



OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, D. C. 20301

17 MAY 1976

Winter W
Hessburg

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Minutes of the 141st Joint Medical Research Conference
(JMRC)

Agenda followed is included as Attachment 1.

Attendees are listed at Attachment 2.

Topic for discussion: Computer Modeling Associated with Combat Casualty Care. Summaries of the formal presentations are included as Attachments 3, 4, 5, 6, and 7.

Discussion:

1. From the beginning of the discussion, it was recognized that the issue and requirement for modeling related to combat casualty care is the responsibility of the ASD(HA) and the Surgeons General. However, it is unclear whether the data base needed to develop the software and the techniques for modeling such a complex set of issues is all in-hand. This JMRC was aimed at trying to identify any deficiencies in order that they may be addressed by RDT&E, if appropriate.

2. The presentations verified the fact that there are several active efforts underway to develop models for identifying the care requirements for combat casualties, disease and non-combat injuries forecasted for future conflicts. However, these models still represent only segments of the overall problem, reflect different reference points as to patient generation criteria and are not inclusive. They also lack the efforts to bring the pieces into a cohesive combat casualty care modeling system. To be successful, the several individual modeling efforts will require such integration, followed by a series of tests, using the projected area scenarios, to validate the models.

3. To date, most of the modeling efforts describe the combat casualty rate, diagnosis, and place of injury based upon historical data. There are indications that this is not valid. Based upon analysis and the data gained from recent conflicts, modern weapons and tactics are expected to produce higher numbers of casualties at the same level of conflict as found in the past; higher numbers of injuries per casualty;



perhaps a change in the degree of incapacity or severity of the injury; by the degree of injured tissues. All of these will greatly effect the complexity of the problems facing the DoD Medical Health Care System in providing care for the casualties.

4. Historical data provides no data regarding the casualty due to chemical, biological or radiological attack. New models will be required to reflect these as potential areas of potential conflict.

5. Modeling to date has tended to aim at answering logistics issues, i.e., beds; facilities; staffing; etc., and has assumed that if a casualty is well supported logistically, the casualty will be best served. This was an acceptable approach when logistic supplies and support were almost guaranteed. However, it is questionable as to whether this level of support can be expected in the future. It would appear, therefore, that future study efforts should address the combat casualty, his injury, his risks, where and how his case will be handled, and what the impact of certain changes in the care and logistics systems will have upon his survival, care, and rehabilitation. Such an approach will require much more data than has been considered before.

6. At the close of the discussion, it was proposed and generally agreed that there is a need for workshop or study effort which will involve all of those at DoD and at Service level who have a responsibility in the care of casualties. The objective will be the discussion and the development of a DoD integrated combat casualty care analysis and study approach to address future potential conflicts. The consensus was the the DoD should initiate this workshop, probably under the aegis of the ASD(HA).

Stanley C White

Stanley G. White
Colonel, USAF, MC
Executive Secretary
Joint Medical Research Conference

Attachments

A G E N D A

JOINT MEDICAL RESEARCH CONFERENCE

22 APRIL 1976

- 0900 - 0930 - MAJOR ROBERT HANDREN, MSC, USA
MAJOR GEORGE HAUSLER, MSC, USA
"MEDICAL MEDPLAN"
- 0930 - 1000 - WAYNE S. COPES, M.S., DAC
WILLIAM J. SACCO, Ph.D., DAC
"A COMPARISON OF THE EFFECTS OF 'OLD' AND 'NEW' WEAPONS/
MUNITIONS FROM A MEDICAL WORKLOAD VIEWPOINT"
- 1000 - 1015 - BREAK
- 1015 - 1045 - ARTHUR B. CALLAHAN, Ph.D., USN
"COMBAT CASUALTY EVACUATION MODELS"
- 1045 - 1115 - MAJOR RICHARD R. PAGE, AGC, USA
"HEALTH STUDIES TASK FORCE OSD(HA)"
- 1115 - 1200 - QUESTION PERIOD (PLEASE HOLD QUESTIONS UNTIL ALL SPEAKERS
HAVE PRESENTED)

CONFERENCE LOCATION - ROOM 1E801, ROOM #1, THE PENTAGON

NOTE: The Conference Room will have provisions for vugraphs and 35mm slides. All speakers are asked to provide a copy of material presented for inclusion in the minutes of the meeting.

Attachi

ATTENDEES

<u>NAME</u>	<u>ORGANIZATION</u>	<u>TELEPHONE</u>
Dr. William Reals	ODDR&E Consultant	
Col S. White	ODDR&E/OAD(E&LS)	695-9604
Col R. M. Johnson	USAMRDC	693-6625
LC S. Sandf	USAMRDC	693-7720
Mr. E. J. Williams	OTSG/HCO	697-2213
LC E. H. Williams	OASG/HCO	697-1674
Col R. W. Poel	AF/SGHX	693-1270
Maj F. Borngasser	AF/SGHXO	693-1270
LC George S. Kush	AF/SGPR	693-5943
Dr. A. B. Callahan	ONR, Code 444	692-4058
Mr. Wayne Copes	AMSAA	283-4287
Mr. Bill Sacco	Biomed Lab	584-3546
Col E. Kraikr	And	536-3817
Capt H. J. Sazima	OASD(HA)	697-5189
Maj Joseph Ballo	AFIP	576-3232
LC R. W. Hertzog	AFIP	576-3288
Col M. W. Hannegan	OASD(HA) TRIMIS	694-3884
LC M. W. Boruff	AFIP	576-2884
Lt C. V. Gordon	NSHCA	295-1324
LCdr D. E. Uddin	NMRDC	295-1520
LCdr J. C. Bond	NMRDC	295-1474
Maj Ernest Sutton	HQ DA-SGRD-EDE	223-8060
Capt E. C. Cowart	AFIP	576-2908
Capt M. I. Varon	NMRDC	295-1453
Col L. R. Stromberg	AFRRI	295-1210
Col W. L. Scheetz	USAMRDC	693-6625
Col R. Barquist	USAMRDC	693-8040
Col Willard Meader	AFSC/SGB	981-3342
Dr. R. R. Hessberg	HQ NASA	755-3726
Dr. J. P. Pollard	DN/ONR	692-4051
Maj R. T. Handren	AHSUSA HSA-CDR	471-4055
Maj R. R. Page	OASD(HA)	694-1281
Col Jack Murphy	OSD	694-1280
Col W. B. Dye	AF/SGPA	693-5784
LCdr L. J. Melton	BUMED 5511	254-4231

Briefing Notes: JMRC Meeting - Pentagon - MAJ Handren

22 April 1976

MAJ Hausler has just described our efforts concerning the Medical Planning Factors Study. I would now like to bring you up to date on the progress toward completion of that study, follow on goals and uses of the study products.

The MEDPLAN Study Report is 95% finished. The Logistics Center has completed their portion and submitted their results to us. This package includes documentation of the data search and manipulations performed during the study, flow charts describing the models and generation of the planning factors and various figures describing the data base.

OTSG (Army) is completing review of the MEDPLN rates and as soon as we can implement their recommendations for change or modification of the tables, we will publish the final draft report, staff it as appropriate within the US Army TRADOC and Medical Communities and forward the final result to TRADOC in accordance with current regulations and directives. We hope to complete these actions Sep 76.

The MEDPLN Study accomplishes three major goals:

1. It provides the military medical community with an automated data base for all significant historical casualty information. Prior to MEDPLN, these data were either manually stored or present in several automated formats. MEDPLN offers a single, common format for all this data.

2. It provides flexible models to simulate the handling of patients and medical work flow.

3. By combining the models with the MEDPLN rates and modifying factors to account for newly developed tactics, offensive and defensive capabilities, an assessment of how a medical force structure would perform can be made.

Follow-on projects, based on the MEDPLN data base and models will include an examination of probable changes in casualty distribution, and relative numbers, as a result of changing weapons technology and tactics. We will thus attempt to quantify some of those "modifying factors" I referred to.

The TRADOC Scenario Oriented Recurring Evaluation System (SCORES) system is a tool which when used in conjunction with the MEDPLN factors and data base modifying factors will provide a useful tool for evaluation of existing and proposed medical organization, procedures and doctrine. The SCORES scenarios utilize real world troop configurations (lists) and consider the real world threat environment. Thus far, scenarios have been developed which consider only conventional types of warfare. It is planned however, to develop at least one scenario involving nuclear and chemical warfare exchanges.

A current effort in which it is planned to utilize the MEDPLN methodology to a great extent is the Theatre of Operations Medical Support System (TOMSS) Study. The study directive has just been received by the Academy of Health Sciences and a draft Study Plan has been prepared.

It is proposed that TOMSS will examine and eventually delineate a theatre of operations health services delivery system. The study will provide a basis for preparing objective input regarding the number, type and function of TOE medical units required to support Mid-intensity combat operations and high intensity

conflicts involving the employment of nuclear and chemical munitions. Bio-logical Warfare will be at least partially examined. The environment during the 1977 - 1986 time frame is to be examined.

The possible methodology being considered to accomplish this evaluation uses the MEDPLN factors as a starting point. Modification of the MEDPLN historical data base will be required in order to properly reflect the real world battlefield threat. It has been proposed that Mid-intensity casualty rates can be estimated by utilizing data from several sources: studies already performed by other service schools, mid-East war data, and performance characteristics of type weapons systems. The effect of varying evacuation capabilities and policies on mortality, etc., will also be considered.

NBC casualty parameters pose particular problems. Nuclear casualty production models generally available consider employment criteria rather than strictly medical considerations. Since a target analyst is concerned with ensuring a certain level of guaranteed effect with respect to a target, the somewhat unpredictable nature of thermal radiation is not considered. Burn treatment constitutes a significant drain on medical resources and failure to consider this effect would drastically alter likely findings. Casualty prediction systems which do consider the thermal effects and evaluate the blast and radiation effects in terms of probable friendly casualty production are, for the most part, at least 15 years old. While the methodology of these systems may be suitable, certain of the assumptions have been antiquated or changed weapons technology may alter the relationships of the effects.

In this case, maximum utilization of the latest approved scenarios, exchange ratios, etc., developed by DA and DOD studies (e.g., Theater Nuclear Force) will be examined for possible application to TOMSS. Preliminary coordination with action level staff officers indicates that at least some of the data available will be applicable.

Chemical casualty models pose a similar problem. Fortunately, a model known as Chem Cas, prepared to support the CBR Carrier Study of the Ordnance Center and School, looks very promising. Assuming that support requirements can be ironed out, the Ordnance Center and School will provide support for this portion of the TOMSS study. The Chem Cas model uses the best available intelligence on opposing weapons systems and can be designed for weather conditions, degree of protection and many other modifying factors a particular scenario might dictate.

Biological warfare casualty data can, at best, be merely guessed at. Only general information is available and although this type of warfare will be addressed, little in the way of models is realistically available and this projected evaluation will, of necessity, be somewhat subjective.

This has been a "thumbnail sketch" on the status of the MEDPLN Study, its content, uses - current and proposed, and our proposals for follow-on application of the methodology.

Much work has been done, much remains to be done, but valid systems providing the combat developer with a measure of the effectiveness of his concepts and designs is essential to the production of valid recommendations for structure and operations of medical units on future potential battlefields.

THE MEDICAL PLANNING PROJECT

MAJ G. W. Hausler
CPT R. M. Anthony

U. S. ARMY ACADEMY OF HEALTH SCIENCES

INTRODUCTION

The medical planner at various levels of the US Army is responsible for designing medical organizations capable of providing responsive medical support to Army units in combat. In performing this function, the planner must make two basic judgments. First, he must assess how many and what types of patients are likely to result from anticipated tactical situations. Second, he must determine the medical resources required to provide an acceptable level of support for those projected patient loads. A medical planning study, "Medical Planning Factors" (MEDPLN), is being completed by the US Army Academy of Health Sciences, Fort Sam Houston, Texas, to improve the medical planning process, through better defined factors. Operations research/systems analysis techniques were applied to develop these factors.

BACKGROUND

Initially, the idea of developing a sophisticated "tool" to plan for Army-in-the field medical units began in the early 1960s at the United States Army's Combat Developments Command Medical Service Agency at Fort Sam Houston, Texas. At that time, a contractor developed a complex computerized Hospital Model. This model was designed to accept patients as inputs and to simulate processing the patients through an Army hospital in the field.

The organization that initiated the contract for the early work was the Medical Service Agency of the US Army's Combat Development Command. This agency recognized the need to develop improved medical planning factors so that medical

planning, to include inputs to the Hospital Model, would be realistic. This need for improved factors resulted mainly from advances made in warfare and in protective devices, from advances in medical knowledge, and from the emergence of guerilla and counterguerilla warfare. As a result, the Medical Service Agency initiated the Medical Planning Factors study in 1972. The 1973 reorganization of the Army incorporated the Medical Service Agency into the Academy of Health Sciences, still at Fort Sam Houston.

STUDY APPROACH

For purposes of this study, medical planning factors were defined as multiples, constants, or factoring rates that can be related to appropriate strengths and missions to provide estimates of patient admission, medical workloads, and medical resource requirements in terms of personnel and medical units. Purposes of the MEDPLN Study are to develop improved patient admission rates and to develop a methodology which can be used to develop the other types of medical planning factors.

Patient admissions include wounded-in-actions, disease cases, and non-battle injuries. These categories have been further refined by the Academy of Health Sciences into 75 classes of patient medical conditions. In each of the 75 classes the "patient rate" is expressed as the number of the US Army personnel admitted to Army-in-the field hospitals per day per 1000 troop strength.

The approach taken for developing patient admission was to first determine the variable conditions that could influence patient rates. These conditions were determined by the Medical Service Agency and are shown in the following slides (#1 - 5). The selection of these independent variables was governed by available resources, money, and most important, the availability of the data.

The US Army Chief of Military History was drawn into the process. He selected a number of representative battle actions from World War II, the Korean War, and the Vietnam War for each combination of the independent variables. Experimental analyses were then conducted by the US Army Logistics Center and Academy of Health Sciences personnel to correlate various combinations of the independent variables with existing medical data from the three wars. Once this procedure proved feasible, a contractor was engaged to perform the detailed data collection. This data collection effort involved collecting operational data (e.g., unit strengths, type posture) for each combat action identified by the Chief of Military History, computerizing the operational and medical data and combining the operational and medical data into a set of summary files. This effort was completed on 30 September 1973 and an automated medical/operational data base, consisting of 28 separate files, now exists on the Control Data Corporation 6500 computer system located at Fort Leavenworth, Kansas.

The data base was structured to permit a statistical analysis of the data for purposes of gaining insight into the influence that the selected independent variables have on the number and type of patients. The statistical analysis involved the use of computerized analysis of variance packages for analysing

various scenario combinations of the Korean War. The results of the Korean analysis show that the selected independent variables explain at most 35 per cent of the variance in patient rates. This result only emphasizes that numerous other factors are contributing significantly to the occurrence of combat casualties. However, as mentioned earlier, data on these other factors were not obtained because of the limited resources available to collect the data and the limited amount of data recorded on the other factors.

RESOURCE REQUIREMENT METHODOLOGY

The methodology developed by the MEDPLN team addressed the two primary requirements of medical planners identified in the MEDPLN Study.

The first requirement identified was to develop improved patient rates. The data on the summary files were analyzed to provide hospital admission rates. These rates will be used to update field manuals concerned with theater level resource requirements, as well as input the rates to an existing Patient Flow Model for determining Army-wide medical requirements. These rates are currently being used by the Academy of Health Sciences to update portions of field manuals for which it is responsible.

The second requirement identified was to develop an analysis tool to assist in estimating resource requirements for combat zone medical support. Communication Zone (COMMZ) Hospitalization was not included in this study. This requirement was met by providing high resolution computer simulation models. The MEDPLN automated data base was used to provide rate distribution tables and patient disposition curves. The existing Academy of Health Sciences' Hospital Model can be used to analyze resource requirements for combat zone hospitals. The MEDPLN team developed a Patient Workload Model to interface between the data base and the Hospital Model and to provide an analysis of medical resource requirements at combat division level. Details of this patient Workload Model are discussed below.

THE PATIENT WORKLOAD MODEL

The general purpose of the Patient Workload Model is to provide an interface in the MEDPLN methodology for determining medical resource requirements between the automated data base and the existing Academy of Health Sciences' Hospital Model. The system approach used is shown in this slide (Slide 6). Its specific purposes are to:

Generate a realistic patient load impacting on the Army-in-the field medical system based on the MEDPIN improved patient rates.

Simulate the processing of patients within the division level medical system, providing reports useful to medical planners.

Deliver patients to the Hospital Model in a manner suitable for further processing.

The portion of the Army medical system addressed by the Patient Workload Model is shown in this slide (Slide 7). The unit of interest is a combat division in a tactical posture and its immediate support. The medical units of interest are the Battalion Aid Stations (BAS) associated with each battalion of the committed brigades, the Reserve Battalion Aid Stations (RESBAS) associated with the battalions of the reserve brigade, the Clearing Facilities (CF) located in each brigade area and the division rear area, and the hospitals providing close support to each committed division (Consisting of some mix of combat support hospitals (CSH) and evacuation hospitals (EVAC)). A typical flow of patients might be as ~~shown~~^{shown} by the arrows in the figure.

The Patient Workload Model must ~~perform~~^{perform} two basic functions: First, it must generate a realistic patient stream; and second, it must process patients generated within the division area from the front door of the BAS to the front door of the combat zone hospitals. Since these are basically different and distinct functions, the Patient Workload Model was divided into two submodels. These submodels are the Patient Generator and the Division Processor.

As its name implies, the Patient Generator performs the function of generating the stream of patients impacting on the medical system. The first requirement of this model is for the user to specify in detail a scenario in which he is

interested. As each patient is generated, his data record is written on a magnetic tape. When all patients have been generated, the records are sorted by the patient's time of entry into the system and the tape is delivered for processing by the other models.

The division processor submodel is now ready to be exercised. This is the actual simulation portion of the patient workload model and basically represents a multi-channel, multi-server, multi-level queueing system.

The patients are selected one at a time from the input tape when they are scheduled to enter the system. They arrive at their appropriate input facility and enter a λ queue to await treatment. When the necessary treaters are available, they are given the treatment they require and are then disposed of. Their disposition may be that they die or return to duty at which time the model is through processing them. If they require additional treatment, available only at larger hospitals to the rear, they enter an evacuation queue until an evacuation vehicle is available to transport them to their next destination. The process is then repeated until they die, return to duty or reach a hospital, at which time they are written out on a tape for further processing by the Hospital Model.

The key to the resolution achieved by this model is the fact that the model keeps track of each patient in the system as he is processed through the system. At the time he enters the system his patient priority is checked and he enters a treatment queue behind those patients of a higher priority and those of the same priority who arrived earlier, but ahead of all patients with a lower priority. Then a series of work units that this patient requires is determined based on his patient class and the level of the medical system at which he is located. These work units are medical procedures that a panel of medical experts determined would

be performed on each class of patient. The expert panel specified the work units, the sequence in which they would usually be performed, the treater to perform them, and a range of time required for each treater to perform each work unit.

Next, the model searches each patient in the treatment queue, determines the next work unit required, and determines the preferred treater to perform the work unit. It then tests whether that treater is available at the current time; if not, it will attempt to select an allowable alternate treater. If no treaters are available, this patient remains in the queue and the model goes on to check the next patient. If a treater is available, the patient is removed from the queue, placed in the treatment area and the treater becomes available. The model then calculates a random time for the given treater to perform the required work unit and schedules the patient out of treatment at the appropriate time.

When the patient leaves treatment the treater returns to availability and one of two things can happen to the patient:

If there are more work units to be performed on him at this facility, he goes back into the treatment queue and repeats the process just described.

If his treatment is completed, the model determines his next destination, based on his final disposition, final destination and total days for completed case.

The evacuation system is based on the use of both ground and air ambulances, and 4 evacuation options exist. These options specify whether each patient priority will normally be moved by air or ground in this particular scenario.

In keeping with medical doctrine, evacuation assets are normally provided by the supporting facility and are prepositioned at the supported facility to

perform the evacuation. The user is able to specify how many patients of each priority are required to justify the dispatch of each type of evacuation vehicle. As soon as enough patients are ready for evacuation, and if there is a vehicle available for use, it is dispatched to perform the evacuation. This vehicle is filled with all the patients available, or all it can carry, with highest priority patients loaded first. The travel time to the supporting facility is then calculated based on a random distance between the two facilities and the average travel speed of the vehicle. At the completion of the trip, each patient evacuated is placed in the treatment queue of the receiving facility and the evacuation vehicle is returned to its original location. At this point, the process repeats itself again.

As stated earlier, the model was required to produce reports on the functioning of the medical system. The design of a model's output reports depends primarily on the types of questions the model user wants to answer. A series of standard reports were designed to describe the system's operation for each day simulated by the model. One of these reports describes the utilization of the medical treaters in the system.

Another standard report deals with evacuation vehicle utilization and presents data for both ground and air ambulances.

These are only two examples of the eight standard reports printed for each simulated day. There are also reports for the operation of the entire system, the patients generated and disposed of at each facility and the treatment and evacuation processes at each facility.

The following kinds of analyses are relevant:

The effect of peak loads on the system can be assessed.

The existence of bottlenecks in the system can be examined.

The adequacy of treater resources can be assessed.

The adequacy of evacuation assets can be examined.

The effects of patient holding policies at each level of the system can be determined.

The types of questions indicated above can be answered by the Patient Workload Model through extensive sensitivity analysis. The resulting answers will significantly assist in the development of medical TOE's and doctrine for the employment of medical units.

CONCLUSION

In summary, MEDPLN should be able to address a scenario, estimate the patient workload generated at the FEBA and in the combat zone, follow the patients through the division's TOE medical facilities, identify by type and number the patients presented to hospitals supporting the divisions, and identify by type and by number those patients that will be presented to other medical facilities outside the combat zone.

In addition, rates will be provided for FM 101-10-1 and FM 8-10. These tables will be arrayed to provide medical planners with a detailed breakout of rates by major unit type, type of operation, terrain-climate, and area of the world.

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SUMMARY OF PRESENTATION:

A COMPARISON OF OLD AND NEW WEAPONS/MUNITIONS FROM A MEDICAL WORKLOAD VIEWPOINT

The US Army Materiel Systems Analysis Activity (AMSAA) has the responsibility within DARCOM for the evaluation of the Army's materiel, including weapons. We have, therefore, been well aware of the increases in weapons effectiveness which have resulted from improved technology and the use of some totally new weapon concepts.

AMSAA also has DARCOM responsibility for "survivability analysis," that is to assess the capability of personnel and materiel to withstand the effects of combat and to make suggestions as to how the capability could be increased. For example, to improve personnel survivability we are working closely with other Army organizations to provide protection through improved helmets and body armor and through the use of ballistic materials to protect the users of artillery and antiarmor weapons.

Casualties will occur, however, regardless of attempts to reduce personnel vulnerability. The "survivability" of these casualties then depends upon the availability of medical support to provide the necessary treatment.

The determination of casualty rates depends upon many parameters, e.g., relative force sizes, types of units involved, tactics, doctrine, intensity and duration of battle and weapons used. The large scale changes which have taken place in some of these parameters since World War II or Korea indicate that some reasonable doubt could be expressed as to the validity of using historical data to make predictions about casualty rates for future encounters.

The purpose of this briefing is to compare the capabilities of "old" (last generation) and "new" (current) weapons and munitions, specifically with regard to:

- a. their relative capabilities to cause casualties;

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Enclosure 5

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- b. the killed/wounded ratios produced; and
- c. some measure of the medical care required for the treatment of the casualties produced.

Historical data showed that for WW II, Korea and Vietnam the vast majority of killed and wounded were caused by bullets and fragmenting munitions. This study, therefore, restricted itself to these two causative agents.

In military small arms, the effects of the US M16A1 were compared with those of its predecessor the M14. On a single round basis, the effects of the two were quite similar, with the M14 causing wounds of a slightly more serious nature (as measured by the probability of incapacitation given a hit, $P(I/H)$). The major benefit of the M16A1 is the reduced weight of the weapon and ammunition which allows the individual to carry a significantly larger number of rounds for the same combat load, enabling the M16 to cause about twice as many casualties per combat load as can the M14.

Limited data available from Vietnam, substantiated the analytic finding of the similarity of effects for the two weapons. Further, at least five days of hospitalization was required for a very high percentage of all small arms casualties.

A similar comparison was also made between "old" and "new" fragmenting munitions. Fragmentation data showed that the newer munitions produced more and smaller fragments than did the older munitions. Simulation indicated that this resulted in casualties caused by the newer munitions to sustain about twice as many wounds as casualties caused by the older munitions. However, the wounds caused by the newer munitions were judged on the average to be less severe (again as measured by $P(I/H)$), and it was predicted that a lower percentage of improved munition casualties would result in deaths, when compared with "old" munition casualties. However, on a single round basis, the newer munitions are able to cause significantly more casualties than the older munitions.

Casualty data from Vietnam supported the prediction that the newer munitions produced a lower killed to wounded ratio than the older munitions.

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Further, it was found that the casualties caused by the newer munitions required roughly twice as many major surgical procedures for their treatment as those wounded by the older munitions.

In summary, the study showed that new weapons are capable of causing significantly more casualties than their predecessors. In the case of military small arms, the character of wounds does not appear to have altered with the adoption of the new weapons. However, the number of casualties/combat load which the new weapons are capable of causing is roughly twice that of older weapons.

However, it appears that there are significant changes between the effects of old and new munitions. The newer munitions were found capable of causing significantly larger numbers of casualties, to produce a lower killed to wounded ratio (hence more casualties require treatment), and the casualties which they produce were found to require more major surgical procedures than do casualties wounded by the older munitions. Each one of these factors could, itself, lead to increases in medical workloads and the combination of these factors could under certain scenarios have very severe effects.

In conclusion, this study has considered but a single parameter which contributes to the estimates of casualty rates, namely weapons. However, I believe it has been shown that the new weapons have the potential to significantly increase casualty rates and perhaps the amount of medical care which is required by those casualties. Finally, it is felt that these changes in capability must be considered when estimating the casualty rates and medical workload to be expected in future encounters.

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Navy Medical Contingency Planning Program
(MEDCON)

Joint Medical Research Council

21 April 1976

The requirement for a planning system for contingency and mobilization requirements for medical manpower originated in a memorandum for the Secretaries of the Military Departments from the Assistant Secretary of Defense. (12 March 1974)

This memorandum requested information on time-phased manpower requirements, the method of analyses used to develop the requirements, and the identification of the key policies and assumptions which drive the analysis.

This information was required for updating the contingency and mobilization requirements for medical manpower for the joint OMB/DOD/HEW Military Health Care Study.

Responsibility for this effort was assigned to CAPT J. W. Johnson, MC, USN, BuMed, Code 49.

Due to the short lead time of 2-3 months allowed, contract arrangements were made through the Office of Naval Research with QEI, Inc., Bedford, Massachusetts, for the preparation and systemization of the required planning procedures.

The result of this effort was the Medical Contingency Planning Program (MEDCON).

Encl. 6

The basic purpose of the MEDCON study is:

1. To determine the overall adequacy of the BuMed Medical Support System to handle any reasonable medical contingency imposed by events which are well described.
2. To provide a continuing and updated specification of Medical and Health workload and requirements as projected by current operational plans and compare this with available capabilities.

MEDCON is a computation tool to assist the medical contingency planning process. It computes the Requirements for health care for injured or diseased Navy personnel moving through the Medical and Health Care System. MEDCON is intended for use in computing Medical and Health Care Requirements for any and all parts of the world and is intended to apply to any and all overseas combat zones and communications zones and to CONUS - the Continental United States.

Figure 1, in general terms, shows the movement of casualty personnel through the overseas areas into CONUS from any of a number of worldwide combat theatres.

Figure 2 shows in detail all possible paths of flow of injured and diseased Navy personnel in the Navy Medical and Health Care System. Returns to active duty from Navy Medical facilities are shown here as are evacuations of casualties to CONUS. The legend in the lower right hand corner of the slide explains the less obvious abbreviations used here.

MEDCON is a flexible computational tool and can be used for a variety of planning purposes, during peacetime, during mobilization or during hostilities. The program also provides the means to compute requirements where the input data can be varied over wide ranges. Figure 3 indicates the types of computations which can be made in which ranges of values can be assigned. MEDCON is sufficiently flexible in that provision is made to permit different time phasing for the outputs, different types of casualties - Wounded in Action (WIA) and Disease and Non-Battle Injury (DNBI) - and different admission rates, evacuation policies, accumulation factors and dispersion factors.

MEDCON assists in the planning process by providing windows on the Requirements Computation for Medical and Health Care Services over time. (Figure 4) A variety of different types of output is provided, some of it partial, some totaled, and some aggregated over force types and over time periods. Requirements are calculated and output is produced for all desired overseas theatres, for CONUS, and for all overseas theatres and CONUS combined.

Figure 5 illustrates that MEDCON computes the average requirements stated in terms of definitive care hospital beds and personnel. (Definitive Care is that which must be provided by the Navy Bureau of Medicine - BuMed - and which is not provided by personnel organic to the Navy and Marine Corps units.) The inputs from which these computations are made must be specified precisely.

The basis for all computations done in the MEDCON program (Figure 6) is the Requirement Formula which is derived from Standard Navy Doctrine. This Requirement Formula is: Requirement (in terms of Definitive Beds and Personnel) = Troop Strength x Admission Rate x Accumulation Factor x Dispersion Factor.

The Requirement calculated is the average requirement for Definitive Beds and Personnel for a particular location (overseas theatre or CONUS) for a given succession of days during mobilization or hostilities (M-46, M-23, M, D, D+30, etc.) (M-Day is the start of mobilization; D-Day, the start of hostilities.) Figure 7.

Inputs to MEDCON Program - Each of the four input factors in the Requirement Formula - Troop Strength, Admission Rate, Accumulation Factor, Dispersion Factor - will now be discussed in turn. As to Troop Strengths, the MEDCON program calculates the requirements for four different force types: Navy Afloat, Navy Ashore, Fleet Marine Forces (FMF) Afloat, and FMF Ashore.

In the case of admission rate, computations are performed separately for WIA and DNBI casualties. The casualty or admission rates that will be used for specific computations are derived from historical data concerning that situation most similar to the particular part of the contingency under study. The similarity of battle situations is determined by their similarity with respect to approximate geographical location, posture of U.S.N. forces (attacking, holding or

withdrawing) and threat environment (enemy strength in personnel and armament, etc.).

The Accumulation Factor is the rate at which patients in a BuMed hospital accumulate under steady state conditions for a given evacuation policy, assuming one admission per day. The accumulation factor is equal to the average length of patient stay. The accumulation factor can also be considered to represent the rate of employment of a Navy Medical Facility.

The Dispersion Factor is a measure of the upward variation in the average rate of health care employment. It is a safety factor used to compensate for mismatches in day-to-day workload and available capability. Quite simply, it refers to that portion of a medical facility which must remain unused until an emergency arises.

Figure 8 lists all the items of input that are needed for the calculation of Medical and Health Care Requirements. The four principal pieces of input - the Troop Strengths, Admission Rates, Accumulation Factors, and Dispersion Factor have already been discussed while Percent Evacuated and Percent Returned to Duty are self-explanatory.

The MEDCON program computes the Requirements over a succession of different time intervals covering the periods of mobilization and hostilities. Requirements have been calculated for the time-phased successions shown on Figure 9.

Input Requirements - Figure 10 shows a typical example of part of the inputs required by the MEDCON program. Here we see

an example of the time-phased inputs for troop strength, admission rates and the different possible evacuation policies. Figure 11 shows additional inputs required by MEDCON. The absence of time-phasing indicates that these inputs remain constant over all time intervals. A matrix of values is given for the Accumulation Factor, for the Percent Evacuated, and for the Percent Returned to Duty, the appropriate value to use being selected according to the evacuation policy in force at the time and the casualty type being considered.

Output of MEDCON Program - The MEDCON program produces three different types of output: the Requirements for each overseas theatre, the Requirements for CONUS and the total world-wide Requirements.

The different types of output produced by the MEDCON program for each overseas theatre are listed in Figure 12. The most important pieces of output produced are the Definitive Beds Required Onsite and the Definitive Care Personnel Required Onsite. The Operational Care Personnel Required Onsite gives the total number of medical personnel organic to the units in each theatre. It is calculated directly from the Troop Strength input.

The different types of output produced by the MEDCON program for CONUS are listed in Figure 13. Both the Definitive Beds Required for casualties generated inside CONUS and those evacuated to CONUS from overseas are calculated and output. Operational Support Care Personnel Required for

CONUS refers to those medical personnel organic to units stationed in CONUS.

Figure 14 lists the different types of world-wide total Requirements that are produced by the MEDCON program.

Figure 15 gives an overview of all the operations and calculations performed by the MEDCON Model computer program. Inputs are shown on the left and outputs on the right, with the basic Requirements formula and arrows indicating the calculation flows being in the center of the slide.

Examples of MEDCON Output - The following figures present examples of some of the output produced for a single theatre by the MEDCON program. Note how the output is given at a succession of points in time and for each of the four force types within each of the casualty types, WIA and DNBI. Figure 16 lists daily admissions in the WIA and DNBI types of casualties.

Figure 17 shows in particular the Definitive Beds Required Onsite for different days for this theatre.

Figure 18 shows part of the output for Definitive Care Personnel Required Onsite. Care personnel are divided into four different classes - Medical Corpsmen (MC), Nursing Corps personnel (NC), Medical Service Corps personnel (MSC), and Hospital Corps (HM).

The above examples have been intended to be representative of the MEDCON output capability and do not represent the full scope of the output capability.

The above has constituted a brief overview of the MEDCON system, its objectives, its logical basis, its inputs, and its outputs. For a more complete picture of the system, we will make the various reports on the MEDCON project available upon request.

The MEDCON program is global in its estimate of contingency requirements. Due to lack of adequate data base for estimation of dispersion factors it was purposely oriented in its original concept to historical data and operation on particular scenarios.

In order to establish a computational data generator for MEDCON, the Naval Medical Research and Development Command, ONR and OASD have at various times funded a study with Dr. Paul Richards of the Naval Research Laboratory. Dr. Richards has developed a Navy Amphibious Medical Evacuation Simulation (NAMES) model.

The NAMES model was developed in order to provide a computational tool for the comparative analysis and evaluation of different medical evacuation systems which may be under consideration by the Navy and Marine Corps for supporting future amphibious operations. The NAMES model has been designed to demonstrate the sensitivity of various medical evacuation systems to the resources of those systems. The model follows the flow of each patient through the entire evacuation chain, from the time the patient enters the chain in the combat zone until the patient leaves the evacuation

chain. The model is capable of simulating various configurations of evacuation chains, ranging from land-based support facilities to sea-based support facilities or combinations of both. The model will accept any specified casualty admission rates, and is designed to demonstrate the effect of the interdependencies among the various elements comprising the amphibious medical evacuation system: casualty receiving facilities, patient movement vehicles, logistics, medical technology, command control and communications, and operational or tactical concepts, requirements and doctrine. The NAMES model computes a considerable amount of output data which can be used to determine the sensitivity of different medical evacuation system configurations to the important design parameters of these systems, to the patient loads imposed upon the systems, and to the evacuation policies which control the period of convalescence which is allowed patients within the system. The model does not require historical data inputs for its operation.

Time does not permit a detailed discussion of the NAMES model and therefore I will refer anybody that is interested to an NRL Technical Progress Report of the Naval Research Laboratory entitled "Overview of the NRL NAMES (Navy Amphibious Medical Evacuation Simulation) Model. Requests for this document may be referred to the Director, Naval Research Laboratory, Washington, D. C. 20375.

Figure 1

COMBAT ZONE

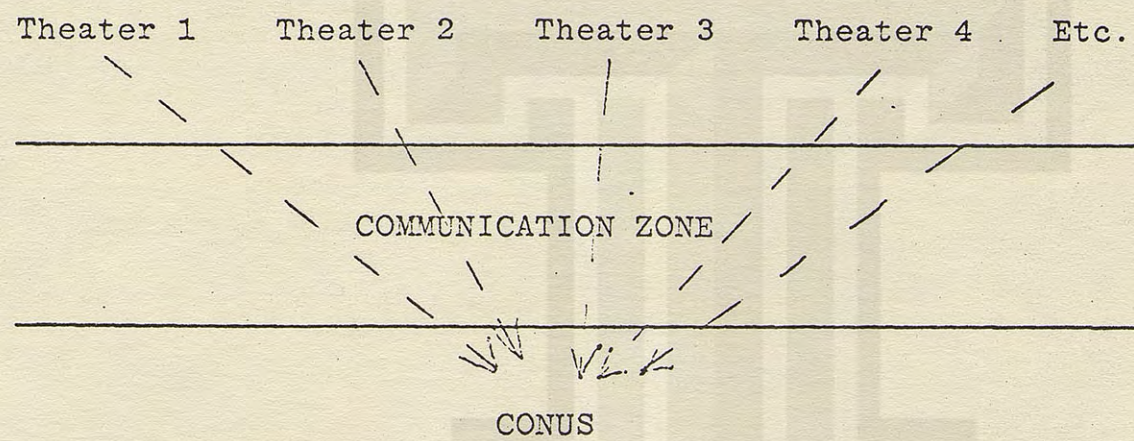
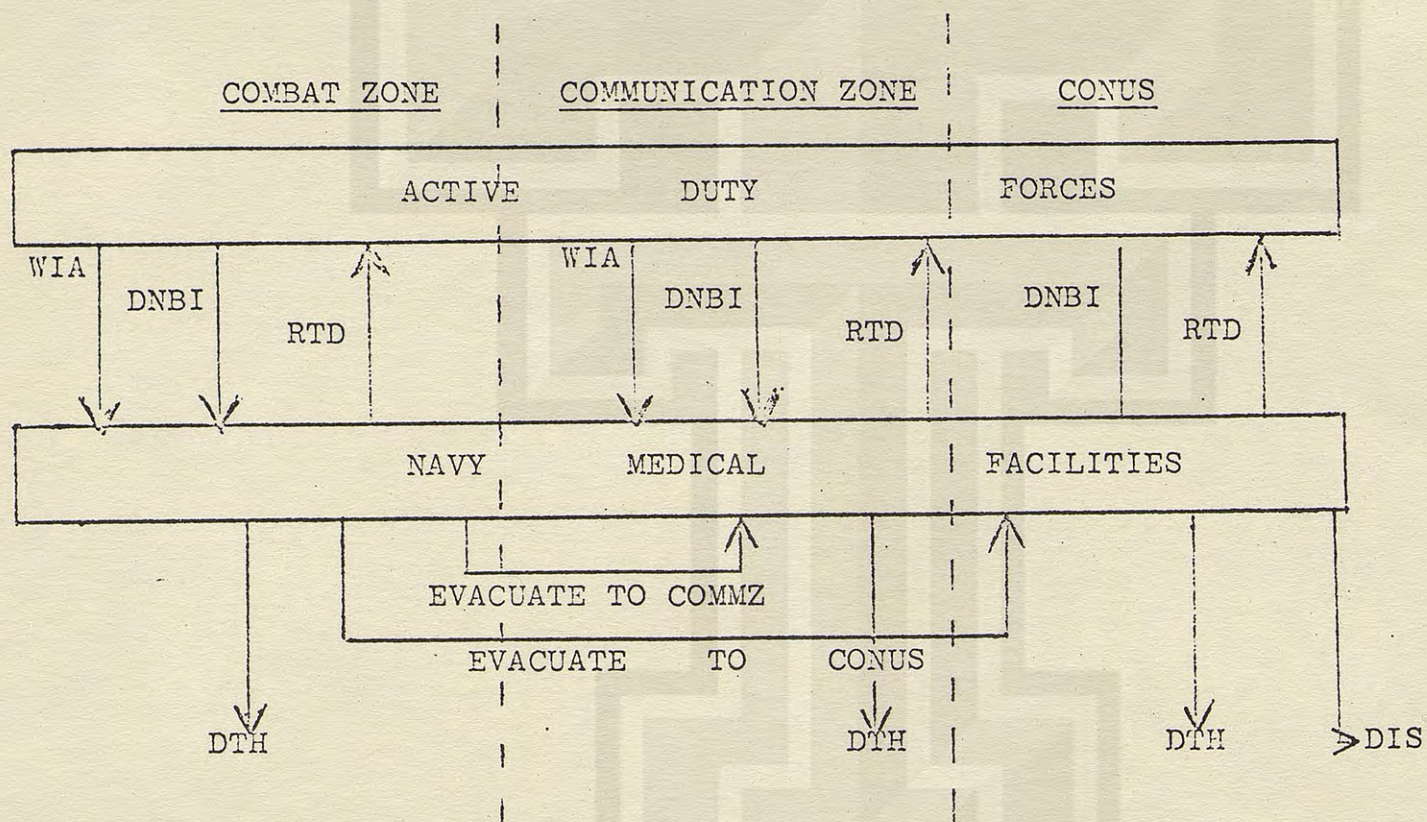


Figure 2

FLOW OF CASUALTY PERSONNEL IN HEALTH CARE SYSTEM



LEGEND

WIA - Wounded In Action
 DNBI - Disease and Non Battle Injury
 DTH - Death
 RTD - Returned to Duty
 DIS - Discharged

Figure 3

MEDCON : COMPUTATIONS CAN BE MADE FOR:

- DIFFERENT TIME PHASES
- DIFFERENT TYPES OF CASUALTIES
 - WIA - WOUNDED IN ACTION
 - DNBI - DISEASE AND NON-BATTLE INJURY
- DIFFERENT ADMISSION RATES
- DIFFERENT EVACUATION POLICIES
- DIFFERENT ACCUMULATION FACTORS
- DIFFERENT DISPERSION FACTORS

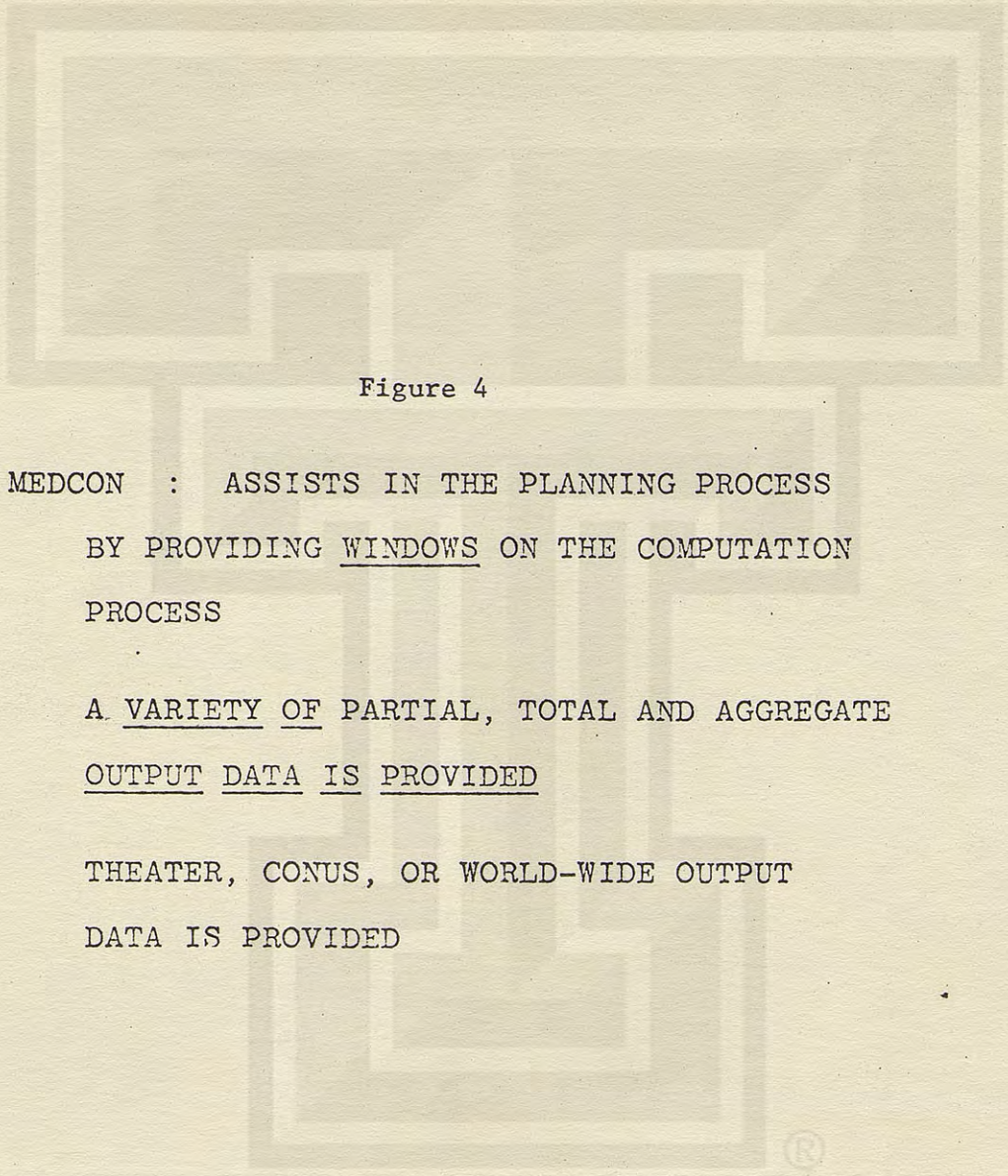


Figure 4

MEDCON : ASSISTS IN THE PLANNING PROCESS
BY PROVIDING WINDOWS ON THE COMPUTATION
PROCESS

A VARIETY OF PARTIAL, TOTAL AND AGGREGATE
OUTPUT DATA IS PROVIDED

THEATER, CONUS, OR WORLD-WIDE OUTPUT
DATA IS PROVIDED

Figure 5

MEDCON : Computes average requirements for definitive care hospital beds and personnel based on work-load data which must be specified.

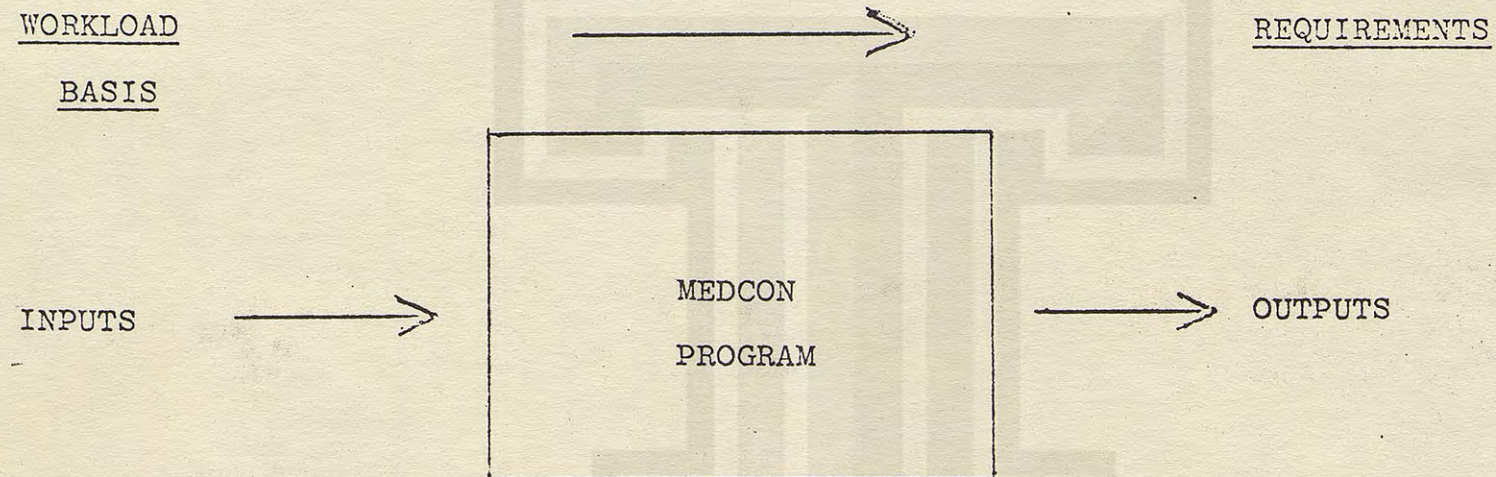


Figure 6

The basis for the MEDCON program is the Requirement Formula
derived from Standard NAVY Doctrine

Requirement

(in terms of
Definitive Beds
and Personnel)

=

Troop Strength x Admission Rate
x Accumulation Factor x Dispersion
Factor

Figure 7

Requirement calculated is the average requirement for Definitive Beds and Personnel for a particular location (Theater, CONUS, etc.,) for a given succession of days (M-46, M-23, M, D, D+30, etc.) during the period of mobilization or hostilities.

Figure 8

MEDCON : Input Data

In summary, the following items of time-phased data are input to the MEDCON program:

Total Troop Strength in Personnel

Admission Rates Per 1000 Troops

(Evacuation Policy)

Accumulation Factor

Accumulation Factor for CONUS

Dispersion Factor

Percent Evacuated

Percent Returned to Duty

Percent Onsite Returned to Duty

Specific conversion tables are also provided for MEDCON operation.

Figure 9

MEDCON : Time-phased Computation

Means are provided in the MEDCON program to compute requirements data over various time intervals to cover the periods of mobilization or hostilities.

The following time-phased successions have been implemented in the MEDCON program:

- M-46, M-23, M day, D day, D+30, D+60, D+90,
D+120, D+150, D+180
- M-16, M-1, M day, D day, D+30, D+60, D+90,
D+120, D+150, D+180

Figure 10

MEDCON INPUT - Example

(Illustrative Data)

		INPUT DATA					
		THEATER 1					
		TOTAL TROOP STRENGTH IN PERSONNEL					
FORCE TYPE		M-46	M-23	M-DAY	D-DAY	D+30	D+60
NAVY ASHORE		6492.	8727.	10961.	13134.	15307.	15307.
NAVY AFLOAT		0.	0.	23495.	46989.	46989.	46989.
FMF ASHORE		3453.	3453.	3453.	27378.	75227.	99151.
FMF AFLOAT		0.	0.	0.	0.	0.	0.
		ADMISSION RATES PER 1000 TROOPS					
WIA							
NAVY ASHORE		0.0	0.0	0.0	0.32	0.32	0.32
NAVY AFLOAT		0.0	0.0	0.0	1.23	1.23	1.23
FMF ASHORE		0.0	0.0	0.0	0.0	2.78	1.32
FMF AFLOAT		0.0	0.0	0.0	0.0	0.0	0.0
DNRI							
NAVY ASHORE		0.32	0.32	0.32	0.45	0.45	0.45
NAVY AFLOAT		0.0	0.0	0.0	0.32	0.32	0.32
FMF ASHORE		0.32	0.32	0.32	0.32	0.80	0.80
FMF AFLOAT		0.0	0.0	0.0	0.0	0.0	0.0
		EVACUATION POLICY					
EVAC POLICY 1		60	60	15	15	30	60
EVAC POLICY 2		15	15	15	15	45	15
EVAC POLICY 3		30	30	30	30	30	30
EVAC POLICY 4		60	60	60	60	60	60

Figure 11

MEDCON INPUT - Example

ACCUMULATION FACTOR		
	WIA	DNBI
15 DAY EVAC POLICY	12.00	9.00
30 DAY EVAC POLICY	20.00	13.00
60 DAY EVAC POLICY	32.00	16.00
DISPERSION FACTOR		
D = 1.25		
PERCENT EVACUATED		
	WIA	DNBI
15 DAY EVAC POLICY	81.74	37.50
30 DAY EVAC POLICY	66.00	17.40
60 DAY EVAC POLICY	42.00	9.24
PERCENT RETURNED TO DUTY		
	WIA	DNBI
15 DAY EVAC POLICY	16.52	62.36
30 DAY EVAC POLICY	32.13	82.55
60 DAY EVAC POLICY	56.05	90.59

(Illustrative Data)

Figure 12

MEDCON - Output

(Time-phased output for THEATER Mode)

Daily Admissions for Interval Following

Admissions for Entire Interval Following

Cumulative Admissions for Intervals Preceding

Number Returned to Duty for Entire Interval Following

Cumulative Returns to Duty

Number Evacuated for Entire Interval Following

Cumulative Number of Evacuated

Definitive Beds Required Onsite

Average Beds Required Onsite

Definitive Care Personnel Required Onsite

Operational Care Personnel Requires Onsite

Figure 13

MEDCON - Output

(Time-phased Output for CONUS Mode)

Daily Admissions for Interval Following - CONUS

Admissions for Entire Interval Following - CONUS

Cumulative Admissions for Intervals Preceding - CONUS

Number Returned to Duty for Entire Interval Following - CONUS

Cumulative Returns to Duty - CONUS

Definitive Beds Required - CONUS

Average Beds Occupied Insure CONUS

Definitive Beds Required - CONUS (From all theaters)

Definitive Care Personnel Required for CONUS

Operational Support Care Personnel Required for CONUS

Figure 14

MEDCON - Output

(Time-phased Output for WORLD-WIDE Mode)

Definitive and Operational Care Personnel for all

Theaters Except CONUS

Definitive and Operational Support Care Personnel
for CONUS

Total Theater Operational and CONUS Operational
Support Care

Total Definitive Care Personnel Required

Total Care Personnel Required

Figure 15

MEDCON MODEL

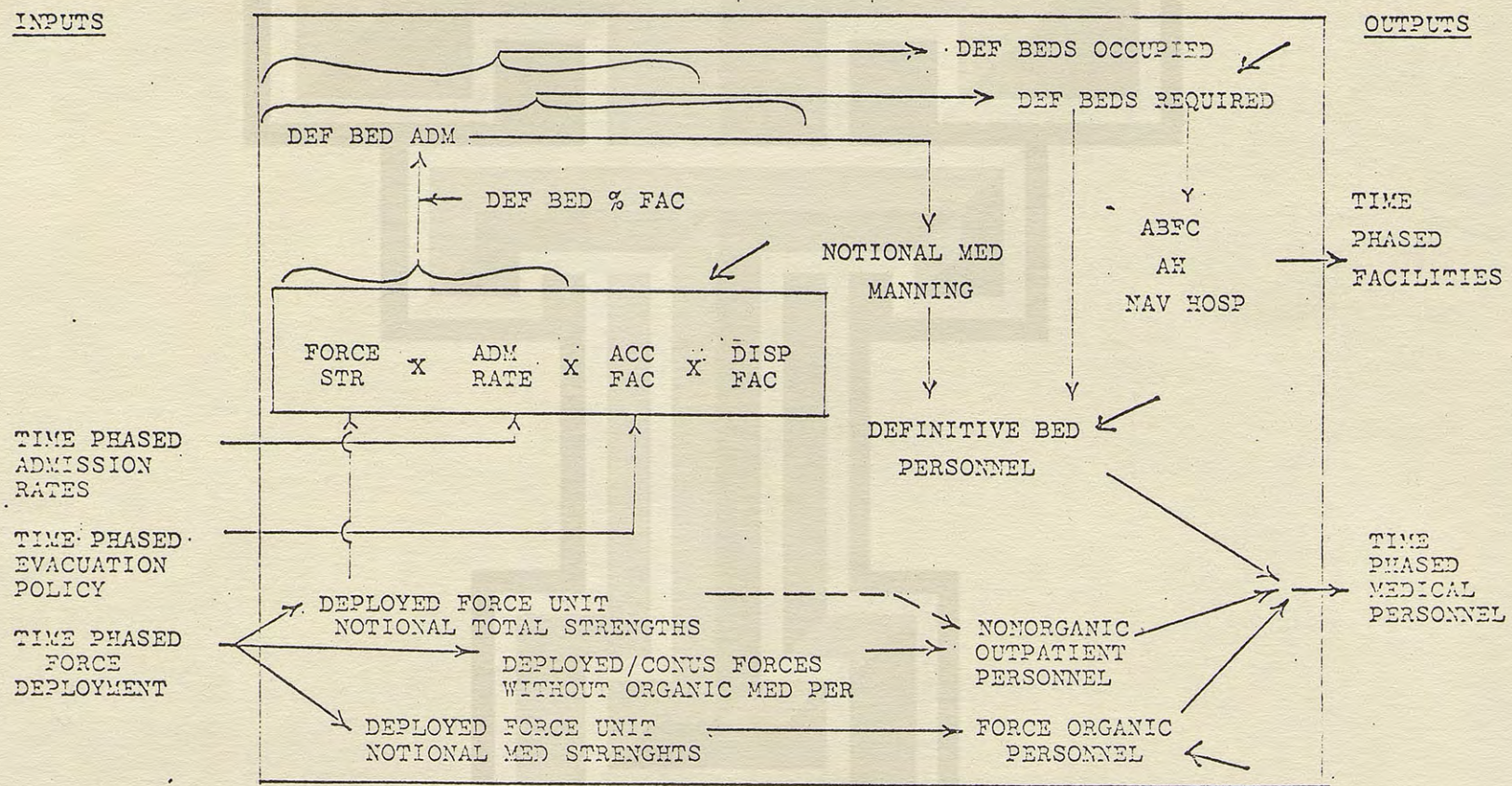


Figure 16

MEDCON OUTPUT - Example

(Illustrative Data)

THEATER = 1		EVACUATION POLICY = 1		BATTLE SITUATION = 2		
		M-46	M-23	M-DAY	D-DAY	D+30
DAILY ADMISSIONS FOR INTERVAL FOLLOWING						
WIA						
NAVY ASHORE	0.	0.	0.	4.	5.	
NAVY AFLOAT	0.	0.	0.	58.	58.	
FMF ASHORE	0.	0.	0.	0.	209.	
FMF AFLOAT	0.	0.	0.	0.	0.	
TOTAL	0.	0.	0.	62.	272.	
DNBI						
NAVY ASHORE	2.	3.	4.	6.	7.	
NAVY AFLOAT	0.	0.	0.	15.	15.	
FMF ASHORE	1.	1.	1.	9.	60.	
FMF AFLOAT	0.	0.	0.	0.	0.	
TOTAL	3.	4.	5.	30.	82.	
GRAND TOTAL OF ALL DAILY ADMISSIONS						
	3.	4.	5.	92.	354.	

Figure 17

MEDCON OUTPUT - Example

(Illustrative Data)

THEATER = 1		EVACUATION POLICY = 1		BATTLE SITUATION = 2				
		M-46	M-23	M-DAY	D-DAY	D+30	D+60	
CUMULATIVE NUMBER OF EVACUATED								
WIA								
	NAVY ASHORE	0.	0.	0.	0.	76.	174.	
	NAVY AFLOAT	0.	0.	0.	0.	1039.	2256.	
	FMF ASHORE	0.	0.	0.	0.	0.	3037.	
	FMF AFLOAT	0.	0.	0.	0.	0.	0.	
	TOTAL	0.	0.	0.	0.	1115.	5467.	
DNBI								
	NAVY ASHORE	4.	4.	10.	32.	91.	135.	
	NAVY AFLOAT	0.	0.	0.	0.	124.	227.	
	FMF ASHORE	2.	2.	5.	12.	87.	344.	
	FMF AFLOAT	0.	0.	0.	0.	0.	0.	
	TOTAL	7.	7.	15.	43.	302.	706.	
GRAND TOTAL OF ALL CUMULATIVE EVACUATIONS		7.	7.	15.	43.	1417.	6173.	
DEFINITIVE BEDS REQUIRED ONSITE								
WIA								
	NAVY ASHORE	0.	0.	0.	60.	116.	186.	
	NAVY AFLOAT	0.	0.	0.	173.	289.	462.	
	FMF ASHORE	0.	0.	0.	0.	4967.	4973.	
	FMF AFLOAT	0.	0.	0.	0.	0.	0.	
	TOTAL	0.	0.	0.	233.	5372.	5622.	
DNBI								
	NAVY ASHORE	33.	45.	32.	53.	90.	110.	
	NAVY AFLOAT	0.	0.	0.	34.	49.	60.	
	FMF ASHORE	18.	18.	10.	79.	782.	1269.	
	FMF AFLOAT	0.	0.	0.	0.	0.	0.	
	TOTAL	51.	62.	42.	166.	921.	1439.	
GRAND TOTAL OF ALL DEFINITIVE BEDS REQUIRED ONSITE		51.	62.	42.	399.	6293.	7061.	

Figure 18

MEDCON OUTPUT - Example

(Illustrative Data)

THEATER = 1 EVACUATION POLICY = 1 BATTLE SITUATION = 2
 DEFINITIVE CARE PERSONNEL REQUIRED ONSITE

DNBI	M-46				M-23			
	MC	NC	MSC	HM	MC	NC	MSC	HM
NAVY ASHORE	2.	2.	3.	20.	3.	3.	4.	27.
NAVY AFLOAT	0.	0.	0.	0.	0.	0.	0.	0.
FMF ASHORE	1.	1.	1.	11.	1.	1.	1.	11.
FMF AFLOAT	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL	4.	4.	4.	30.	4.	5.	5.	37.

	D-DAY				D+30			
	MC	NC	MSC	HM	MC	NC	MSC	HM
NAVY ASHORE	7.	8.	4.	32.	9.	9.	7.	54.
NAVY AFLOAT	5.	5.	3.	20.	5.	5.	4.	29.
FMF ASHORE	11.	12.	6.	47.	74.	80.	63.	468.
FMF AFLOAT	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL	23.	25.	13.	99.	87.	94.	74.	551.

	D+90				D+120			
	MC	NC	MSC	HM	MC	NC	MSC	HM
NAVY ASHORE	8.	8.	9.	66.	8.	8.	9.	66.
NAVY AFLOAT	4.	5.	5.	36.	4.	5.	5.	36.
FMF ASHORE	88.	95.	102.	759.	88.	95.	102.	759.
FMF AFLOAT	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL	99.	108.	115.	861.	99.	108.	115.	861.

Aeromedical Evacuation Study
Office of the assistant Secretary of Defense
(Health Affairs)
Major R. R. Page

1. Two years ago the Health Studies Task Force was asked to examine the aeromedical evacuation system and its ability to respond to contingency requirements. The objective of the study was: to determine the requirements and capabilities for aeromedical evacuation in support of contingency and mobilization operations. The intention was to examine the effect of a change to the current theater evacuation policy to reflect a policy of 15 days throughout the duration of the operation.

2. The actions we took initially involved contact with personnel in the studies and analysis area, airlift managers at Military Airlift Command (MAC), representatives of the three surgeons general, and a number of OSD activities to include M&RA, PA&E, and H&E. We made three observations: (1) the services used different methods to determine requirements for mobilization and contingency operations, (2) there was little detail in the aeromedical airlift portion of airlift studies and (3) the calculations were cumbersome for the service planners. It seemed to us that we could solve some of these problems by developing a model of the system that would be of assistance to the service planners and at the same time provide a capability within the OASD (HA) to respond to questions concerning the subject.

3. Concurrently with this effort the Office of the Surgeon General, USAF developed a concept of operation for aeromedical evacuation support of a scenario approved by OSD. This concept was developed by Captain Hamako of AF/SG, coordinated through the Army and Navy Surgeons Offices and approved by the Air Force Surgeon General.

4. This concept was converted into a model of the system using a simulation package known as Graphic Evaluation and Review Technique (GERT). The model depicts the four functional roles of aeromedical evacuation; tactical, intratheater, strategic and domestic. Patients enter the system in three places (1) through the tactical role (2) at the interface of tactical with intratheater and (3) at the interface of tactical and intratheater with the strategic. The model requires the following inputs:

- Number of evacuees
- Resource levels within the system

Patient stability parameters

Airlift parameters

The concept of operation

The outputs of the model are numerous and are in tabular form as well as graphic displays of frequency distributions. Shown below are representative output types categorized into three areas:

PATIENTS

Delivery rate

Number moved in the system

Time spent in the system

Waiting time in the system

RESOURCES

Medical crews required

Aircraft required

Configuration kits required

Comfort pallets required

MASF and ASF beds required

POLICY IMPLICATIONS

Effect of changes in evacuation policy

Effect of changes in MASF and ASF throughput percentages

Effect of changes in resource utilization

Effect of changes in patient load planning factors

5. The model we have developed addresses only the aeromedical evacuation portion of the total resources required to support contingency and mobilization operations. There is a need to develop the total resource requirement. Our office has contracted with DOT Systems of Vienna, Virginia to develop this capability within the OASD(HA). The eight tasks assigned to the contractor are:

1. Develop a casualty generation planning capability
2. Assist in selecting a range of scenarios
3. Develop a combat zone care model
4. Develop a communications zone care model
5. Develop a CONUS port model
6. Develop a CONUS care model
7. Integrate the required patient stabilization capability into the models
8. Interface the models with the aeromedical evacuation model

6. In summary, we now have a model of the aeromedical evacuation system running and plan to have a report out this summer outlining the results. The DOT Systems contract is progressing well and a report available by 1 September 1976.