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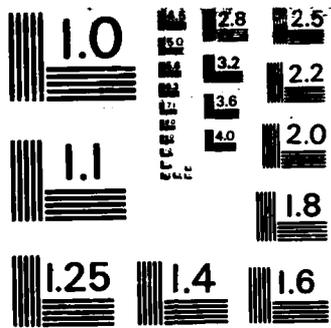
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# AUTOMATION OF MARINE CORPS CASUALTY MEDICAL DATA MANAGEMENT

C. W. BOLLINGER  
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AUTOMATION OF MARINE CORPS  
CASUALTY MEDICAL DATA MANAGEMENT

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#### SUMMARY

The accelerated pace of combat operations, together with the increased sophistication of medical care available to forward units, demands that we improve the efficiency of our data transfer and casualty management. Automation has the potential for improving the speed and accuracy of information relative to casualties for forward tactical units and for support and administrative units to the rear of an operation.

Increasing experience in battle casualty handling has led to significant improvements in evacuation of wounded and the location of a treatment capability close enough to the fighting to permit early definitive care. The recent experiences in Southeast Asia, however, are recognized to have been a significant departure from normal Marine Corps operations. The techniques and assumptions which served in that context, where terms like "forward" and "rearward" often lost their meanings, must give way to an understanding of the type of military operation anticipated in the future: amphibious operations. Therefore, the practice of evacuating casualties from a landing zone at the battle site directly to a fixed hospital is replaced in our planning with the concept of movement of all casualties through echelons of care.

In Vietnam, every Marine with a significant wound arrived at a fixed hospital; any medical information available was sent with him. In the future, it is anticipated that many Marines will be tended at lower echelons and returned to action, but the information relative to the casualty must nevertheless be transmitted rearward. These data are of more than casual interest. If a fixed hospital and medical regulating system are informed of a casualty at the time of wounding, it is as important to know that the Marine was "turned around" at a lower echelon as it is to know that another Marine is, after all, on his way to the hospital. And just because the Marine never reaches a location where clean and orderly medical records may be generated and automated is no reason for subjecting important casualty and treatment data to the danger of loss.

This paper will discuss existing plans for combat casualty care and invite consideration of the advantages of automation within that context.

#### GENERAL PRINCIPLES OF MEDICAL SUPPORT

There are five "General Principles of Medical Support" which provide a guide for the employment of medical and dental units (1). The principle of Conformity requires that care be provided at the proper place and time, and so must be planned in concert with the tactical plan. Proximity is the principle of assuring that care is as immediately available as possible to where the wounds are being inflicted, to reduce morbidity and mortality. The ability to shift medical support resources in response to changes in tactical plans or operations lies in the principle of Flexibility. There must be close medical support to maneuvering combat forces. A more capable unit is leapfrogged past an immobilized one when the need arises. This ability to shift rapidly rests on the principle of Mobility. Finally, the ability to provide care in a consistent and uninterrupted manner requires Continuity. This is the principle which governs moving the patient through a progressive, phased medical support system.

#### THE CONTEXT OF COMBAT CASUALTY CARE

Combat casualty medical care is delivered at various echelons ranging from the highly mobile unit Hospital Corpsman through facilities of increasing capability to the rear area and CONUS fixed hospitals (2). As medical care capability increases, so does administrative and record handling capability. Decreased mobility permits the installation and reliable performance of automatic data equipment. As a result, greater versatility is possible in the equipment for fixed installations and the systems developed for forward area use should easily be accommodated here.

#### COMPANY CORPSMAN

The first care that a sick, injured, or wounded Marine receives from medically trained personnel is usually delivered by the Company Corpsman. During engagement of the enemy, the corpsman is in the field with his unit. His equipment consists of a "Unit 1", which provides him with sufficient surgical equipment to perform lifesaving first-aid and relieve pain. The medical history available at the time of treatment depends upon the corpsman's tenure with the company, and a new corpsman may have had no time to review medical records. A medical warning tag system exists to alleviate this problem, but these red-colored "dog tags" identify only minimal special medical data and allergies to medications (3).

The company corpsman generates a casualty's first medical record in the form of the U.S. Field Medical Card (4). This card documents sparse information regarding the nature of the medical problem and treatment rendered. In a typical combat situation casualties are not generally brought to the Company Corpsman; he is nearby and goes to them. They are moved to the next echelon on foot, by manned litter, by ground transportation, or possibly direct to the rear by tactical helicopter.

#### AID STATION

The aid station is manned by hospitalmen and medical officers who are equipped to perform some resuscitation and minor surgery. These personnel will perform those complete treatments which allow the Marine to return to his unit, but there is usually no attempt at debridement and repair of significant wounds in a casualty handling setting. Bleedings from major vessels may be tied off, tracheostomy performed, and fractures stabilized in preparation for evacuation. The first sorting of casualties is done here. The priority of each arriving casualty's care is assessed relative to the casualties already received and being attended. Some casualties will be treated and returned to the field. Others may be retained briefly, but within a short time will have to be evacuated, if they cannot return to the field, as the aid station prepares to move. Others are treated and prepared for rearward evacuation.

The U.S. Field Medical Card is used to record the treatment and disposition of an evacuee. If the BAS has the Marine's medical jacket, it is often sent with the casualty. Evacuation to rearward land echelon is by ground or helicopter transport, and to casualty receiving and treatment ships by landing craft or helicopter. This process, as well as all further evacuations, is guided by an evacuation policy established by area and subordinate commanders and is coordinated by the Medical Regulating Agency (5).

#### HOSPITAL COMPANY AND MEDICAL BATTALION

In a classic amphibious assault situation, during the first 60 - 100 hours, facilities to the rear of aid stations are casualty receiving and treatment ships (6). Later, and as action proceeds inland, hospital companies and medical battalions are landed and replace the ships in the chain of evacuation and treatment.

The staffs of these companies and battalions are large and are augmented by medical and support specialists, capable of definitive surgical and medical care. Patients may be retained for significant lengths of time, because mobility is not an overriding concern. The records used

consist of standard forms and are retained in regular chart holders. To the extent that it is possible to set them up, CONUS hospital automation systems are appropriate in this setting. This is the first level from which evacuation can be planned and scheduled, often involving other services, such as the Air Force Military Airlift Command.

#### U. S. FIELD MEDICAL CARD

The U. S. Field Medical Card is the only record used to document injury and treatment data until the casualty has reached a hospital setting (4). If one card is filled, any number of cards may be added. The instructions pertaining to the uses of the card state that the card remains attached to the casualty until he reaches his ultimate destination in the chain of evacuation. However, it was the practice in Vietnam to leave the card attached only until the Marine received his first surgery, when a formal inpatient record was generated. The card(s) were then permanently included in that record. There presently is no type of vehicle to accommodate the card as a record; it is simply stapled or clipped to another page or is wedged in the chart holder. As the information on the card becomes "old history", the card suffers a decrease in prestige. The danger in this lies in the potential for loss of data which may not have been extracted.

Although automation of the input to the card may be inappropriate, certainly it, or a new device which replaces it, should be constructed to permit the efficient and total extraction of its data when the first formal chart is created. Equally necessary is the development of a method to accommodate the card in the chart as a legal record of the manner and time in which the wound was incurred.

#### MEDICAL REGULATING

Evacuation to the aid station is unregulated. That is, it conforms to local policy and field decisions. Evacuations from the aid station to the rear are controlled or regulated by the Medical Regulating Agency (MRA), which accumulates data on facility workload and availability of transportation, and coordinates the movement of casualties to appropriate medical facilities. The basic doctrine is that no patient is to be evacuated farther to the rear than his physical condition or the military situation demands.

#### THE POTENTIAL FOR AUTOMATION

The information which the MRA must have from the field is the number of casualties, diagnosis or type of wound(s), and a prognostic indicator in the form of a triage category or, better, a Trauma Score, which is an easily automated objective assessment of prognosis. Automation at this point could compare these data instantly with all other parameters, including facility materiel and medical staff (specialist locations), workload, and transport types and availability. The output might be used to provide information to the MRA; then to automatically notify facilities and transportation units of the present and developing situation. Similarly, each receiving or transporting facility should be able to feed back its data with speed and accuracy. Finally, automation permits tracking and receipt - with the benefit of accounting for each Marine.

## SUPPLY

Planting for operations includes consideration for initial supply based on a great variety of factors. Much of this is presently automated. An initial 3-5 day medical allowance is manlifted ashore. Ambulances are landed combat loaded.

Replacement of critical items, usually disposables, is presently facilitated by prepackaging in modules. Forward units may request minor resupply from rearward groups, but properly make requests to the tactical-logistical group for modules.

A tri-service group is presently working on standardizing supplies and equipment and echelons of care for each of 307 of the most common wound and illness types encountered in Vietnam (9). The result of their efforts is intended to be the provision of standard materiel to reduce expense and cube (cubic volume). A by-product of this effort might be the development of a system which permits a real-time estimation of the amount of supplies consumed based on the predetermined rate of utilization at each echelon. Then, when any unit reported the types and number of casualties handled, a resupply requirement would be automatically generated as a background operation. Resupply could be effected from this estimate with additional input from the unit as necessary. If this were coupled with an off-the-shelf packaging of consumables, the cube resupply could be no greater than actual requirement. A forward unit would not be oversupplied with some items in order to receive those which are actually needed. This would reduce the potential for restricting mobility due to the cube of supplies, and the abandonment of excess when the unit was required to move.

## PERSONNEL ACCOUNTING

During combat, when one battalion has suffered sufficient casualties to limit its effectiveness, another is landed to leapfrog over it to the engagement. The first, now rearward, battalion must replenish men and materiel and evacuate casualties, so that it can leapfrog ahead when needed.

The rapid reporting of individual casualties by identifier could be integrated with manning tables to produce a list of the type of replenishments needed. The number and specialties of replacement personnel would be exactly equivalent to the losses.

## EPIDEMIOLOGY/TEACHING

Epidemiologic analyses of casualty care have no immediate operational value, but the information required for planning and training (11). Record automation will permit systematic background analyses. These data could suggest early modifications of various protocols to reduce morbidity and mortality.

Similarly, the training of medical personnel being deployed, as well as that of those in theater, would reflect the latest information. Interactive computer-based teaching now being developed for trauma care could effect updates in decision trees and in video demonstration of techniques.

## HARDWARE CONSIDERATIONS

Every discussion of hardware must address, as a primary issue, the need for portability. This concept must include not only the actual ability to transport an item, but the ease and

reliability of installation. Once in place, a hospital company may occupy its location for a relatively long time. But its initial emplacement will have been effected during a single 48-hour period or less. Such urgency will not encourage patience for equipment accustomed only to the stroking of its manufacturers' technicians. The recourse to "Break Glass for Stubby Pencil" will be made in a heartbeat. In fact, our programs must address this impatience in every case. An abandonment of automation at any step should affect the medical care and the operation only minimally.

We should examine what is available for use as is, or what could be adapted for use economically. The Marines presently have the IBM Series 1 equipped with a 4110 display processor unit which is somewhat less efficient than the 4955 processor in the commercially available model. However, the Army is developing a field-hardened microcomputer with significant power, so there is reason to be optimistic about the availability of equipment when it will be needed.

With regard to technology, however, some of the most interesting work may occur in the areas of input/output and communications. Will a reborn U.S. Field Medical Card have check-off blocks for input and barcode for data extraction? What will the "smart dog tag" with its embedded IC chip allow us in terms of conveying information to accompany the casualty through the echelons?

How will our communications interface with and employ what is in place to support the operation? What is the place of microwaves, lasers, satellite communications, and radio?

#### BENEFITS OF AUTOMATION

Automation of the medical record has the potential of producing the advantages enjoyed in any hospital type practice, the principal of which is increased efficiency of care to the individual. It should permit the rapid integration of information at each step as evacuation proceeds rearward. Formal narrative summaries should not be required. A data medium included with the patient chart, on arrival, could quickly be read into the database of the receiving facility. Care at the new facility would then be provided as for an established patient, eliminating the requirement for the extraction and assimilation of information from a written chart. Procedures such as regular medication and antibiotic administration schedules would proceed effortlessly.

#### CONCLUSION

The accelerated pace of combat operations, together with the increased sophistication of medical care available to forward units, demands that we improve the efficiency of our data transfer and casualty management. This effort does not compete with those addressing tactical issues. The Marine Corps has traditionally understood that casualty management is a tactical issue of great importance.

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