Computer Model for Simulation of Emergency Medical Systems

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CONTINGENCY planning for emergency medical systems (EMS) is primarily based on the experience of individual physicians caring for trauma patients. To great extent, many of the factors involved with large numbers of casualties are omitted from the planning of emergency medical systems because of lack of money, personnel, and physician interest. At best, trauma patients receive excellent care in centers designed to manage major injuries. Unfortunately, these centers are widely distributed throughout the world and can only make a limited impact on the mortality of the multiple-injured patient.

The purpose of this report is to describe a computer model (NAMES II, Navy Amphibious Medical Evacuation Simulation) that includes in concept the many complexities of an emergency medical system. The model simulates medical treatment and evacuation of casualties within a military combat zone. In addition, the simulation of a variety of logistical, medical, and administrative problems can predict requirements for the necessary resources to best manage the emergency situation.[1]

General Description of the NAMES II Model

The NAMES II Model is capable of simulating various configurations of the basic medical treatment and evacuation chain illustrated in Fig. 1. Casualty receiving facilities may be added or removed at any level. As each patient enters the system, he is classified according to the nature and severity of his wounds or illness by assigning him to one of a set of *user-defined* patient classes, which encompass all types of anticipated casualties, including outpatients as well as inpatients. A patient may enter the system at any facility level. The distribution of entering patients over all levels is specified by the model user. The user also selects the second facility level to which a patient should go if he must be evacuated from his entry level. The class to which a patient is assigned determines to a large extent his flow through the evacuation chain and his processing at each facility that he enters.

Each inpatient's class determines which of three priorities he will be assigned: Priority 1, "urgent," indicates that the patient is in critical condition and must receive the most

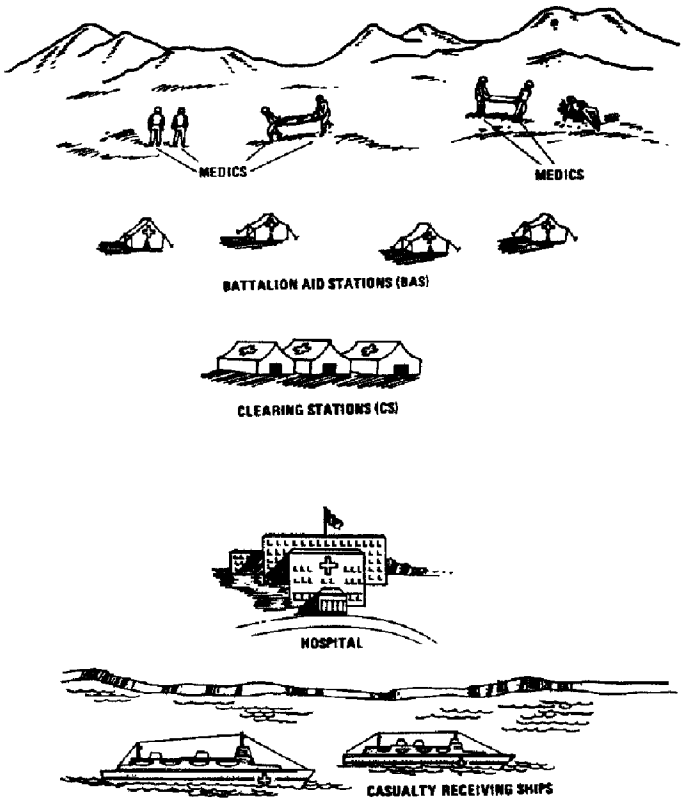

Fig. 1. Basic chain of medical evacuation.

expeditious attention in order to save his life; Priority 2, "immediate," indicates that the patient's condition is very serious and he must be treated without delay; Priority 3, "routine," indicates that the patient is serious enough to require admission to the medical system, but requires no special attention to treat his condition. Outpatients are assigned Priority 4, which indicates that those patients may wait for treatment until there are no other patients at a higher priority requiring commitment of medical resources. Each patient's class also indicates whether he occupies a litter or ambulatory status, and assigns to the patient an ordered sequence of medical treatments, called work units, that are determined by the type and severity of the injury. For each patient, certain work units may be identified as critical work units in that any delay in completing them will cause death or prolonged convalescent time because of complications.

Some patient classes, more serious than others, are assigned threshold times for initiating treatment at the entry level. If treatment is delayed beyond these specified times, the patient dies. These critical times associated with the various patient classes determine the mortality rate within the NAMES II Model, and allow the user of the model to observe the resources and parameters of the evacuation

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