood volume (bv) loss. no change in skin perfusion	minor	1
		10-20% bv loss (500-1000cc). ↓ skin perfusion, urine normal (+30cc/hr). myocard. cont. bp normal	moderate	2
		20-30% bv loss (100-1500cc). ↓ skin perfusion, urine (> 30cc). tamponade, bp 80.	major	3
		30-40% bv loss (1500-2000cc). ↓ skin perfusion, urine (< 10cc). tamponade, conscious, bp < 80.	severe	4
		40-50% bv loss. restless, agitated, coma, cardiac contusion or arrythmia, bp not obtainable.	critical	5
		50% + bv loss. Coma. Cardiac arrest. No vital signs.	fatal	6
NERVOUS SYSTEM		NO INJURY	no injury	0
		head trauma c̄ or s̄ scalp lactns. no loss consciousness (coma). no fracture (fx).	minor	1
		head trauma c̄ brief coma (< 15′), skull fx, cervical pain c̄ minimal fndgs, one facial fx.	moderate	2
		cerebral injury c̄ coma (+15′). depressed scull fx. cervical fx c̄ neuro fndgs. multi facial fxs.	major	3
		cerebral injury c̄ coma (+60′) or neuro findings. cervical fx c̄ major neuro findings, i.e., paraplegia	severe	4
		cerebral injury c̄ coma c̄ no response to stimuli up to 24 hrs. Cervical fx c̄ *quadriplegia*	critical	5
		cerebral injury c̄ no response to stimuli & c̄ dilated fixed pupil(s).	fatal	6
ABDOMINAL		NO INJURY	no injury	0
		mild abdominal wall, flank or back pain & tenderness s̄ peritoneal signs.	minor	1
		acute flank, back or abdominal discomfort and tenderness. fx of a rib 7-12.	moderate	2
		one of: minor liver, sm bowel, spleen, kidney, body pancr. mesentery, ureter, urethra. fxs 7-12 rib	major	3
		2 major: rupture liver, bladder, head pancr, duodenum, colon, mesentery (large).	severe	4
		2 severe: crush liver. Major vascular including: thor & abdom aorta, cavae, iliacs, hepatic veins	critical	5

HOSPITAL TRAUMA INDEX

SYSTEM	initial impression — INJURY	final impression — CLASS	INDEX
EXTREMITIES	NO INJURY	no injury	0
	minor sprains & fx(s) — no long bones	minor	1
	simple fx(s): humerus, clavicle, radius, ulna, tibia, fibula. single nerve.	moderate	2
	fx(s) multiple moderate, cpd moderate, femur (simple), pelvic (stable), dislocation major, major nerve	major	3
	fx(s) two major, cpd femur, limb crush or amputation, unstable pelvic fx.	severe	4
	fx(s) two severe, multiple major	critical	5
SKIN & SUBCUTANEOUS	NO INJURY	no injury	0
	< 5% burn. abrasions, contusions, lacerations	minor	1
	5-15% burn. extensive contusions, avulsions 3-6" extensive lacerations (total 12"2).	moderate	2
	15-30% burn. avulsions 12"2+.	major	3
	30-45% burn. avulsions entire leg, thigh or arm	severe	4
	45-60% burn (3rd degree)	critical	5
	60% + burn (3rd degree)	fatal	6
	COMPLICATIONS		
	NO SIGNIFICANT COMPLICATIONS	none	0
	subq. wound infection, atelectasis, cystitis. superficial thrombophlebitis. temp < 38.5° (101°F).	minor	1
	major wound infection, atelectasis, pyelonephritis septic or deep thrombophlebitis. temp > 38.5°.	moderate	2
	i.p. abscess, pneumonia, anuria or oliguria c̄ ↑ BUN (no dialysis). jaundice. < 6u gi bleed. rds < 1 day	major	3
	septicemia, empyema, peritonitis, pulm embolis (nl bp). renal failure (dialysis < 1 wk) > 6u bleed < 3d rds.	severe	4
	septicemia c̄ ↓ bp. pulm emb c̄ ↓ bp. renal failure 7-40d. gi bleed > 12u. resp arrest. > 3d rds c̄ vent.	critical	5
	pulm emb c̄ card arrest. cardiac arrest. renal fail > 6 wks. coma > 6 wks. > 30d rds c̄ vent or > 80% 0_2 > 7d.	fatal	6

DEFINITIONS:

minor = trivial injury
moderate = minimal injury, short hospitalization anticipated
major = major injury, not immediately life-threatening
severe = life-threatening but survival probable
critical = survival uncertain
fatal = survival unlikely

ABBREVIATIONS:

bp — blood pressure
bv — blood volume
cpd — compound
c̄ — with
d — days
fndgs — findings
fx — fracture
i.p. — intraperitoneal
lac-lactns — lacerations
mult — multiple
nl — normal
rds — resp. distress synd.
s̄ — without
sgns — signs
u — units
vent — ventilator
wnd — wound
↑ — increased
↓ — decreased
> — greater than
< — less than

Brief History: _____

APPENDIX B

SURVEY - QUESTIONNAIRE

A. Is your hospital a:
General Acute ( ) Trauma Center Level I ( ) Trauma Center Level II ( )

B. Number of beds:
Under 50 ( ) 50-99 ( ) 99-150 ( ) 150-200 ( ) 200-250 ( ) 250-350 ( )
350-450 ( ) 450-550 ( ) Over 550 ( )

C. Is your emergency department a Base Station?
Yes ( ) No ( )

D. Does your emergency department treat trauma patients (Trauma Score 12-0)?
Routinely ( ) Ocasionally ( ) Rarely ( )

E. The following data elements pertain to trauma patients with Trauma Scores 12-0. Please circle the appropriate number as it relates to your emergency department data recording and collection.
Column I asks if the particular data are being recorded in your department.
Column II asks if same data are reported to a Regional EMS office.
Column III asks if same data are stored in a separate trauma log in your emergency department.

Data Elements	I. Recorded in E.R.		II. Reported to Regional EMS Office		III. Stored in E.R. Trauma Log.	
Patient Information	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Name	1	2	1	2	1	2
Sex	1	2	1	2	1	2
Age	1	2	1	2	1	2
County of residence	1	2	1	2	1	2
Case Number	1	2	1	2	1	2
Time						
Patient Arrival	1	2	1	2	1	2
Seen by Physician	1	2	1	2	1	2
E.R. Care Completed	1	2	1	2	1	2
Mode of Arrival						
Police	1	2	1	2	1	2
Fire Vehicle	1	2	1	2	1	2
Basic Life Support	1	2	1	2	1	2
Advanced Life Support	1	2	1	2	1	2
Air	1	2	1	2	1	2
Injury Information						
Cause of Injury	1	2	1	2	1	2
Distance from Accident to Hospital	1	2	1	2	1	2
Diagnostic Category						
Trauma	1	2	1	2	1	2
Burn	1	2	1	2	1	2
Surgical	1	2	1	2	1	2
Trauma Score System						
Field Report	1	2	1	2	1	2
Confirmed in E.R.	1	2	1	2	1	2
Systolic B.P.	1	2	1	2	1	2
Respiratory Effort	1	2	1	2	1	2
Respiratory Rate	1	2	1	2	1	2
Capillary Refill	1	2	1	2	1	2
Glascow Coma Scale	1	2	1	2	1	2
Numerical Description of above	1	2	1	2	1	2
Injury Severity Score (ISS)						
Respiratory	1	2	1	2	1	2
Cardiovascular	1	2	1	2	1	2
Nervous System	1	2	1	2	1	2
Abdominal	1	2	1	2	1	2
Extremities	1	2	1	2	1	2
Skin and Sucutaneous	1	2	1	2	1	2
Numerical Description of above	1	2	1	2	1	2
Disposition of Patient						
DOA	1	2	1	2	1	2
Expired in E.R.	1	2	1	2	1	2
Transferred	1	2	1	2	1	2
Admitted to Hospital	1	2	1	2	1	2
Expired in Hospital	1	2	1	2	1	2
Released	1	2	1	2	1	2
Duration of Stay	1	2	1	2	1	2
Disability						
None	1	2	1	2	1	2
Temporary	1	2	1	2	1	2
Long-Term	1	2	1	2	1	2
Permanent	1	2	1	2	1	2

How many trauma patients did your department treat in 1983 ( )? in 1984 ( )?

Jenny P. Thayer
Box 5036
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(714) 679-6680

Dear Emergency Department Supervisor:

Attached is a survey-questionnaire concerning trauma patient data recording, collection and storage. Your hospital is located in the geographical area under study and was selected as a source of information for the research project.

I am a Master's Candidate at California State University, San Bernardino and am gathering information for my thesis. The survey is concise, self explanatory, and easy to complete. Moreover it is anonymous, and comparisons between hospitals will not be made.

If you are interested in obtaining the results of this study, please indicate so on the enclosed postcard, and give the name and address where you wish the copy to be mailed. To ensure anonymity, mail the postcard separate from the survey-questionnaire.

Should you have any questions, please contact me at (714) 679-6680 or my thesis chairman, Dr. El-Ahraf at (714) 887-7517. I will greatly appreciate your cooperation in the compiling of accurate data for this research.

Sincerely yours,

Jenny P. Thayer

Jenny P. Thayer

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