Why this concern with information requirements and data collection? Past research has shown that considerable resources can be drained for inappropriate relief on the bases of myths or unverified reports. Not uncommonly, a major catastrophe results in the mobilization and transportation to the disaster affected area of the following: unsorted drugs in large amounts that are in foreign languages, opened or expired; medical volunteers lacking proper training or familiarity with the local situation and culture; field hospitals that arrive too late for the severely injured; and a tidal wave of food that may be culturally unacceptable to the victims. Multi-vitamins, which do not meet actual deficiencies, are examples of expensive but largely useless items that are often shipped in large quantities to disaster-stricken populations. Another example of innappropriate activities concerns mass prophylactic typhoid immunization Typhoid vaccinations are not innocuous. Not only will few people complete the course of three vaccinations required over a several month period, however, typhoid vaccinations may cause severe myalgias and fever, provide little actual immunity, and divert manpower away from more productive activities.

A typical disaster relief scenario is as follows. Initially there are undocumented local requests for assistance. The validity of these requests is often questionable, and they may not relate to any genuine need. They generally result from inadequate assessment of the situation by local officials, combined with political pressures on them to appeal for assistance. In response to these pressures, there is a tendency to rely on the usual myths about the needs of victims (food, shelter, vaccines, field hospitals, blood, doctors, etc.).

It is clear that accurate information is critical for effective planning and response to disaster situations, especially for linking assistance with genuine need. The purpose of this chapter is to describe these information requirements. There are four major categories of data important for disaster relief: 1) hazard analysis; 2) vulnerability analysis; 3) resource analysis; and 4) assessment of disaster impact and needs of those affected by the event. These information requirements have relevance to both pre- and postdisaster activities and should be well-known to those responsible for disaster planning and response

HAZARD ANALYSIS

A hazard can be defined as a potentially harmful state or event whose existence and magnitude of occurrence can be expressed in probabilistic terms. Hazards analysis involves the collection and assessment of data on past or potential hazards in terms of their nature, causes, frequency, distribution, and effects in order to predict the same for future events. An example of a hazard analysis is a map of areas with a high probability of being hit by an earthquake, or indicating locations of nearby chemical plants. Unfortunately, detailed data collection on potential hazards is rare in those developing countries most prone to disasters due to poor data base resources and limited monitoring and data collection systems.

Disaster planners must use the results of a hazard analysis to plan for those disasters most likely to occur in their community. For example, hospitals along the Gulf Coast of the United States should plan for hurricanes, those in California should plan for earthquakes, those near chemical industries should have facilities for decontamination. Are there large transportation facilities nearby (eg., airports, harbors) where accidents could generate large numbers of casualties? Are there festivals, stadiums, and amusement parks nearby where large numbers of people assemble? It is very important to have knowledge of those disasters most prevalent in the area since different disasters are characterized by very different morbidity and mortality patterns and thus health care requirements. For example, earthquakes cause many deaths and severe injuries. Hurricanes cause much property damage, however, deaths are usually low and injuries minor. Pulmonary irritation may result from fires or hazardous chemicals requiring large supplies of oxygen as the Bhopal accident demonstrated. Fortunately, some disasters such as hurricanes are predictable or have several days leadtime, and preparations for management can begin early if disaster managers heed warning signals.

VULNERABILITY ANALYSIS

Vulnerability is defined as the susceptibility of a population at risk to loss when a hazard of a given magnitude occurs. Vulnerability analysis involves the collection and assessment of information on communities at risk from hazards, including data on the performance of structures and lifeline systems (eg. utilities such as water, electricity and gas, health facilities, etc.) during past disasters Obviously, hazard and vulnerability analyses go hand in hand. Operationally, the vulnerability of a community can be defined as the probability of damage (ie., deaths, injuries, and property damage) from future disasters.

Determining community vulnerability is difficult due to the lack of good baseline data. Necessary information to complete a vulnerability analysis includes population density and geographic distribution, location of lifeline systems and structures with high occupancy, such as schools and factories, and proximity of people and these structures to the potential dangers identified in the hazard analysis.

RESOURCE ANALYSIS

The third major category of disaster-relevant information needs consists of an assessment of the resources that a community can mobilize to respond to a catastrophic event. These resources can be divided into human and material resources. Human resources consist of the personnel and local expertise that can be mobilized to respond to the needs of the victims of a disaster. Examples of material resources include heavy-lifting equipment utilized in search and rescue operations, vehicles to transport relief supplies or particular kinds of facilities, such as hospitals.

As part of a resource analysis, it is important to determine the level of disaster preparedness in the affected community. Does a national, regional, or local disaster plan exist? Is there a national emergency planning commission or agency? What mitigation measures have been taken? Has there been any effort at hazard or vulnerability analysis? What is the past disaster history of the community and how well did it respond to past events? It is important to document the existence of preestablished emergency facilities, shelters, and supply stores and equipment. It is very important to know the location of major health care centers such as hospitals and polyclinics relative to the disaster site as well as the type, numbers, and level of training of personnel at these hospitals.

It is important to have a rough idea of the organizational structure of health services in the affected country. The location and availability of services such as specialized laboratory facilities for surveillance for infectious diseases, storage and transportation facilities for vaccines, drugs, and other medical supplies should be known in advance. The existence and quality of the country's health information systems should be documented so that already existent mechanisms to gather disaster-relevant data in the postdisaster period can be utilized.

ASSESSMENT OF DISASTER IMPACT

Although the preceding three categories of information requirements relate to a variety of predisaster activities such as prevention, mitigation, preparedness, planning, and warning, they are also important for decision-making in the postdisaster period. The results of a careful hazard, vulnerability, and resource analysis cannot take the place of specific postdisaster impact information, however, combined with a systematic postimpact assessment, the decision-making process can be enhanced to a considerable degree.

Predisaster Modeling of Disaster Impact

The results of hazard analysis and vulnerability analysis can be combined to model or simulate natural disasters. This is accomplished by assuming that a given type of natural disaster of particular intensity will affect a human population that has been characterized by a particular vulnerability to that event. For example, in the case of earthquakes, it has been possible to establish probabilistic relationships between the level of shaking, the type of construction, and the level of damage to be anticipated. One can then assign specific damage probabibility matrices for given building types. This information, combined with the seismic risk for a given community, can be expressed in terms of the total expected loss over a given future period, the average annual loss, or the probibility of exceeding a catastrophic loss threshold during the period.

Of greater significance to health and medical providers, this analysis can be extended even further to describe the probability of death and injury in an earthquake. For example, the probability of injury is the product of the probability of occurrence of an event of a given magnitude and the conditional probability of injury experienced by various population groups at risk for injury at that level of magnitude. Thus the probability of injury (or fatality) at a given level of intensity for a given type of construction may be expressed in the form of an Injury (or fatality) Probability Matrix (IPM). With vulnerability expressed in an IPM or FPM, it becomes possible, using an estimate of an event probability, to estimate potential morbidity and mortality. In addition, in the immediate postdisaster period, it becomes possible, with prior knowledge of the distribution of populations and structures and the event intensity, to estimate rapidly the probable level of injuries and fatalities. IPM (FPM) may be developed on the basis of observed damage that occurred in previous disasters.

Several investigators are currently developing casualty estimation models based on damage estimation for principal building types and occupancy levels as part of earthquake vulnerability studies for high-risk communities (Ohta Y, et al, 1986; Steinbrugge K, 1989). This has been a difficult task since the data on damages collected in earthquake events continue to be crude estimates based on superficial observations of limited technical and statistical validity. For example, deaths, injuries, and other related data are gathered without correlation to building design, dynamic characteristics of soil around each building, and the population at risk in individual buildings. Therefore, casualty and health care extrapolations to other earthquake magnitudes and other geophysical settings have generally low credibility. This serious deficiency is now beginning to be addressed. Postdisaster medical studies conducted after the 1988 Armenia earthquake are major beginning steps toward rationally quantified casualty estimates that take into account both numbers of casualties as well as severity of injury (Noji E, 1989d; Ricci E, 1989). It is hoped that the development of valid casualty estimation indicators will allow rapid prediction of emergency health care needs given knowledge of types and numbers of buildings in a given geographic area. It is considered essential to begin studying in detail the injury patterns from earthquakes in an analytical rather than descriptive manner, closely linking the engineering and epidemiologic considerations.

The predisaster estimate of expected future disaster loss is a potent tool, because it brings together the two components of disaster risk (hazard and conditional damage probability) in a statement of expected impact. Thus it has been possible to establish probabilistically a series of conditional relationships that link expected damage to buildings to health-related issues such as numbers, type, and severity of injuries.

Although employed primarily as a predisaster tool for purposes of mitigation and preparedness, modeling of disaster impact also has potential use for postimpact assessment. For example, if one has information on local geological conditions; on the vulnerability of structures; on the population size, density, and distribution of the impact area; and on the magnitude of the earthquake, it is now possible to quickly estimate the effects of impact with considerable precision. This, combined with data on disaster-relevant resources and level of disaster preparedness within the affected community, may permit a rapid estimate of requirements for outside assistance Similar analyses can be done for tropical cyclones and hurricanes, whose area of impact can be predicted to a much greater degree than for earthquakes.

A major problem associated with the use of disaster simulation and impact estimation is the lack of information on the various populations at risk and their vulnerability to disaster-agent effects. In order for disaster modeling to be of much use, disaster intelligence and data gathering must be a high priority item Gathering the necessary information will require both sophisticated remote-sensing techniques and labor-intensive ground-surveying techniques, particularly in areas known to be subject to disasters. This is not to imply that better predisaster information will automatically result in a clearer understanding of the relationship between disaster-generated needs and local as well as external responses. Although the situation would be markedly improved, the technique of disaster modeling can only serve as a supplement to careful postdisaster assessment.

Postdisaster Assessment

Currently, the data on damages collected in actual disasters are usually crude estimates based on superficial observations of limited technical and statistical validity. Thorough postdisaster health assessment requires the systmatic and objective measurement of the overall effects of the disaster impact, specific health care needs of the survivors, local resources to cope with the event, and the extent of response to the disaster by local authorities. Postdisaster assessment must be a continuous process with information collected throughout the postdisaster and reconstruction phases. This allows sustained feedback about changes in postimpact needs and allows authorities and disaster relief agencies to modify their response efforts. As mentioned above, predisaster modeling for purposes of predicting or rapidly estimating needs has serious limitations for assessment purposes. Postdisaster assessment clearly provides the best source of information for disaster responders to base their decisions on.

Despite the almost universal acceptance of the need for good disaster intelligence, it is extremely difficult to collect accurate data in the immediate postimpact period for a variety of reasons. The authorities or disaster relief agencies may be reluctant to commit scarce resources to assessment at the expense of other operational activities. During the immediate postimpact phase, access to the affected area is difficult and sometimes impossible due to disruption of roads, traintracks, flooding, etc. The country or region may lack persons with the epidemiologic expertise to conduct rapid assessment surveys. The country may not be able to conduct a survey by plane or helicopter due to lack of resources, and remote-sensing techniques may not be available. Local authorities may object to the arrival of external or foreign assessment teams. This problem of lack of good information is compounded by the press who may disseminate inaccurate or simply wrong information.

There are currently no standardized methods or indicators to rapidly determine the needs of disaster victims and communities. It is important to identify those pieces of information that can be realistically gathered in the field for rapid decision-making after a disaster. Time is the key issue here. Serious health and medical needs must be addressed within days of impact. Ideally, health needs assessment should be completed in one day. In order to accomplish this, we need to develop a rapid sampling frame with which to quickly estimate number of injuries and severity of the injuries.

The objectives of postdisaster assessment are to determine both the actual needs resulting from impact (eg., the number of people injured by collapsed structures) and the possible needs that could arise (eg., interruption or contamination of water supply). Immediate health requirements may be divided into three classes: food, shelter, and medical care. Indicators for a rapid needs assessment should estimate the type and quantity of human or material resources to meet each of these three requirements.

There are three major methods of collecting postdisaster information: 1) indirect aerial assessment (both low-level and high-level) and information derived from space satellites; 2) information reported from the affected region through regular reporting mechanisms; and 3) ground surveys. The measurement of disaster-associated health and medical problems are generally dependent on information obtained from ground surveys.

Only information that has the potential to influence disaster-relevant actions should be collected in this first "quick and dirty" survey. Time should not be wasted on collecting information that does not have any immediate operational value. This is not to suggest that such information is not of ultimate value. For example, the number of deaths is an important measurement of impact, but it is irrelevant to assessing medical needs. The number of injured admitted to hospitals suggests a need being served rather than an estimated demand for medical services. The number of injuries is not particularly useful if there are no distinctions made between major and minor trauma, the type and severity of injuries, and the types of medical care required for these injuries.

Information should be collected such that decisions regarding provision of aid can be made based on a minimal amount of data. Elaborate sampling techniques have no place in this rapid assessment of health needs. A fine balance exists between maintaining simplicity and operationality of survey procedures and achieving a high degree of validity and reliability. To achieve this balance, a disaster assessor must have knowledge ahead of time of where to look, how many people to examine, how to make sure they are not a biased sample of the disaster-affected population, and how to rapidly conduct a survey with simple techniques ("quick and dirty" survey).

Once requests for assistance are received by donor agencies, it is important that the donors check the validity of these requests. It is important for validating these requests in order to determine priorities of assistance, particularly when these appeals for assistance multiply, and the number of donor agencies considering providing aid proliferates. In certain cases donors feel it important to provide assistance even before requests for such assistance are received, and they seek information on what needs are likely to exist. Hazard, vulnerability, and resource analysis data as described above may provide useful information for donor agencies who are contemplating providing assistance before the results of a postimpact needs assessment are available. Unfortunately, for the most part, predisaster hazard and vulnerability analyses as well as disaster simulation models are not sophisticated enough to provide estimates of the scope and intensity of damages, let alone base operational decisions on. It is relatively easy to obtain some useful logistics data (eg., location of roads, hospitals, airports, customs regulations, warehouses, names of local officials, etc.); but data on hazards, vulnerability, and immediate postimpact health care needs are usually inadequate, incorrect or do not exist at all.

However, even the presence of good predisaster hazard and vulnerability data cannot replace postdisaster assessments on the precise geographic scope of damage, the number of deaths and injuries, the type and severity of injuries, the communicable disease potential, the extent of damage to hospitals and local sources of food, and the extent to which the affected community has been able to use its own resources to respond. For this reason, research must be conducted to improve postdisaster assessment information systems, define the information that should be collected, including the methodology of assessment, and techniques of data collection. Those in charge of gathering this information (eg., local health departments, district medical officers, international relief organizations, foreign experts, etc.) should be knowledgeable in the types of data that are needed as well as well trained in the methodology of rapid epidemiologic surveillance.

The development of valid methods for rapid assessment of needs under highly adverse conditions in disaster-stricken societies will require considerable research and additional resources. The objective should be to develop standardized procedures for collecting data that can then be linked to operational decisions.

SUMMARY

Better epidemiologic knowledge of the causes of death and type of injuries and illnesses caused by different types of natural and technological disasters is clearly essential to determine appropriate relief supplies, equipment, and personnel needed to effectively respond to such situations. Research into the exact nature of immediate needs in terms of trauma, injury (fatal and non-fatal), and mortality together with their relationship to disaster-specific characteristics (eg. magnitude of earthquake, intensity of hurricane, etc.) and demographic factors of the community would, therefore, make a significant contribution toward a cohesive disaster preparedness plan for community education, needs assessment for relief aid, public worker training for emergency need, and appropriate rehabilitation programs.

The development of such methods to systematically assess the effects of a disaster will be of great value to communities and local officials who will need rapidly available information in order to decide when to request outside assistance and what their greatest needs are (e.g., determining the requirements for food, medicine, and clothing, the need for temporary accommodations for the homeless, as well as assessing the need for infectious disease control). By identifying variables that reflect the impact of a disaster event upon a community and those variables that measure the amount of community resources to effectively deal with that event, one can begin to quantify factors associated with the severity and magnitude of disasters.

In summary, it is clear that disaster response would not be automatically improved simply by collecting more information. Large amounts of information on disasters are currently generated by governments, international agencies, voluntary relief agencies, and other groups. Much of this information is of questionable validity, and much of it is improperly collected, analyzed, and used. Valid and reliable hazard, vulnerability, and resource analyses, combined with systematic assessment of disaster impact and the affected population's needs would contribute much to the improvement of disaster assistance.

TABLE 1

Information Required For Health Needs Assessment

1. Casualties (eg. estimated number of injured by body part and severity);
2. Heath care resources (eg. type of health facilities, number of beds, personnel);
3. Food requirements;
4. Shelter requirements;
5. Condition of temporary settlements (eg. location and population of settlements);
6. Epidemiologic surveillance;
7. Availability of transportation (eg. number of operational health vehicles, amount of fuel available);
8. Communications;
9. Water (eg. number of people without minimum water supply);
10. Sewage;
11. Excreta;
12. Solid Waste;
13. Toxic substances;
14. Food protection;
15. Dead bodies.

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EPIDEMIOLOGIC MEASURES FOR EMERGENCY SERVICES PLANNING

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Planning for the system which responds to a population's routine emergency needs will occur at many different levels within a country's health care delivery system. A planner's focus will vary depending on the organization's scope of interest and the country's health care system. Planners working for health care delivery organizations focus on the care of individual patients, while those working for national/regional planning or regulatory agencies focus on the global system for delivering care. The different data bases which can be used by these two groups are described below.

CENTRAL PLANNING

Unfortunately for the central planner, there are no standard data bases which monitor the multiple parameters which determine a population's use of emergency services. This difficulty is compounded by the absence of universal agreement about the exact health conditions which require treatment in "emergency" facilities.

Most central planners have access to census data as well as birth/death certificate data. Depending on the sophistication of the country/region, a planner may also know the prevalence rates of certain chronic diseases, as well as the incidence rates of certain types of unintentional injuries. However, due to the differences in patient perceptions of what constitutes an emergency, it is impossible to predict the need for emergency services by adding the predicted incidence of all the possible conditions which could lead to an emergency department visit.

The central planner should focus on assuring that there is an organized, comprehensive regional response available to treat certain predictable categories of serious illness or injury which are most amenable to emergency treatment. This response begins in the prehospital setting and extends to the aftercare and rehabilitation needs of the ill and injured.

The seven categories of illness needing a special planning effort which have been defined in the United States are: major trauma, burns, spinal cord injuries, coronary heart disease, poisoning, high-risk infants and mothers, and behavioral emergencies. Although emphasis may vary among countries, this list provides emergency planners with basic areas upon which to focus.

Central planners also need to assure that there is an integrated system for accessing the prehospital care system, verifying that the prehospital care system will respond quickly and provide the patient with appropriate care on route to the proper facility. This process is very difficult in the United States because prehospital care organization has evolved and is funded at the regional or municipal level. Central government organizations set either voluntary or legal standards, and the delivery organizations are expected to comply, but central authority has little clout at the delivery level.

PLANNING AT THE SERVICE DELIVERY LEVEL

There are three important types of service delivery organizations which provide emergency services to a population; prehospital care organizations, hospitals, and alternatives to hospitals. Most emergency screening and immediate treatment is provided in emergency departments of general or specialized (ie. pediatric, psychiatric) hospitals. Alternatives to hospitals include freestanding emergicenters, emergency facilities run by multi- specialty practices, and primary physicians' offices.

The quality and usefulness of data available to planners in any type of delivery organization depends both on the efficiency of an organization's record keeping and the creativity of planners in specifying what parameters are tracked. Although modern information systems provide planners with great analytic capability, inadequate data collection in the emergency environment still presents the greatest impediment to record keeping. Often emergency personnel are so caught up in the act of providing care that they fail to spend adequate time recording the extent and scope of services provided. System managers must provide proper incentive, supervision, staffing, and a userfriendly tool for good data collection.

Prehospital Care

The structure of prehospital care organizations and prehospital treatment protocols show great national and regional variation. The basic mission however, is universal; transport critically ill and injured patients to the proper receiving facility in a timely manner.

The "run sheet" is the basic document used to collect prehospital data. This form is completed after every ambulance dispatch or patient encounter. The correlation of the run sheets with centrally collected dispatch information allows EMS systems managers to calculate the number and location of transports, patient demographics, types of problems treated, dispatch and response times, types of prehospital interventions, and hospital diversions. The planners will examine this information to determine trends from which future decisions about budget, staffing, and levels of service can be made.

EMS systems are required to keep data for quality assurance purposes. These data could include triage and outcome measures which might assist planners. For example, a system might compare the field triage assessment of a trauma victim with the hospital evaluation of the same victim to help determine if paramedics are making accurate assessments. This information could be eventually used by planners who are deciding about number and location of designated trauma centers. Patient satisfaction surveys could be used to help orient future paramedic training programs.

Hospital Emergency Departments

The hospital emergency department is becoming a complex system for the delivery of a wide range of urgent and emergent services. Emergency departments in United States hospitals received about 85 million patient visits last year.

Planners at hospitals must decide about the staffing levels and capital expenditures which are necessary to adequately treat the emergency department patients. When deciding on the level of service which will be offered, planners need to consider institutional mission, institutional capability, interests of the hospital's medical staff, regional medico-political issues, and what their institution's posture is toward other facilities competing for emergency patient visits.

The basic types of data which are available to planners at the delivery level includes the current and historical information on emergency department census, severity of patient illness, overall hospital census, quality assurance parameters, charge/insurance data, and the recognition that there are continually changes in medical practice which affect emergency department practice.

The emergency department census information which should be recorded includes the numbers of patients treated, the time and mode of patient arrival, and patient disposition. This information can easily be generated by keeping a hand-completed registration log. Experience in an urban hospital shows regularly recurring variations in patient flow (15% of patients arrive between midnight-8am, 52% between 8am - 4pm, and 33% between 4pm and midnight) allowing staffing patterns to follow patient arrival patterns.

There is no good system for calculating severity of illness of emergency department patients. Many hospitals use the ICD-9 CM system to describe the emergency department visit which has too many categories to be useful for the emergency department planner. An ancillary-destination based severity of illness index describes patient mix more accurately. In most hospital emergency departments approximately 25% of these patients had minor illness which required no laboratory or x-ray testing, 25% required only one type of ancillary, 44% were either admitted to the hospital or released after extensive testing or treatment, and 6% of the visits were from seriously ill patients who were admitted to an intensive care unit or operating room.

Changes in the frequency of different patient charge items might be used as a surrogate for severity of illness. For example, changes in the number of charges for oxygen, cardiac monitors, or infusion pumps might indicate a corresponding change in severity of patient illness.

Planners must consider future hospital census trends when making emergency department staffing decisions. As the hospital in-patient census approaches 90% of capacity, the slower bed availability will force an increasing number of scheduled "urgent" patient admissions into the emergency department. There will also be longer waits for bed assignment for unscheduled emergency patients. These two factors result in severe space congestion and redistribution emergency department staff effort from the "unassessed" patient stream to inpatients waiting for bed assignments.

Creative use of data collected primarily for quality assurance purposes can be useful to planners. For example, analysis of the patients who left without being seen can assist in the planning of the registration and triage systems. Analysis of the trends in unusual occurrence reports can demonstrate the need for new personnel, special training, or new equipment. Table 1 lists a group of quality assurance parameters which might be useful to planners.

Planners must also follow changes in medical practice which have an impact on the use of emergency services. For example, the beneficial effects of the early use of thrombolysis in myocardial infarction has increased the numbers of real and suspected ischemic heart disease patients evaluated the ED. Once in the ED, administration of thrombolytic agents necessitates an increased intensity of nursing and physician services.

Alternatives to Hospitals

Doctors' offices and multi-specialty group practices are the sites of 50% and 20% respectively of ambulatory visits in the United States. There are no data available about how many of these visits represent unscheduled "emergencies". Nor are there clear-cut distinctions between the type of ambulatory patient who would be treated better in an office rather than a hospital emergency department setting. Recent changes in medical practice which have required the earlier application of advanced technology in patient diagnosis and treatment have made physicians more reluctant to treat unscheduled emergency patients in the regular office setting. It is unlikely that the office environment will need to be considered by future emergency service planners.

Freestanding emergicenters are outpatient facilities which are oriented toward the unscheduled visit of patients with acute, minor medical, and surgical problems. They can adequately treat the sicker subset of office patients and the less severe subset of emergency department patients. Adequate cost analysis has not yet been performed to determine if this recent delivery system is a cost-effective way of treating a population's minor emergencies.

SUMMARY

There are multiple sources of data which assist planners in devising the medical system's response to routine patient emergencies. Central planners need population based data, while institutional planners can rely on data generated from their institutions. More research is needed to better define the optimal system to respond to a population's emergency needs.

TABLE 1

Quality Assurance Parameters Useful for Planning Emergency Services

1. Number and description of patients who leave the ED Against Medical Advice (AMA);
2. Number and description of patients who leave the ED after registration but before treatment is completed;
3. Unusual occurrence reports;
4. Patient and physician complaint and complement letters;
5. Unscheduled returns with 72 hours of initial treatment;
6. Deaths within 24 hours of emergency department registration;
7. Referrals to hospital social services;
8. Patients remaining in the ED for greater than 8 hours;
9. Numbers of patients scheduled to return to the ED;
10. Numbers of major trauma and cardiac arrest patients.