

The critically
injured patient:

A plan for the organization of a statewide system of trauma facilities

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Introduction

A plan to organize a statewide system of facilities for the treatment of the critically injured patient was recently proposed for Illinois. The focus of the approach is to define an easily identifiable segment of the emergency problem—that of the critically injured patient—and establish a network of statewide trauma units. The plan will provide adequately staffed facilities, linked together by a communications network, which is equipped for the comprehensive management of seriously injured patients.

The need for a comprehensive program is rapidly becoming evident to the consumer, governmental officials, physicians and many health organizations. At this very moment, in the State of Illinois, as well as throughout the country, someone is being seriously injured. As a result, he may face extensive physical disability, prolonged and costly hospitalization or even loss of life. These possibilities occur not because of disinterest in the problem by those concerned, nor even inadequate medical knowledge, lack of money, or equipment, but because the health establishment has been unable to provide a successful method for access to proper treatment and care.

There is presently a dilution of manpower and resources causing a crisis in the accessibility by the public to this type of specialized care. Interestingly, this accessibility is not of the mod-

ern fashionable type—bringing health care to the disadvantaged—for the poor have immediate recourse to the nearby "County" hospital with its fully staffed and equipped trauma service.

The recently published study on emergency services in the Chicago area documents the problems in the urban community.¹ There are also many studies throughout the country which have proposed solutions to the problems related to emergency service and emergency rooms, including the recent document from the Illinois Hospital Association.² It is believed that as this program proves successful it will act as the catalyst, as well as the foundation, upon which the solution to the total emergency care problem can be structured.

Since this is a proposal for a model, it will not describe at this time the minute details of organization, financial relationships or guidelines of function. Regionalization, financial disbursement of funds, administrative guidelines, involvement of voluntary organizations and possible legislation are some of the many aspects which will be evaluated.

McNerney, in a recent article, calls the health administration establishment an underachiever.³ Kinzer, of the Illinois Hospital Association, proposes that immediate steps be taken to create a system of comprehensive emergency service planning.² The time and opportunity have come for this state's health establishment, in conjunc-

tion with the state government, to solve a serious health problem. Considering the presently available monies, facilities and personnel, the loss of life, the disability and lack of accessibility to care can no longer be tolerated.

The Trauma Problem

Definition:

The "critically injured" defines a patient who has sustained a life endangering injury. In addition, certain injuries such as severe eye damage, hand problems, massive facial lacerations, though not specifically life endangering, are critical in that they often result in considerable permanent disability. For this reason we include them in our definition of the critically injured.

This category of injuries accounts for approximately 10% of the emergency service problem. Listed below are certain aspects of this group of injuries:

1. These are the most serious problems within the emergency service situation.
2. The decision that an injury is critical can, in most cases, be made without sophisticated professional aid.
3. Extensive information gained from the treatment of battle casualties in Vietnam has not been utilized for civilian injuries in the community.
4. Criteria that are useful in establishing what is comprehensive emergency room care for ambulatory patients are not applicable to the accident victim with life endangering injuries.
5. In hospitals treating large numbers of trauma victims (e.g. Cook County Hospital), it has been shown that there are significant benefits in separating the critically injured from other ambulatory patients. Care can then be rendered in a specialized trauma-care unit.

6. From the professional, as well as the hospital point of view, the problem continues to grow because of complex sociological, geographic and economic factors not related to the technical and scientific advancements which can be utilized for treatment.

(a) The cost of caring for these patients is enormous. Besides reimbursement not meeting actual costs, one such critically injured patient can tie up equipment and personnel severely needed in other hospital areas.

(b) The disruption imposed on the hospital facilities is undeniable whenever these cases are not treated in specifically designated locations.

(c) Adding to the difficulties is the burden placed on the busy practicing physician. Often the patient is injured away from home and is cared for by someone other than his personal physician.

(d) When injured away from home, there is increased difficulty in gaining accessibility to medical help.

(e) There are also social problems which cannot be overlooked. The violence in the inner city, coupled with prejudices, both racial and economic, can create a problem in accessibility for many urban dwellers.

7. The consumer is demanding that action be taken to solve the problems associated with bringing modern medical knowledge to all members of the community.

Background:

Last year, the National Safety Council reported 11,100,000 injuries from all types of accidents.⁴ Wage losses, medical expenses and administrative insurance costs resulting from trauma totaled \$13,600,000,000. The estimated total



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A study of 150 accident deaths showed

cost of this pandemic is over twenty billion dollars annually.^{5,6}

The National Safety Council estimates that 105,000 civilian accidental deaths occur annually; 47,000 are due to vehicle injuries.⁷ The one-millionth traffic fatality occurred in 1951; if the present rate continues, the two-millionth victim will die by 1976.⁸ Although our traffic injury problem is colossal, it is estimated that only 15% of the nation's accidents involve autos.⁹ Accidents are currently the third commonest cause of death in the United States, being only slightly less than death from cardio-vascular disease and cancer.¹⁰ Under 40 years of age, trauma is our leading cause of death. We are annually experiencing over 15,000,000 significant injuries of children under 14 years of age of which over 16,000 are fatal;⁸ it is also the biggest killer in this age group with the peak incidence being from two to three years. One-third of all hospital admissions, approximately two million per year, are the result of accidents.¹² In one comprehensive study in a large metropolitan area, pediatric cases accounted for 47% of all emergency room visits and traumatic injuries stimulated one-fourth of these.¹¹

The nationwide problems of emergency medical care delivery are well known. The intensive care and continued close surveillance which are necessary to maintain a critically ill patient are beyond the scope of the average practicing surgeon or physician. The average practitioner cannot devote the necessary time and involvement required for the long-term intensive management of these patients. Only where around-the-clock observation is available by hospital-based physicians, therefore, senior surgical and medical residents in training, can a high quality of medical care be continually available. Facilities with these personnel available are eager to receive and manage these difficult problems that are truly beyond the scope of one physician. At the present time, there are many competent medical personnel in the community who perform in an exemplary manner, especially in the acute resuscitation phase. These physicians, unfortunately, have no back-up, and are held responsible for complex problems that are beyond the ability of any one doctor. These patients must be evacuated after adequate resuscitation, which sometimes may even include major surgery, to better equipped and staffed facilities.

A solution to this complex problem will require the cooperation of many interest groups and resources. Of utmost importance in undertaking the project is continuous monitoring of the magnitude of the problem and the results which are obtained. With the use of special computer techniques, coupled with the only trauma registry in the United States, a comprehensive ongoing analysis of this major community health program will be possible.

The Trauma Unit Concept:

As a solution to this problem, we are suggesting the development of an organized statewide system of specialized trauma units. A proposal for area-wide trauma units has been described for the city of Chicago by Freeark, and the Chicago Committee on Trauma.¹³

The trauma unit concept has proved to be an excellent plan for the in-hospital care of the critically injured. The plan of early physical segregation of these patients into a specialized area, staffed and equipped to completely resuscitate and evaluate the serious multiple injuries patient, can be adapted to hospitals of varying size and potential. The accumulative motivation, education and proficiency gained from many centers has been shown to be of great survival advantage in the early management of the critically injured (Fig. 1).

Trauma Unit Concept

Established geographic centers, with designated echelons of care
Adequately staffed and equipped
"Streamlined care" of the critically injured
Part of General Hospital complex
Communications and transportation
Epidemiologic and clinical data collection

Fig. 1.

A satisfactory outcome after severe traumatic injury is dependent on two basic factors: the availability of initial medical care, and the adequacy of these early therapeutic measures. A study by Frey, et al, in 150 accidental deaths showed that 18% could have been salvaged with better emergency service.¹⁴ Delays in proper resuscitation and evaluation in life-endangering injuries are the crucial indices to survival. Injudicious or inadequate emergency management can cause unnecessary fatalities and permanent disabilities. The continually increasing incidence

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and magnitude of serious injuries resulting from high speed transportation, complex industrial equipment, continued civil disturbances, and unpredictable mass catastrophes, necessitates a re-evaluation and re-education of the priorities and techniques of trauma patient care. Changing patterns of traumatic injuries of all types and newer developments in the surgical subspecialties and biomedical disciplines have been responsible for major progress in the field of trauma management.

The first objective of the physician examining an injured person is the preservation of life. When dealing with acute trauma, it is impossible to separate diagnostic and therapeutic measures. The techniques of the resuscitation are not dependent on an etiologic diagnosis. Airway obstruction, shock and cardio-respiratory failure are similarly treated without knowing the precipitating causes of these disorders.

Once the patient is stabilized he may then be safely evaluated, treated or transported to a more competent facility.

Functioning Trauma Unit:

The Trauma Unit of the Cook County Hospital in Chicago has had experience with over 28,000 seriously injured patients since its beginning in 1966. The Trauma Unit is a specialized facility, staffed and equipped to cope with all possible life-threatening emergencies. It is a centralized area where all of the essential hospital resources are concentrated for the comprehensive resuscitation, evaluation and operative needs of these patients. Principles employed in this specialized facility can be effectively utilized in any emergency room environment. We believe the trauma patient, because of the probable complexity and severity of his injuries, should be separated from other patients in any emergency room by streamlining his passage through the admitting and the X-ray departments into a special intensive care area. Close surveillance for the tell-tale signs of shock, aspiration, respiratory distress, and cardiopulmonary arrest can avoid possible catastrophe. Should such untoward effects develop, adequately trained physicians, nurses and paramedical personnel are readily available to institute effective therapy.

The Trauma Registry:

The complexities involved in the various as-

pects of severe injuries in conjunction with the deficiencies in our health care delivery system have thus far precluded comprehensive quantitative analysis. With the introduction of modern computer technology, it is now possible to thoroughly investigate the epidemiological and clinical aspects of this major health problem.

A computerized trauma registry has been developed at the Trauma Unit of the Cook County Hospital and Research Resources Laboratory of the University of Illinois. It uses an IBM 360/44 Computer and a generalized information retrieval system. The registry employs a card-oriented data collection procedure, but will soon be utilizing direct entry from remote dataphone terminals. This means that any participating facility can address information into the computer. The internal classification of disease categories (adapted 1969) are integrated in the registry, but a new tabulation system is being utilized as the prime patient indexing method.

For the first time, a multifactorial approach to this complex major community health problem is possible. The registry will be instrumental in analyzing mortality rates for graded injuries in paired patients comparative studies, and determining risk factors for various accidental events. The computer cost for such services is far below typical record library expenses.

As information is collected on epidemiological factors, extent of anatomic damage, operative treatment employed, and specific complications, the program will not only be formulating solutions but initiating feedback based on fact rather than intuition.

Critically Injured Patient Problem:

National symposia, as well as numerous local workshops have been concerned with this problem. Personal experience and anecdotal analysis do not, however, provide the basis for sound operational approach to this dilemma. The president's address at the American Association for the Surgery of Trauma and the Schudder oration on trauma at the American College of Surgeons Clinical Congress¹⁵ were directed to these problem areas. Both speakers, at some length, discussed the many self-appointed and multi-directed groups that are presently involved with some small aspect of emergency medical care. There is presently no central or organizational agency involved with the analysis, planning and

"The most difficult problem — coordinate

development of a local or statewide program.

Conclusions:

We believe that a statewide organization of trauma units as an approach to the critically injured may provide a working solution upon which to solve many of the deficiencies in emergency medical care in this state. We also believe the trauma unit concept, if instituted in a statewide comprehensive program, cannot only give Illinois a working life-saving system, but also a model for the nation to utilize.

A Model for Emergency Care of the Critically Injured Patient

An overview:

The basic concept of this plan is to coordinate the existing hospital facilities in conjunction with the available manpower and add essential equipment as necessary. At present, in Illinois there is no organized plan either on the part of the hospitals or the medical profession for the treatment of critically injured persons, individually or as part of a civilian disaster. Compounding the situation is a public totally unaware of the facilities available and of the medical potential in the community.

The proposed model has three functioning levels to solve these problems. The basic unit is the emergency room of a community hospital, and if present, its intensive care unit. It functions as the immediate provider of care. Attached to its emergency room is a specialized ambulance of the type recommended by the American College of Surgeons.¹⁶ According to Senate Bill 568, this unit is a Type B emergency room, one that is fully equipped, providing 24-hour service and has a physician on duty at all times.

Servicing many local basic units is the area-wide trauma center. This is a hospital with a house staff, teaching programs, specialized treatment units, and many specialty services not available at the local level.

Finally, there will be a small number of university-based regional trauma centers where the full advantages of modern science can be utilized for the care of patients whose condition warrants intensive diagnosis and therapy. One of the centers will act as the coordinator and administrator of the proposed state program.

The local hospital unit:

This is a hospital which fulfills the following criteria. Although many criteria are consistent with Senate Bill 568, this program requires more stringent organization and trained personnel (Fig. 2).

1. There is twenty-four-hour medical and paramedical coverage which can provide comprehensive emergency care to a critically injured patient. Personnel are available to make diagnoses and institute basic resuscitation and treatment necessary to sustain life and to make the decision to continue therapy within its own confines or referral by helicopter to the areawide center will be made.

Local Area Trauma Center

Serve a specified geographic area (50 miles)
Maintain a Type "B" emergency room service (S.B. 568)
24 hour Medical and Paramedical Coverage
Comprehensive Resuscitation and Specialty Care Potential
Staff trauma coordinator
Hospital based ambulance (American College of Surgeons, Recommended Model)
Radiocommunications system
Dataphone Remote Terminal

Fig. 2.

2. It must have competent emergency facilities which will not require large sums of money for the addition of essential equipment.
3. A desire on the part of the hospital and professional staff to offer emergency care to an area which includes an ambulance round-trip of no more than two hours (i.e. approximately a 50 mile radius). In urban areas, this would by necessity be a much smaller distance and, in many cases, might be no more than one or two miles.
4. There must be a specific location within the hospital, set aside and designated for the care of trauma victims with necessary equipment, medication, and most important, the personnel.
5. The type of personnel will vary with the specific hospital. The following is a minimum suggested staff:
 - (a) A staff physician to act as the local trauma coordinator. In small communities,

local community's resources into one "

this physician may be the only doctor with trauma training, while in others, he may be the senior staff surgeon. In any case, it is his responsibility to see that the program functions properly. It does not imply that he is the physician in charge of all patients, the only referring doctor, or even responsible for medical care at all times. His duties encompass keeping the facilities functioning, the program vitalized, the paramedical personnel trained, and the program data collected and transmitted to the central computer.

(b) At his disposal is at least one paramedical, trained individual who is available at all times to assist him.

6. A hospital-based ambulance of the type specified by the American College of Surgeons. This ambulance, which is equipped to handle an injured person at the scene of the accident, is manned by individuals with training in the care of severely injured. The criteria for this training has been detailed by the American College of Surgeons. The key to the program is the education of the personnel involved at all levels of the system.
7. There are two significant aspects regarding paramedical personnel. First, there must be an immediate upgrading in the level of care afforded at the site of injury by ambulance personnel. Second, the initial care provided by the professional staff at the designated local trauma unit. Central to the theme of this program is the desire to utilize, wherever possible, the present staff properly trained in the care of the severely injured. Where applicable, personnel can be retrained through grants, so that at least one individual trained in trauma is available to provide 24-hour consultation coverage.
8. A coordinated system of communications between ambulance, hospital, and the area-wide center.

The most difficult problem is not how to create this local emergency care facility, with its specialized personnel and equipment, but how to pool and coordinate the local community's resources into one. This means reorganization through voluntary action among many local hospitals in some communities, and in others, some

arbitrary choice between two duplicating and inefficient emergency rooms, sometimes very closely situated.

The areawide hospital center:

This institution must have an accredited teaching program in surgery, though university affiliation is not required. This facility will be the referral center for a number of basic trauma units. As the center for local units, it will provide four vital functions (Fig. 3):

Areawide Hospital Trauma Center

Serve a local and areawide geographic district
Maintain a Type "A" emergency room service (S.B. 568)
Clinical Training Programs
Provide Standard and Specialized Functions
Trauma and specialty professional staffing
Hospital based ambulance and helicopter service
Radiocommunications Center
Data Collection Unit

Fig. 3.

1. Provide service to the local community in which it is situated by functioning as a Type B unit.
2. A communication center which will give medical and technical advice to the local hospital trauma center.
3. A helicopter service. Any patients, whose injuries or status requires more sophisticated care, either because the problem cannot be handled at the local level or the facilities are not available, will be flown to one of a dozen or so designated areawide centers. The service must be available on no more than a four-hour basis (300 miles). At present, approximately 40 hospitals in Illinois have heliports which are not utilized.
4. Special care units for the treatment of trauma victims, providing sophisticated study, treatment and equipment, complemented by the full range of medical specialties. These would include blood banks, training centers, special laboratories, hemodialysis facilities, etc.
5. Meet all the criteria for a comprehensive unit as Type A set forth in Senate Bill 568.

The regional center:

Since these centers will function as the regional planning and coordinating hubs, they should be

Senate Bill 568 allows a group of hospitals

responsible for financial disbursement, training and educating professional and non-professional workers at all levels, have super specialty facilities (burn units, transplant facilities, hyperbaric chambers, etc.), they must, by dint of available manpower and facilities, be located in the university medical centers throughout the state. At present, this means six in Chicago and the proposed centers at Springfield, Carbondale, Rockford and Peoria (Fig. 4).

Regional Trauma Center

Serve a local, areawide and regional geographic district

Maintain a Type "A" emergency room service (S.B. 568)

General and Subspecialty Training Programs

Provide Standard and Special Investigational Functions

University hospital staffing

Hospital based helicopters and ambulance services

Communications Center

Central Trauma Registry

Fig. 4.

These centers at the same time would also provide basic facilities to their local neighborhoods.

Since the manpower and facilities for care are now available at this level, the only difficulties are those of organization and administration. These centers, with their training programs and facilities, will in most cases, be delighted to assume the job.

The regional center will be tied by radio and dataphone communications to its many member areawide institutions. The helicopter service based at the areawide hospitals would serve as its transportation arm.

There is no intention to have routine cases forwarded to the regional center. The vast majority of cases would be handled at the areawide level—Type A. In some areas most of the routine work can be accomplished at the local level—Type B.

The problem in the Cook County area:

This model is not applicable to the Cook County area without specific modifications. There are a number of specifics to the Chicago-wide area which must be considered. Many of these problems are detailed in the emergency service report from the University of Chicago.

1. A police policy which requires that patients

be brought to the nearest hospital emergency room.

2. A large indigent population, without easy access to medical care, geographically isolated, where trauma is mostly secondary to human violence rather than accidents.
3. Six medical schools, of which five have their own medical centers.
4. Non-university affiliated medical centers.
5. A long history of inability to solve problems by cooperative organization because of petty jealousies, both administrative and medical in content.

On the other hand, many of these so-called difficulties, if properly coordinated, can be turned into advantages. In the Chicago area, an abundance of facilities and trained manpower is presently available. Very little in the way of money, new personnel or funding is necessary, but rather a willingness to accept a plan of action by the member hospitals and medical staffs.

The problem created by the requirement that injured persons be taken to the nearest emergency room, which in the past has been a major obstacle to comprehensive planning, has been relieved by Senate Bill 568. This law allows a group of hospitals to designate levels of emergency room care. Thus, the police can take seriously traumatized patients to the nearest designated emergency room.

In Cook County, most participating hospitals will function as areawide Type A comprehensive emergency treatment centers. Since many of them have well-equipped emergency rooms and trained personnel, they will handle most non-critical injuries. The small Type B and C standby and basic hospital emergency rooms can be designated as emergency rooms for ambulatory trauma patients. The critically injured patients will be sent directly to the regional hospitals.

The areawide, Type B, hospitals will be divided into regions, each relating to one of the six medical centers. The medical centers, as in the rest of the state, will be responsible for data collection, financial responsibility, and training as described in previous sections. However, in the urban program, they will be charged with the care of all critically injured persons and, whenever possible, these patients will be brought directly to their trauma centers.

It is anticipated that certain hospitals will not

to designate levels of emergency room care

desire entry into this plan. It must be emphasized that the program is voluntary, and it is hoped that as the plan proves successful, institutions at all levels will seek admission.

Development of the Program

At the present time, there are numerous agencies studying the emergency medical care problem. Each of these agencies and commissions are groups attempting to define some chosen aspect of the problem. At the completion of these necessarily limited studies there has been no central or authoritative forum where their findings can be presented.

A very real problem is the implementation of such a broad-based program. The development of any major reorganization scheme and the concomitant distribution of medical resources, will unfortunately, meet with resistance to change. However, by working with the medical societies, the hospitals, and most importantly, the physician in the field, an honest aggressive sales pitch should return the necessary cooperation and support. Support will be obtained by showing these groups that the basis of our plan is to involve the physician and his local hospital and staff with the responsibility for the primary treatment and transfer decisions. To carry out these tasks they will be given the necessary essential modern equipment. An ongoing education extension program is envisioned to continually update professional and paramedical personnel.

The entire emergency health care delivery program will be possible only through the auspices of the local county medical societies, and specialty organizations, such as the Committee on Trauma of the American College of Surgeons.

Illustrations

The present system:

A youthful 31-year-old mother of two, driving along an Illinois highway, is involved in an automobile accident. Her car, skidding on a patch of ice, careens off the road and hits a telephone pole. She is knocked unconscious with head injuries, and associated abdominal and extremity damage. It is one hour before the State Police find her wrecked auto. The nearest town is 25 miles away and the police request an ambulance.

Because of the late hour and lack of any plan or organization to treat accident victims, it takes another 90 minutes before the victim finally reaches a small community hospital with a standby emergency room. There is a nurse on duty but she has no formal trauma training, and another two hours elapse before a physician arrives to render care.

The victim, though requiring intravenous fluids, chest tubes, care of a fractured leg and other immediate therapy, receives only basic first-aid treatment. Through no fault of the medical personnel in attendance, the proper equipment is not available, nor if available, can it be mobilized.

It takes another five hours before the proper personnel can be mobilized to perform surgery. The patient's condition is followed during the next few days by a limited staff already overworked with other medical problems and duties.

Again, the patient's condition deteriorates. This time because the magnitude of her injuries has caused slowly progressive head and kidney damage. There is another delay of three days before these complications are noticed because of the shortage of personnel and lack of specialized detection equipment.

As often happens, the attending physician decides that this patient should be referred to an institution capable of dealing with a problem of this magnitude. It may very well be that he is fully trained in the care of trauma, but without support, there is very little that can be accomplished.

It takes another 48 hours before arrangements can be made to transfer this patient to another hospital some 175 miles away. The trip takes four hours by ambulance during which time the patient's condition steadily declines. Finally, reaching a 250 bed hospital which has a multitude of specialists, and the necessary equipment, little can be offered because of the delay; and the patient expires three days later.

All of the individuals involved, from the state highway patrolman, to the neurosurgeon performing the last ditch, life-saving operation, are filled with remorse. They feel that everyone did all that was possible. In fact, it may be another year before another accident of that type occurs in the community and by that time the tragedy will have all but been forgotten.

However, if one accumulates these individual

The basic geographic regionalization . . .

accidents on a statewide basis, the overall loss of life, prolongation of hospital stay, and extensiveness of individual disability becomes frightening in scope and magnitude.

The future program:

What occurred in the previous example should not have happened. The State Police would call the nearest hospital with a Type B trauma emergency room. In our previous example, instead of the patient going to the unprepared hospital, she might have gone in the opposite direction to a hospital of 250 beds with a fully staffed trauma facility. The unit is notified before the patient arrives and a pre-planned program is instituted. Minutes after the patient is examined in the emergency room it becomes apparent that the problem is complex and will require many specialists having available a full range of paramedical services.

The areawide center is notified about an impending transfer. At the same time, advice is offered regarding the latest treatment for severe head injuries.

The local physician requests that helicopter service be initiated. With the help of the paramedical team the patient is stabilized and therapy instituted. It takes three hours before the accident victim arrives at the regional center. The most sophisticated treatment available is utilized in treating the victim, and during the next few days she remains under 24-hour care because of the presence of a house staff. She undergoes two major surgical procedures. During her recovery period, which spans a period of four weeks, the professional staff works with the knowledge that a university center with specialized services is ready to back them should the need arise.

Conclusion

Contrasting the two brief examples above, it is obvious that there is no new facility or expensive cost requirement. All that must be accomplished is organization of a system that presently exists in a fragmented form.

Consider the following:

1. The patient's insurance covers many of the medical costs; whenever hospital stay is diminished, a substantial insurance savings results.

2. Choice of referral will remain with the responsible physician.
3. Whatever initial costs are incurred in organizing the program will be quickly offset by the economic savings accumulated by decreasing losses in life, loss of work time, diminution in permanent injury and the fuller utilization of existing facilities.
4. The accumulation of scientific data, coupled with improved training and education of personnel at all levels.
5. The first statewide system in the United States which can bring to its citizens the full impact of medical care that has been learned from the treatment of battle casualties from Vietnam.
6. A statewide system to be used as the framework for a civil defense plan in time of disaster.

The tangible return of comprehensive and integrated emergency care system will have to be evaluated. Monitoring of time and morbidity factors will be made possible by the use of the Trauma Registry and can document the advantages. The ability to organize volunteer help and community financial support for ambulance service and emergency care costs may be an indication of the productiveness of this plan. The citizen's awareness that he will have an equal opportunity to receive optimal emergency medical care when it is most needed will result in considerable community enthusiasm and support.

These programs will entice previously trained personnel, as well as future aspirants into the health care system. Specific aim will be made at the medical corpsman who have been extremely well-trained by the federal government to remain in the health-care delivery system. The program, as it is developed, will enhance the performance of professional and paraprofessionals at all levels.

At the present time there is a great deal of duplication in medical research. In any major institution, one or more investigators may be involved with very similar and related research interests. The awarding of grants in many instances is not well-planned. While competition is good, duplications of expenditures for personnel and equipment can no longer be tolerated. A central agency could best allocate or advise

can have wide application . . .

in the distribution of monies in the best interest of the public needs. Also, with new computer methodology, a combined inter-disciplinary study coupled with institutional multiple approach can be developed for the benefit of all.

As the problem of the critically injured patient is solved, new ways will be developed to evaluate and manage other urgent medical problems. The basic geographic regionalization, if utilized successfully, can have wide application in the solution of many health care problems. ◀

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