AD-A151 001 MEDICAL PLANNING CRITERIA FOR IMPLEMENTATION OF CLINICAL HYPERBARIC FACILITIES(U) SCHOOL OF AEROSPACE MEDICINE BROOKS AFB TX W T WORKMAN ET AL. DEC 84

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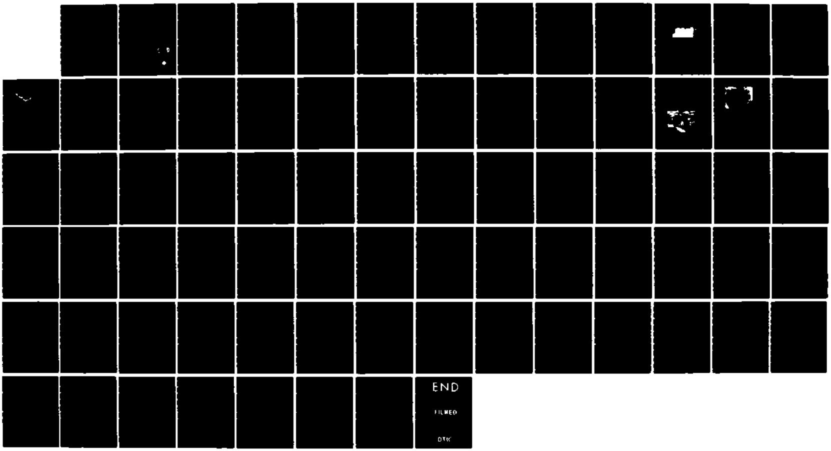

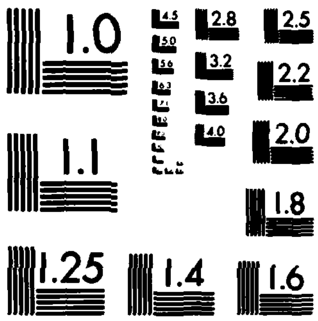

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MEDICAL PLANNING CRITERIA FOR IMPLEMENTATION OF CLINICAL HYPERBARIC FACILITIES

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December 1984

Final Report for Period October 1983 - August 1984

Approved for public release; distribution is unlimited.

USAF SCHOOL OF AEROSPACE MEDICINE
Aerospace Medical Division (AFSC)
Brooks Air Force Base, TX 78235-5000

NOTICES

This final report was submitted by personnel of the Hyperbaric Medicine Division, USAF School of Aerospace Medicine, Aerospace Medical Division, AFSC, Brooks Air Force Base, Texas, under job order HM888202.

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The Office of Public Affairs has reviewed this report, and it is releasable to the National Technical Information Service, where it will be available to the general public, including foreign nationals.

This report has been reviewed and is approved for publication.

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UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) USAFSAM-TR-84-36	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION USAF School of Aerospace Medicine 6b. OFFICE SYMBOL (If applicable) USAFSAM/HM	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State and ZIP Code) Aerospace Medical Division (AFSC) Brooks Air Force Base, Texas 78235-5000	7b. ADDRESS (City, State and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION USAF School of Aerospace Medicine 8b. OFFICE SYMBOL (If applicable) USAFSAM/HM	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State and ZIP Code) Aerospace Medical Division (AFSC) Brooks Air Force Base, Texas 78235-5000	10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO.: 87714F PROJECT NO.: HM88 TASK NO.: 82 WORK UNIT NO.: 02

11. TITLE (Include Security Classification)
MEDICAL PLANNING CRITERIA FOR IMPLEMENTATION OF CLINICAL HYPERBARIC FACILITIES

12. PERSONAL AUTHOR(S) Workman, Wilbur T.; Robinette, Michael D.; Laird, Thomas D.; and Cramer, Frederick S.

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Yr., Mo., Day)	15. PAGE COUNT
Final Report	FROM Oct 1983 TO Aug 1984	1984, December	76

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB. GR.	Hyperbaric chamber design, patient transportation, patient populations.
06	11		
06	19		

19. ABSTRACT (Continue on reverse if necessary and identify by block number)
Over the years designs of hyperbaric chambers have varied from spherical, tubular, horizontal, and upright cylinders. To date, there has been no published attempt to correlate vessel size and type, projected patient work load and subsequent manpower requirements to produce the most cost effective mix. The upright cylinder provides an optimum compromise between vessel construction costs, patient capacity, and personnel required to operate the facility. The maximum patient treatment capacity was determined for an upright cylinder of six different diameters. These diameters were 11, 14, 16, 18, 20, and 22 ft. The maximum ambulatory patient capacity for each vessel size is 6, 10, 12, 14, 16, and 18, respectively. The maximum litter patient capacity for each vessel size is 2, 3, 4, 6, 8, and 10, respectively. As the patient load and the number of dives per day increases, the requirement for inside medical attendants increases proportionally. This manpower factor is significant in that personnel costs can be as high as 85% of the total operating budget for a clinical hyperbaric medicine facility. These facilities must be

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL WILBUR T. WORKMAN, Major, USAF, BSC	22b. TELEPHONE NUMBER (Include Area Code) (512)536-3281 22c. OFFICE SYMBOL USAFSAM/HM

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UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

20. ABSTRACT (Continued)

designed with manpower costs uppermost in mind. It is a recurring cost that will most likely increase with time. Even though the initial investment in larger diameter vessels is high, these costs are recovered within a reasonable period of time through design and operational efficiencies. Also transportation costs of patients who are candidates for hyperbaric oxygen (HBO) therapy must be considered in the planning for future clinical hyperbaric facilities. This technical report provides a method for determining the cost of air transportation between the 9 Department of Defense (DoD) regions.

A major portion of this report deals with development of a study of prevalence of those patients whose diagnosis and/or complications of treatment would be amenable to adjunctive hyperbaric oxygen therapy. This base data was used in a projected work load algorithm. A survey of extant patient data bases revealed the existence of the Automated Inpatient Data System (AIDS) which collected both demographic and diagnosis data at the time of discharge from a medical treatment facility. Diagnoses were coded according to the International Classification for Disease nomenclature 9th Edition as modified by the DoD. A list of 42 diagnoses and procedures with their associated codes was compiled which included those recognized by the Undersea Medical Society (UMS) Hyperbaric Oxygen Therapy Committee report as well as other experimental entities. The prevalence data extracted from over 400,000 inpatient records for calendar year 1982 was then incorporated into a projected work load algorithm which included estimates of: Outpatient populations, percentages of patients within a diagnosis that could benefit from hyperbaric oxygen, average number of treatments necessary, and the space requirements dictated by chamber design. The population at risk, based on fiscal year 1982 Air Force Inpatient catchment area population estimates for the continental U.S. including Alaska and Hawaii, was 2,057,281. Results are summarized as follows by UMS Hyperbaric Oxygen Committee Report category: Inpatient Count - Accepted 4,514; Experimental 16,592. Number of treatments (Tx) - Accepted 17,992; Experimental 124,265. This is a first approximation of prevalence and potential treatments in the HBO arena. However, the magnitude of need indicated here, in what was basically a conservative estimation of work load based on confirmed diagnoses, points out the necessity of a careful and thoughtful evaluation of the size and capability of any proposed clinical facility. This technical report is to serve as a model for future projects within the clinical arena.

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MEDICAL PLANNING CRITERIA FOR IMPLEMENTATION OF CLINICAL HYPERBARIC FACILITIES

INTRODUCTION

Hyperbaric Medicine in the United States Air Force (USAF) has entered its 3d phase in the evolution of this specialized treatment modality. The period from 1965-1973 saw the initial installation and operation of 8 small chambers at selected flying bases. Their primary purpose, which continues to the present time, is the emergency treatment of decompression sickness in aviators.

These facilities also provide life-and limb-saving hyperbaric oxygen (HBO) therapy in emergency cases of air embolism, carbon monoxide poisoning, and gas gangrene.

In 1974, Colonel Jefferson C. Davis and colleagues at the USAF School of Aerospace Medicine foresaw the emergence of the clinical application of hyperbaric oxygen to all USAF patients. The Hyperbaric Medicine Division was formed and has guided the treatment of over 1,800 patients since that time (table 1).

TABLE 1. USAF EXPERIENCE: CASES TREATED 1965 - 1983

Decompression Sickness	571
Air Embolism	53
Carbon Monoxide Poisoning	115
Clostridial Myonecrosis	138
Chronic Osteomyelitis	151
Osteoradionecrosis - Mandible	130
Diabetes Mellitus - Wound Healing	69
Soft-Tissue Radionecrosis	96
Soft-Tissue Infections	29
Osteomyelitis - Mandible	62
Wound Healing Enhancement	159
Mandibular Reconstruction	151
Other	87
TOTAL	1,811

Patients from each of the services in the Department of Defense (DoD) are included in approximately 3,000 patient treatment dives annually (Fig. 1.), which is the maximum treatment capacity of existing USAF hyperbaric facilities.

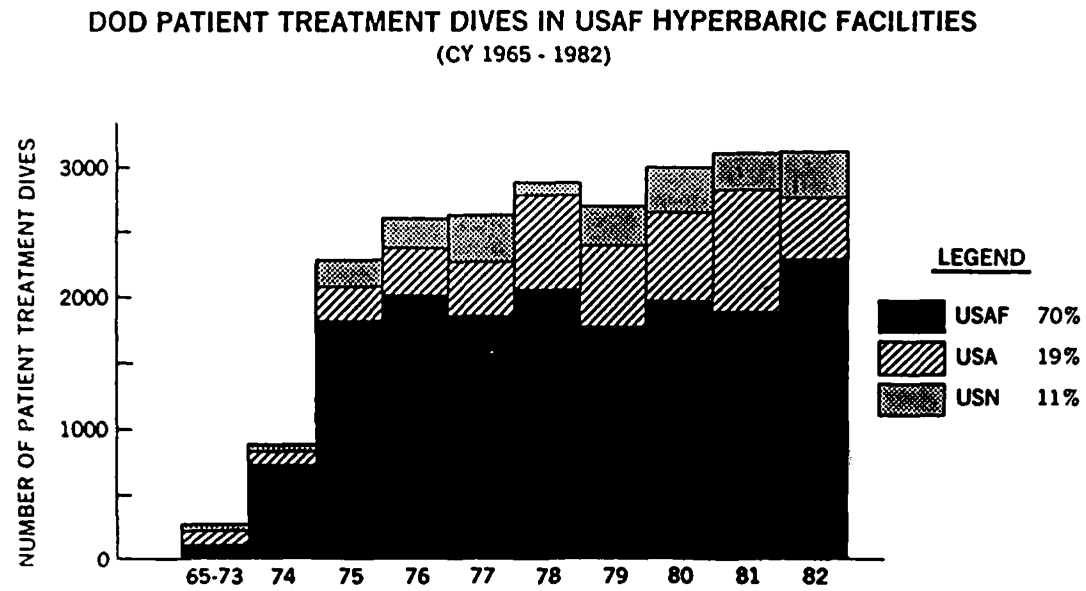

Figure 1. DoD patient treatment dives in USAF hyperbaric facilities.

Historically, 70% of the DoD patients treated were USAF patients, and 30% were U.S. Army and Navy patients. Based on that initial experience, the U.S. Air Force cosponsored publication of a textbook on hyperbaric oxygen therapy (1) to describe the response of va.ious disease entities to hyperbaric oxygen. A USAFSAM Technical Report, SAM-TR-77-7, was published (2) which recommended the design and construction of DoD clinical hyperbaric facilities. A variety of design options were considered from which the upright cylinder design was selected for the first of these facilities presently under construction at Wright-Patterson USAF Medical Center, Wright-Patterson Air Force Base, OH. As this first USAF clinical facility becomes operational in early 1985, Hyperbaric Medicine in the U.S. Air Force enters the third phase of its development: The implementation of hospital-based clinical hyperbaric facilities in medical centers.

The purpose of this technical report is three-fold. First, it provides a review of the design criteria used to determine the size of the clinical hyperbaric chamber. The upright cylinder chamber arrangement has been selected for this purpose after careful consideration of the available options.

Secondly, it provides a method for determining the cost of air transportation between DoD regions which has been reviewed and validated by the Military Airlift Command Surgeon in November 1983. Thirdly, it describes a method to predict patient treatments in advance of facility availability which is crucial to facility planning. A system based on inpatient International Classification for Disease Nomenclature - 9th Edition (ICD-9) criteria has been developed and is presented in detail in the Patient Population Data paragraph.

This report provides the various planning data necessary for future design and construction of clinical hyperbaric facilities in the U.S. Air Force. The concepts presented are suitable for application to DoD, VA, and civilian medical centers that are planning clinical hyperbaric facilities.

HYPERBARIC CHAMBER DESIGN CRITERIA

A geometric growth in clinical hyperbaric facilities has occurred in the United States over the past 5 yr. The Maryland Institute for Emergency Medical Services Systems, The Shock and Trauma Center at Baltimore, MD, publishes an annual Hyperbaric Chamber Register which lists the location and work load of clinical chambers (3). According to this report, there were approximately 40 clinical hyperbaric chambers in 1977 compared to 171 such facilities in 1983 (Fig. 2). A corresponding geometric increase in cases treated was also noted (Fig. 3).

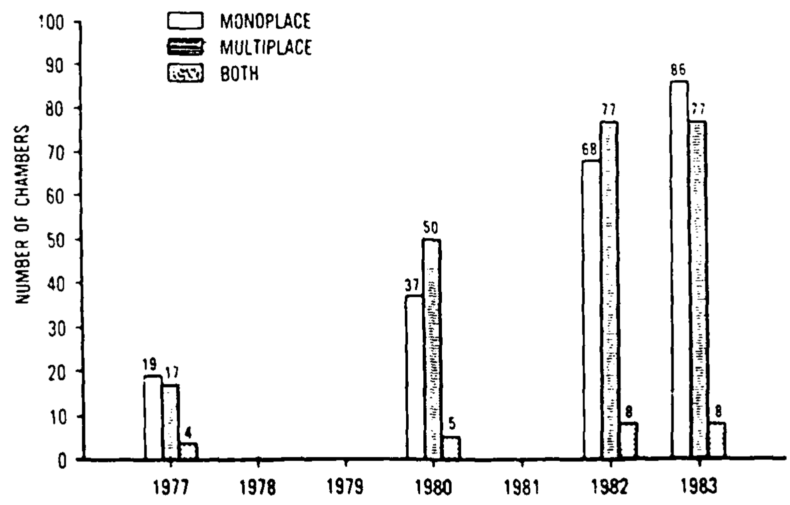

Figure 2. Hyperbaric Chamber Register--Clinical Chambers in the United States (1977-1983).

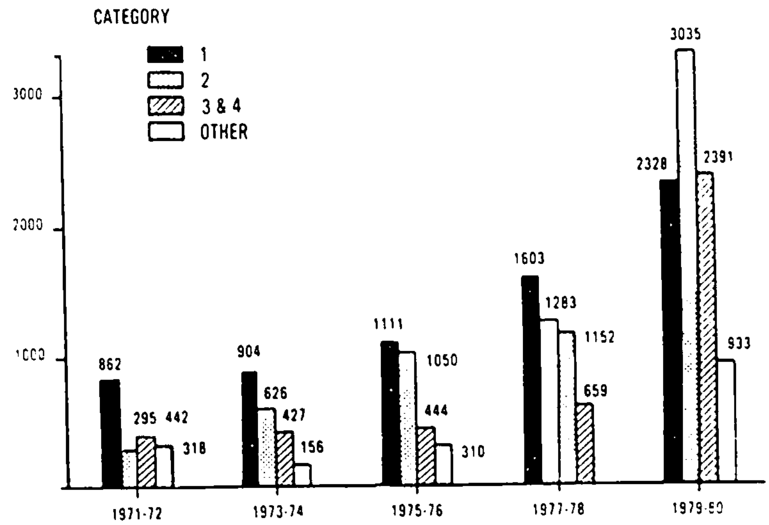

Figure 3. Hyperbaric Registry--Case Load.

Treatments occur in chambers in a variety of shapes and sizes ranging from single person chambers to those that treat several patients simultaneously. The single person chamber (monoplace) is a portable unit in which one patient can be treated by pressurizing the chamber with 100% oxygen (4). These units are primarily located in physician's offices and clinics. Approximately one-half of the chambers are large clinical chambers (multiplace), in which several patients can be treated concurrently (5). These larger vessels contain oxygen delivery systems that deliver oxygen to the patient via mask, hood, or respirator while the pressurized environment surrounding the patient consists of air. Exhaled gases are routinely exhausted outside the chamber via an overboard dump system in order to reduce the risk of contamination of the chamber air with oxygen and carbon dioxide. One of the most recent chambers to become operational is located at Southwest Texas Methodist Hospital in San Antonio, Texas. It is the second of a two-chamber complex and was constructed in accordance with the upright cylinder design, similar to the design specified for each chamber compartment at Wright-Patterson AFB, OH.

The Wright-Patterson clinical hyperbaric facility is designed as three interconnected upright cylinders in a molecular configuration (Fig. 4).

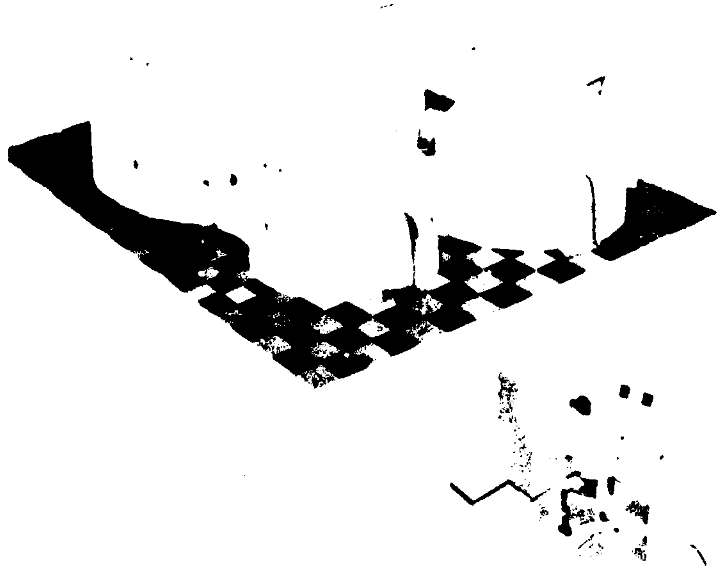

Figure 4. Wright-Patterson Clinical Hyperbaric Facility (WPCHF) Design.

The largest is 22 ft in diameter with a capacity of 18 ambulatory patients. It is interconnected with two smaller 11-ft-diameter chambers which have a capacity of six ambulatory patients each. This concept permits the management of a large number of patients at one treatment depth, while simultaneously treating an emergency patient at a different treatment depth. The third chamber is used as an elevator to move attendants and equipment up and down in pressure between the other two compartments and the surface. The three pressure vessels are welded together by interconnecting passageways and mounted on large concrete supports. Each chamber is filled with water and hydrostatically pressure tested before being placed into service. Final testing of the facility is scheduled for December 1984, with a projected operational date of March 1985.

Many design concepts were considered in designing the Wright-Patterson chamber (2). The molecular configuration with upright cylinders was considered to be the best of the design options because it provides: (a) the maximum floor space for the minimum chamber volume, (b) the maximum utility of the chamber compartments to manage both routine and emergency patients, and (c) expandable capability in that two of the three compartments can be used for routine patients when there are no emergency treatments in progress. The overall chamber design has two expandable features: (a) there is floor space in the center of the main chamber for additional mask breathing units, and (b) one of the smaller treatment compartments can be used in the event additional patient treatments are required beyond the capability of the larger compartment. The small compartment would not be available for routine patients when emergency patients are being treated.

The number of patients that can be treated in the chamber is directly proportional to the available floor space. For example, an 11-ft-diameter chamber can be outfitted to accommodate 6 ambulatory patients (Fig. 5) or 2 litter patients (Fig. 6). The distribution of seats and litters that achieves maximum treatment capacity for the 14, 16, 18 and 20 ft-diameter chambers is shown in Figures 7 through 14. The maximum treatment capacity for a 22-ft-diameter chamber is 18 ambulatory patients (Fig. 15) or 10 litter patients (Fig. 16). Each 1-ft increase in diameter increases the treatment chamber's capacity by one additional ambulatory or litter patient (table 2).

TABLE 2. PATIENT TREATMENT CAPACITY RELATIVE TO CHAMBER DIAMETER

Chamber Diameter (ft)	Ambulatory Patient Load Per Dive	Litter Patient Load Per Dive
11	6	2
14	10	3
16	12	4
18	14	6
20	16	8
22	18	10

The likelihood that all litter or all ambulatory patients would be treated in any given treatment dive is rare. More commonly, there would be a combination of litter and ambulatory patients (Fig. 17). Each litter occupies two ambulatory patient positions in the upright cylinder. This is a more efficient design than the horizontal cylinder design in which each litter occupies three ambulatory patient positions.

Sizing of the Wright-Patterson clinical hyperbaric chamber is based on an anticipated work load of 36 ambulatory patients/day. The 22-ft-diameter chamber will accommodate this number of patients in two dives/day, which is a single work shift (table 3). If a smaller diameter vessel had been selected (e.g., a 14-ft diameter), four treatment dives would have been required to treat 36 ambulatory patients. This would require two work shifts, or twice the staff to treat the same number of patients. A 22-ft-diameter chamber can accommodate 20 litter patients in two treatment dives during a single work shift (table 4). If a 14-ft-diameter chamber had been selected, seven treatment dives would be required, which is beyond the capacity of a double work shift. It is not practical to plan a triple shift operation because of the downtime required for equipment maintenance, as well as significant patient management concerns.

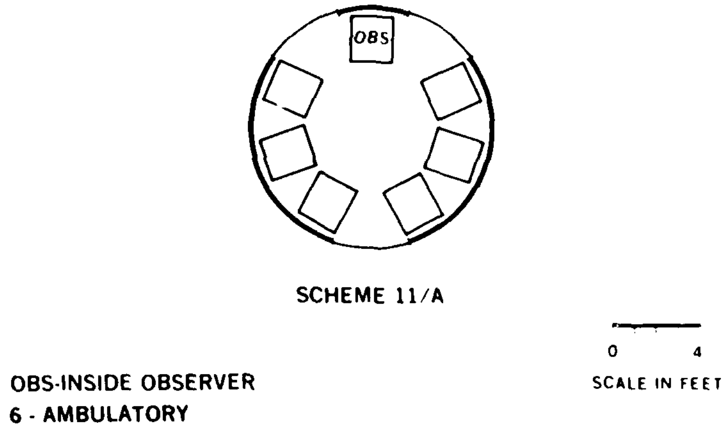

Figure 5. Patient placement for 11-ft-diameter chamber design (ambulatory).

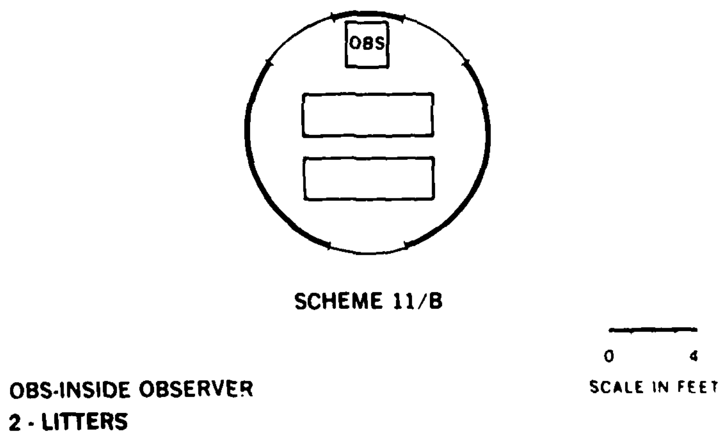

Figure 6. Patient placement for 11-ft-diameter chamber design (litter).

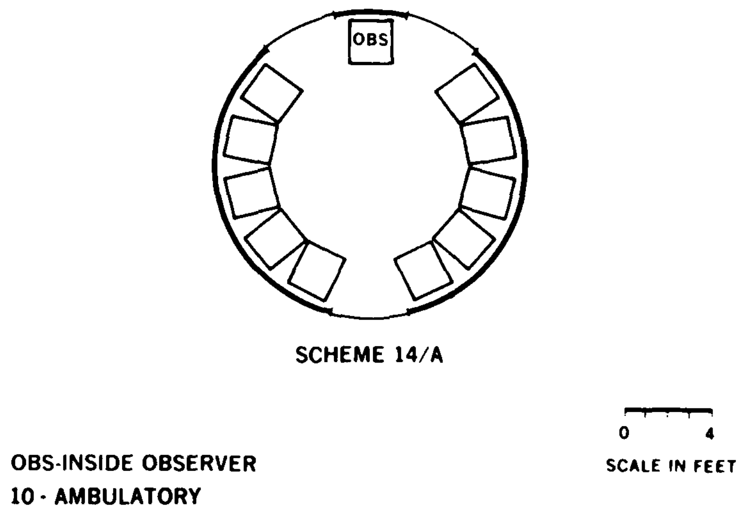

Figure 7. Patient placement for 14-ft-diameter chamber design (ambulatory).

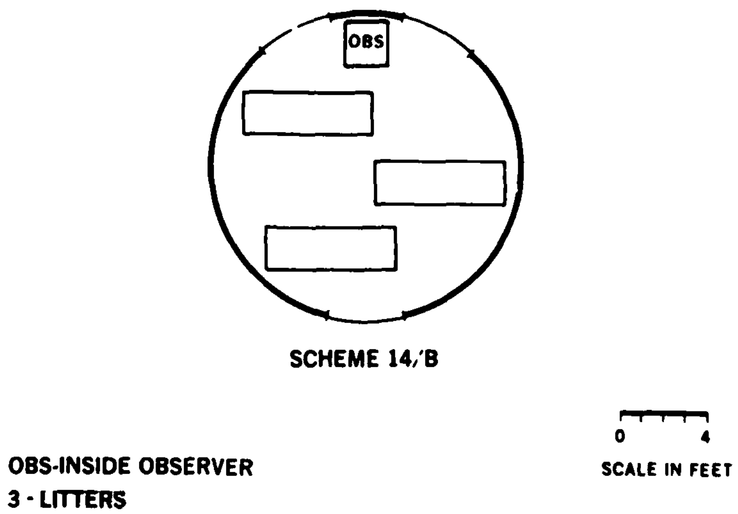

Figure 8. Patient placement for 14-ft-diameter chamber design (litter).

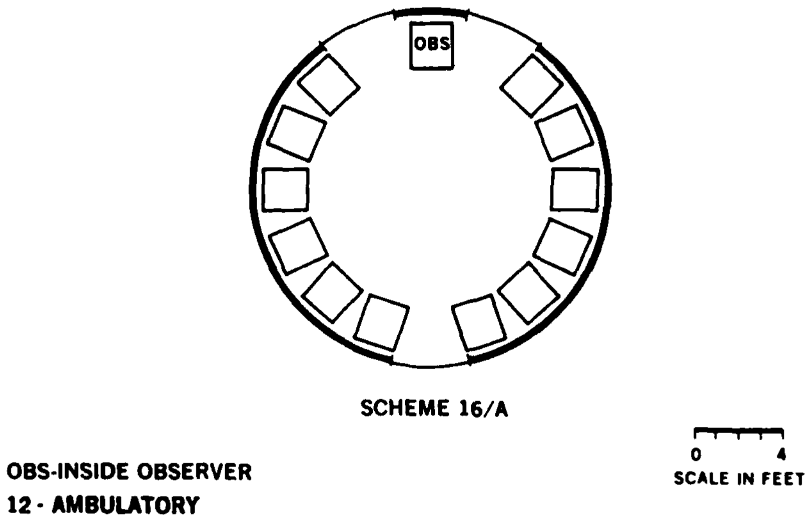

Figure 9. Patient placement for 16-ft-diameter chamber design (ambulatory).

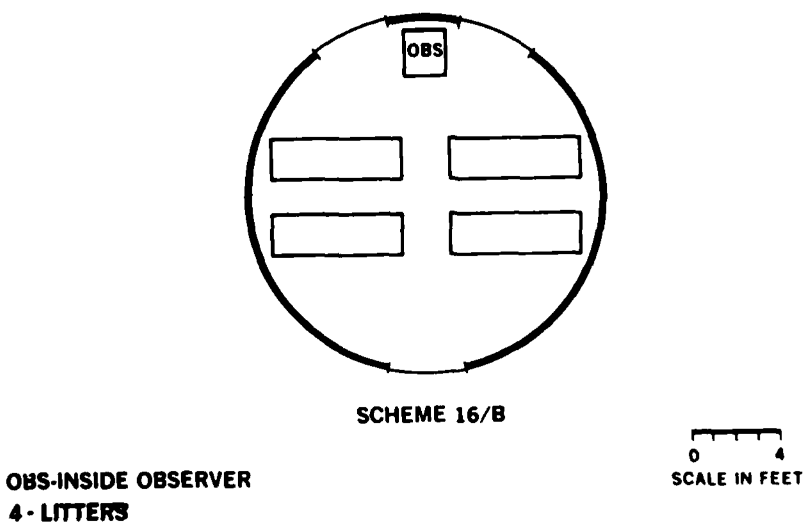

Figure 10. Patient placement for 16-ft-diameter chamber design (litter).

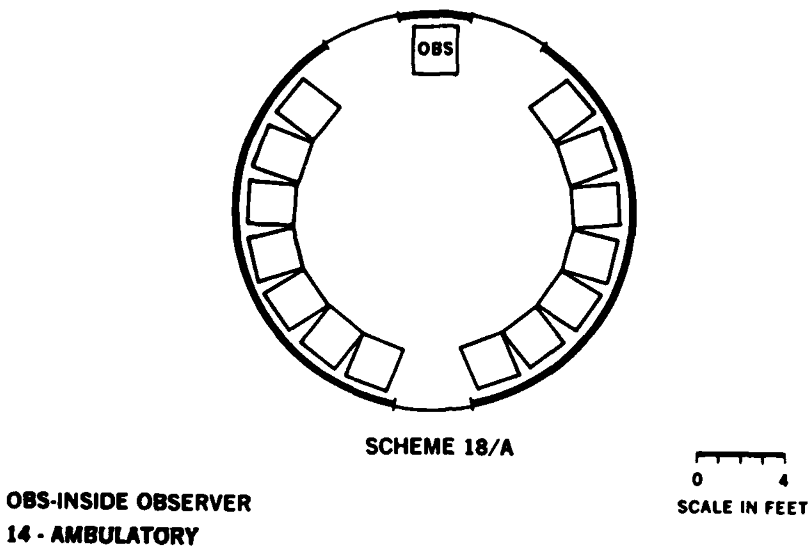

Figure 11. Patient placement for 18-ft-diameter chamber design (ambulatory).

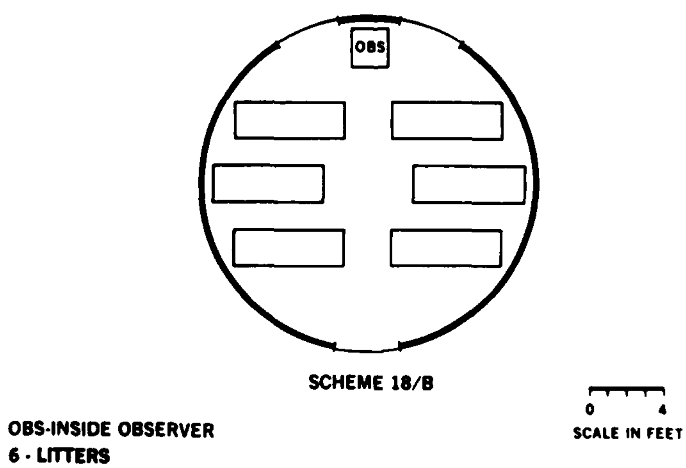

Figure 12. Patient placement for 18-ft-diameter chamber design (litter).

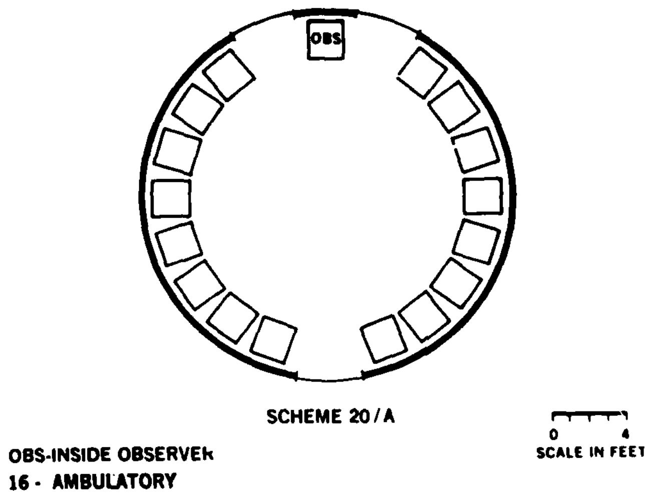

Figure 13. Patient placement for 20-ft-diameter chamber design (ambulatory).

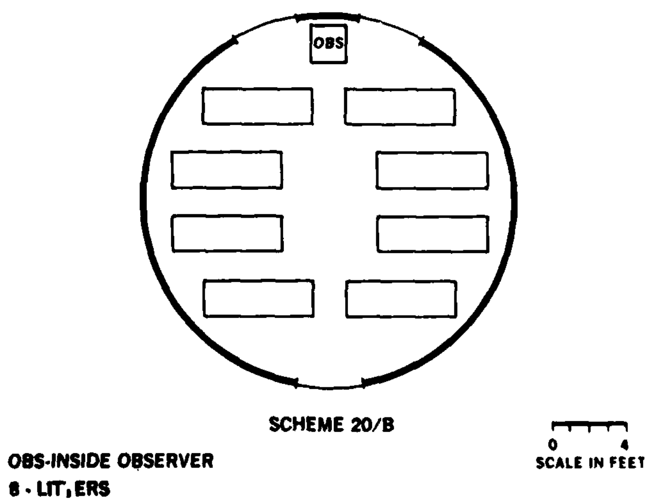

Figure 14. Patient placement for 20-ft-diameter chamber design (litter).

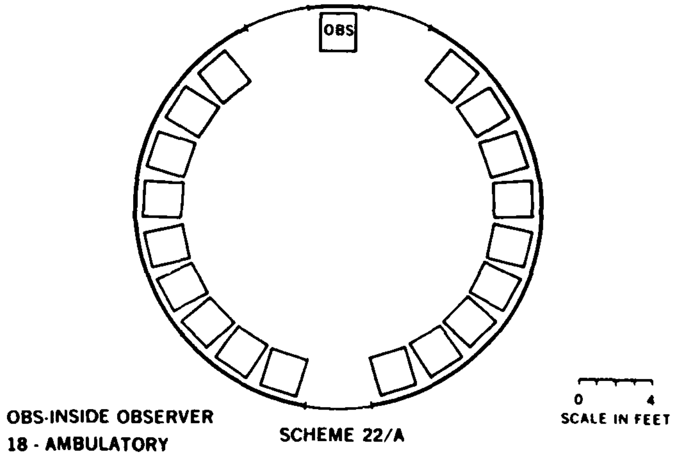

Figure 15. Patient placement for 22-ft-diameter chamber design (ambulatory).

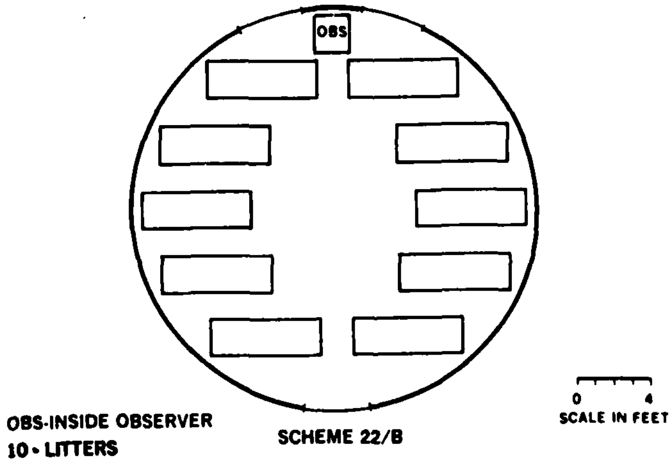

Figure 16. Patient placement for 22-ft-diameter chamber design (litter).

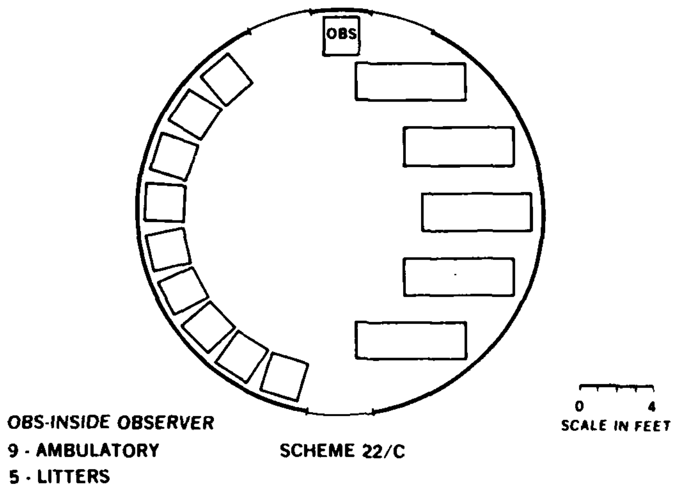

Figure 17. Patient placement for 22-ft-diameter chamber design (ambulatory and litter).

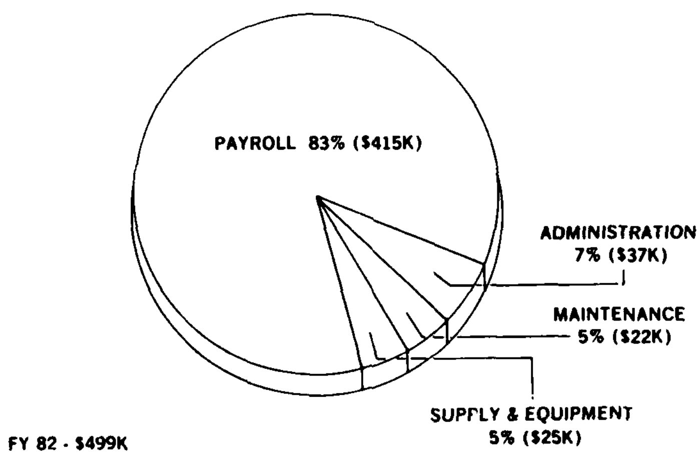

Figure 18. Distribution of operating expenses for the Hyperbaric Medicine Division.

The Wright-Patterson clinical hyperbaric facility has been designed to minimize the staff requirements while accommodating 36 patients/day. A staff of 17 people has been approved for that facility. Table 5 lists recommended staff distribution for future facilities. Staffing is a most important consideration because it constitutes the majority of recurring costs for the facility. For example, the FY 82 operating budget for the USAF Hyperbaric Center at Brooks AFB, Texas, was approximately $500,000, 83% of which was staffing costs (Fig. 18). Thus, design of a clinical hyperbaric facility must be based on the most efficient patient-to-staff ratio, since the recurring costs to operate the facility will be primarily attributed to staffing costs.

TABLE 3. NUMBER OF PATIENT DIVES REQUIRED TO TREAT 36 AMBULATORY PATIENTS DAILY RELATIVE TO CHAMBER DIAMETER

Chamber Diameter (ft)	Dives Required
11	6
14	4
16	3
18	3
20	3
22	2

TABLE 4. NUMBER OF PATIENT DIVES REQUIRED TO TREAT 20 LITTER PATIENTS DAILY RELATIVE TO CHAMBER DIAMETER

Chamber Diameter (ft)	Dives Required
11	10
14	7
16	5
18	4
20	3
22	2

TABLE 5. CLINICAL HYPERBARIC FACILITY STAFFING

Position	Qty
Physician	3
Physiologist	2
Nurse	2
Medical technician	2
Chamber technician	6
Maintenance technician	1
Medical administrative specialist	1
Total	17

Engineering considerations increase the cost of pressure vessels sharply when chamber diameters are selected greater than 14 ft. This is principally due to unavailability of prefabricated heads and restrictions on overland transport which necessitate on-site construction. If one compares the difference in initial cost of two vessels (14 ft vs 22 ft), and the recurring staffing costs required to operate each size, one can see why it is cost effective to select the larger, more expensive vessel (table 6). The estimated capital investment of a 3-compartment chamber (one 14-ft-diameter compartment and two 11-ft-diameter compartments with appropriate supportive systems) is approximately $4.5 million. If the larger compartment is increased to a 22-ft-diameter, the cost is approximately $9 million, representing a cost difference of $4.5 million. However, the improved patient-to-staff ratio which results in reduced staffing costs significantly influences the cost effectiveness of the facility. For example, with the 22-ft diameter chamber, 36 patients can be treated with a single work shift at a cost of about $.5 million. In the 14-ft-diameter chamber, 2 work shifts are required at a cost of about $1 million, an added recurring cost of $.5 million/year. Within 9 years, the added staffing cost for the double shift will equal the $4.5 million additional purchase price of the larger chamber. Furthermore, the added staffing cost continues to accrue throughout the life of the facility which may be 50 yr or more. Therefore, it is more cost effective to purchase the larger chamber at the additional cost of $4.5 million because of the increased recurring staffing costs.

TABLE 6. COMPARISON OF INITIAL AND RECURRING COSTS

Chamber Size (ft)	Initial outlay ($Million)	vs	Recurring staffing costs ($ Million/year)
14	4.5		1.0
22	9.0		0.5
Difference	4.5		-0.5

NOTE: Number of years to equalize costs = 9 yr

The design engineers of new facilities should incorporate the most advanced design features and the most efficient methods of manpower utilization because the chambers remain in service for such a long time. For example, the primary treatment chamber (Fig. 19) at the USAF Hyperbaric Center has been in operation for 25 yr, and the emergency treatment chamber (Fig. 20) was used to treat divers during the construction of the Panama Canal 80 yr ago.

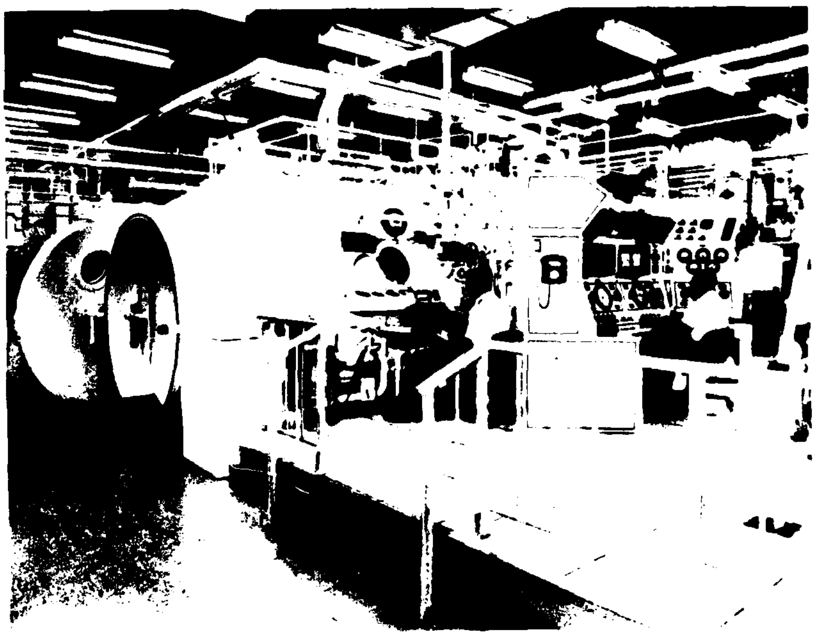

Figure 19. Treatment Chamber I, USAF Hyperbaric Center, Brooks AFB, TX.

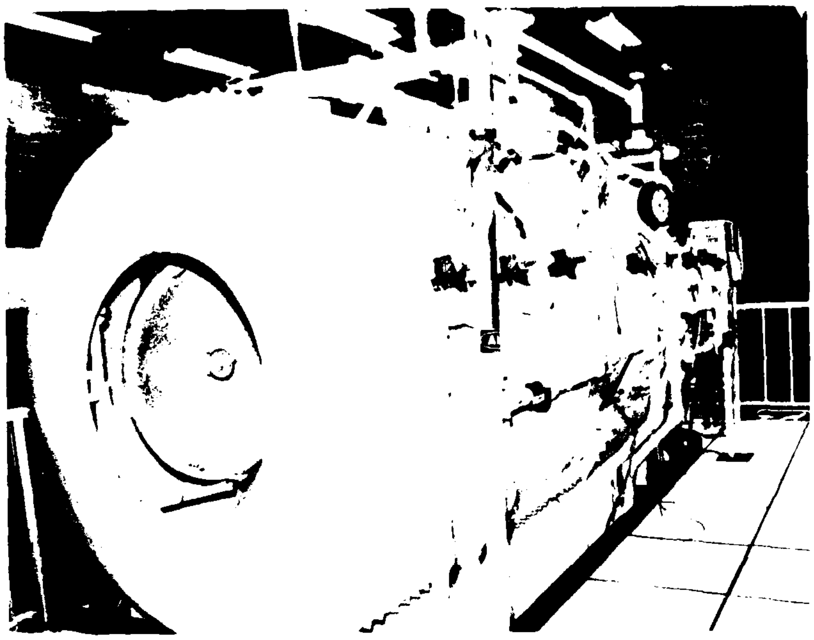

Figure 20. Treatment Chamber II, USAF Hyperbaric Center, Brooks AFB, TX.

PATIENT AIR EVACUATION COSTS

Previous studies (2) have supported the concept of placing clinical hyperbaric facilities in major medical centers to serve as a regional resource. Applying this concept, each of the nine DoD medical regions should eventually have at least one clinical hyperbaric facility. An alternative concept might be to construct one large, centrally located clinical hyperbaric facility and air evacuate patients to that location for treatment. For purposes of this theoretical discussion, the Wright-Patterson clinical hyperbaric facility was selected as the central location for the DoD hyperbaric chamber complex.

A study was conducted to determine the cost of moving patients by the Military Airlift Command (MAC) Aeromedical Evacuation System from each of the nine DoD regions to Wright-Patterson AFB, OH. The mission of the MAC Aeromedical Evacuation System,as defined in DoD Directive 4515.13-R and AFR 164-5, is to evacuate casualties from the combat zone to definitive care facilities. Preparation for this mission is accomplished during peacetime by exercising the command control system, training crews, and testing equipment. A by-product of the peacetime mission is that authorized DoD personnel are expeditiously moved between medical facilities to insure optimal patient care. Three movement priorities are used to assure timely, but cost effective transportation. These priorities are:

Routine

Patients who should be picked up within 72 hr and moved on routine or scheduled flights.

Priority

Patients requiring prompt medical care not available locally. Such patients must be picked up within 24 hr and delivered with the least possible delay.

Urgent

Emergency cases which must be moved immediately to save life or limb, or to prevent complication of a serious illness. Psychiatric or terminal cases with a very short life expectancy are not classified "urgent".

Most patients who are candidates for hyperbaric oxygen therapy fall into either the "routine" or "urgent" categories. Therefore, historical data maintained at Headquarters Military Airlift Command, Scott AFB, IL, were used to determine costs of air evacuation of both "routine" and "urgent" cases. The costs associated with moving "routine" ambulatory and litter patients were based on flight data in which several patients would be airlifted on the same routinely scheduled mission. The cost of moving patients in the "urgent" category was based on flight data for which the aircraft mission was dedicated to that patient alone. For each DoD region, a major airport used by USAF C-9A aircraft was selected for calculating interregional transportation costs.

Hourly flying costs for C-9A Nightingale aircraft were calculated based on CY 82 data. The Military Airlift System separates C-9A aircraft operating costs into three user categories: (a) DoD, (b) non-DoD and other Federal agencies, and (c) non-U.S. Government and Foreign Sales. Cost elements used to determine these costs are shown in table 7. Non-DoD users have military pay added as a cost factor and non-U.S. Government and foreign sales users have military pay, civilian pay, and aircraft depreciation added as cost factors.

The cost to airlift a patient from point A to point B was determined by using the following formula:

$$\frac{\text{(C-9A aircraft operating cost/flying hour) X (flying hrs/mission)}}{\text{Average Number of Patients Per Mission}}$$

Based on CY 82 data, operating cost of C-9A aircraft per hour of flying time was $2,025/hr for DoD patients, $2,904/hr for non-DoD and other Federal patients, and $3,387/hr for non-U.S. Government patients (table 8). The cost per patient per flying hour was determined by dividing C-9A hourly operating costs by the average number of patients per mission. Records at Scott AFB, IL revealed an average of 21.2 patients per scheduled mission in CY 82. Table 9 lists "routine" DoD patient airlift costs as $95.52/hr, non-DoD and other Federal patient costs as $136.98/hr, and non-U.S. Government patient costs as $159.76/hr in CY 82.

TABLE 7. C-9A AIRCRAFT COSTS

Cost Elements	User
Civilian pay	
Depot maintenance	
Aviation pol	
Supplies	
Travel (aircrew and other)	
Other direct cost	
Aeromedical mgt/admin	
	DoD
Military pay	
	Non-DoD other Federal
Military Pay, Accelerated	
Civilian Pay, Unfunded Retirement	
General and Admin	
Depreciation	
	Non-U.S. Government and foreign sales

Source: HQ MAC/ACI

TABLE 8. C-9A FLYING HOUR COSTS (CY 1982)

User	Cost
DoD	$2,025
Non-DoD and other Federal	$2,904
Non-U.S. Government or foreign sales	$3,387

Source: Calculated from FY 82-83 figures from HQ MAC/ACI

TABLE 9. PATIENT COST PER FLYING HOUR FOR ROUTINE PATIENTS (CY 1982)

User	Cost/Patient/Flying Hour
DoD	$ 95.52
Non-DoD and other Federal	$136.98
Non-U.S. Government or Foreign Sales	$159.76

In order to convert patient costs per flying hour to the total cost of airlift from the various regions to Wright-Patterson AFB, OH, the flying times for existing air evacuation missions were determined from existing flight plans at the Military Airlift Command Headquarters at Scott AFB, IL. For transportation requiring two travel days, existing missions were selected which would ensure travel on consecutive days.

For a routine mission in which a patient is moved from Travis AFB, CA to Wright-Patterson AFB, OH (following the current plan at Scott AFB, IL), the patient would board at Travis AFB, CA, make 6 intermediate stops (7.92 flying hours), remain overnight at Scott AFB, IL, and then be transported to Wright-Patterson AFB, OH on the following day with two intermediate stops (Fig. 21).

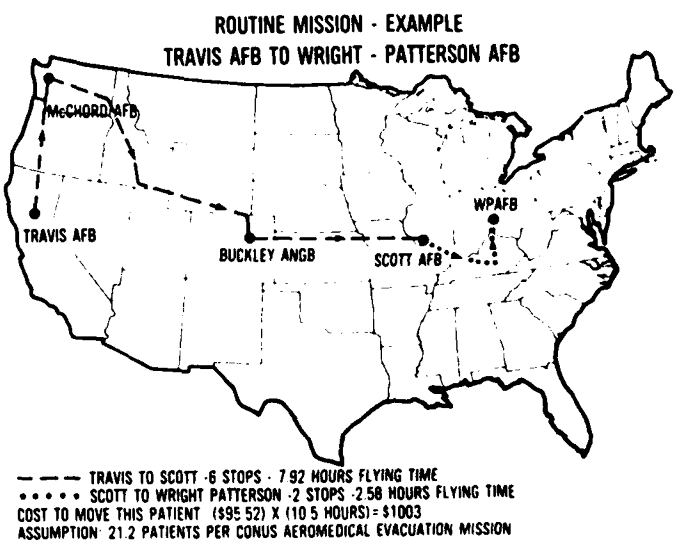

Figure 21. Routine Mission (e.g., Travis AFB CA to Wright-Patterson AFB OH)

This would require a total flying time of 10.5 hr, which, when multiplied by the factor of $95.52/hr, results in an air transportation cost of about $1,003/DoD patient. The same cost factors can be applied to determine the cost to air evacuate patients from each of the western regions to Wright-Patterson AFB, OH (table 10). Thus, air evacuation of a routine patient from McChord AFB, WA, would cost $852; from Travis AFB, $1,003; from Buckley ANGB, $414; from El Paso International Airport, $693; and from Kelly AFB, $501. These costs do not include the cost of returning patients to their homes upon completion of therapy.

TABLE 10. ROUTINE AIR EVACUATION TO REGION 6 (WRIGHT-PATTERSON AFB, OH) PATIENT COST

From DoD Region	Flying Hours	Trip Cost Per Patient DoD	Other Fed	Non-Fed
1 (McChord AFB)	8.92	$ 852	$1,222	$1,425
2 (Travis AFB)	10.50	$1,003	$1,438	$1,677
3 (Buckley ANGB)	4.33	$ 414	$ 593	$ 692
4 (El Paso Intl)	7.25	$ 693	$ 993	$1,158
5 (Kelly AFB)	5.25	$ 501	$ 719	$ 839

Source: MAC Flight Plans

Emergency or "urgent" patients are more expensive to airlift because an aircraft is dedicated to move a single patient. A similar approach was used to determine the cost of transporting emergency patients from the various DoD regions to Wright-Patterson AFB. The emergency route assumed no opportunity of flights available that were close to the patient such as reserve C-141 Starlifter or C-130 Hercules aircraft. The routes and times were based on the aircraft proceeding from Scott AFB, IL to pick up the patient, transporting the patient to Wright-Patterson AFB, OH, and then returning to Scott AFB, IL. Approximate flying times were obtained from the 0.78 Mach cruise chart in the C-9A flight manuals. For a scenario in which an emergency patient is airlifted from Travis AFB, CA (as shown in Fig. 22), the total flying time would be 8.75 hr.

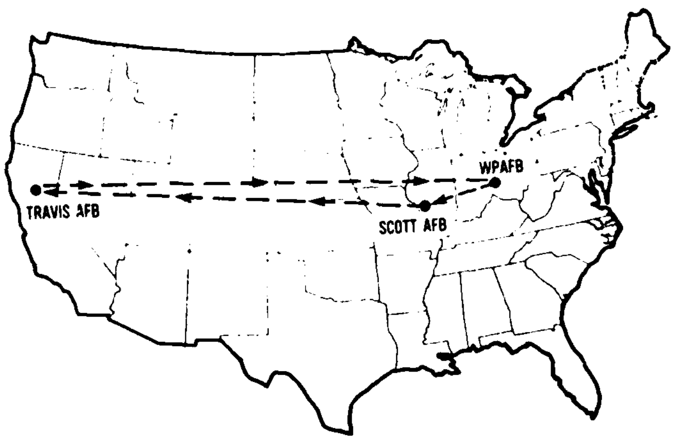

Figure 22. Emergency Mission (e.g., Travis AFB CA to Wright-Patterson AFB OH)

For an aircraft transporting a single DoD patient at an hourly rate of \$2,025, the total cost would be (\$2,025 X 8.75)= \$17,719. The cost to air evacuate an "urgent" DoD patient from McChord AFB would be \$17,557. Airlift costs from the other western regions would range from \$10,000 to \$13,000 (table 11). These calculations do not include the cost of returning patients to their homes after completion of therapy.

TABLE 11. EMERGENCY AIR EVACUATION TO REGION 6 (WRIGHT-PATTERSON AFB OH)

From DoD Region	Flying Hours (Approximate)	*Trip Cost Per Patient DoD	Other Federal	Non-Federal
1 (McChord AFB)	8.67	\$17,557	\$25,351	\$29,365
2 (Travis AFB)	8.75	\$17,719	\$25,585	\$29,636
3 (Buckley ANGB)	5.33	\$10,793	\$15,585	\$18,053
4 (El Paso Intl)	6.33	\$12,818	\$18,509	\$21,440
5 (Kelly AFB)	5.00	\$10,125	\$14,620	\$16,935

*Assume one patient on board
Scott - Pickup - Dest - Scott

Once the patient transportation cost from 1 region to another is known, the total annual cost of moving all HBO amenable patients can be predicted if the number of such patients is known. The Patient Population Data section (p. 24 of this report) provides the data from which the total HBO patient requirement by DoD region was determined.

In 1982, had all patients requiring hyperbaric oxygen therapy in DoD Region 2 (David Grant USAF Medical Center/Travis AFB, CA region) been air evacuated to Wright-Patterson AFB, OH, the transportation cost would have been $600,000.

Total air evacuation cost from the western DoD regions for patients that could have benefited from hyperbaric oxygen therapy at Wright-Patterson AFB, OH in CY 82 would have exceeded $1.5 million (table 12). These data are based on the assumption that all patients were in the routine category for aeromedical transportation and that there would be an unlimited hyperbaric treatment capability and hospital capacity at Wright-Patterson AFB, OH.

TABLE 12. TOTAL AIR EVACUATION COSTS FOR HBO PATIENTS (REGIONS 1-5 TO WRIGHT-PATTERSON AFB OH)

From DoD region	Number of Patients	Cost/patient (DoD user)	Total cost from region
1 (McChord AFB)	85	$ 852	$ 72,420
2 (Travis AFB)	591	$1,003	$ 592,773
3 (Buckley ANGB)	238	$ 414	$ 98,532
4 (El Paso Intl)	414	$ 693	$ 286,902
5 (Kelly AFB)	1,043	$ 501	$ 522,543
		TOTAL COST	$1,573,170

For future calculations to predict air evacuation costs, flying times between all DoD regions are presented for both "routine" (table 13) and "urgent" (table 14) categories. Individual patient transportation costs between each DoD region were calculated using CY 1982 C-9A costs and are presented for DoD-user "routine" and "urgent" category patients (tables 15 & 16) at $95.52 and $2,025/hr respectively.

In determining total cost of patient airlift, several cost factors were excluded from the calculations: (a) Upon completion of therapy, patients must be transported back to their duty stations. (b) Cost of JP4 fuel fluctuates greatly, thus making it difficult to predict future expenses. (c) Should a patient's condition require that the aircraft maintain altitude restrictions (i.e., sea level cabin pressure in the case of a decompression sickness patient), cost of JP4 would increase approximately $250/hr. (d) Air evacuation results in added time loss from the duty section. (e) New clinical trials ongoing at the Hyperbaric Medicine Division of the USAF School of Aerospace Medicine may indicate that other disease entities are responsive to hyperbaric oxygen therapy, thereby increasing the number of predicted patients.

PATIENT POPULATION DATA

Heretofore, no acceptable method of determining patient treatment population was available. To provide guidance, the Hyperbaric Medicine Division developed a study of prevalence of those patients whose diagnosis and/or complications of treatment would be amenable to adjunctive hyperbaric oxygen therapy.

The base data was then used in a projected work-load algorithm. A survey of extant patient data bases revealed the existence of the USAF Automated Inpatient Data System (AIDS) which collected both demographic and diagnosis data at the time of discharge from a medical treatment facility.

Diagnoses were coded according to the International Classification of Diseases (ICD), 9th Revision as modified by the Department of Defense. A list of 42 diagnoses and procedures with associated codes was compiled, which included those recognized by the Undersea Medical Society, Hyperbaric Oxygen Therapy Committee Report of 1983 (8), as well as other experimental entities.

The prevalence data extracted from 388,916 inpatient records for CY 82 was then incorporated into a projected work-load algorithm which included estimates of outpatient population, percentages of patients within a diagnosis that would benefit from hyperbaric oxygen, the average of number of treatments necessary, and the space requirement dictated by chamber design. The aforementioned variables were determined either by survey, actual count, or best estimate based on census data. This data was presented in December 1983 to the Hyperbaric Medicine Criteria Development Committee, Office of the Assistant Secretary of Defense of Health Affairs (OASD/HA). This was a first approximation of prevalence and potential treatments in the HBO arena. Also, the work-load algorithm lends itself easily to modification to reflect a more accurate approximation as data becomes available. However, the magnitude of need found pointed out the necessity for a careful and thoughtful evaluation of chamber sizing and capability for future clinical facilities. This study serves as a model for future projects in projecting clinical work loads.

TABLE 13. INTERREGIONAL FLYING TIMES FOR ROUTINE CATEGORY PATIENTS

Origin Dod Region/Airdrome	Hours								
1. McChord AFB	----	1.58	4.58	5.00	4.50	8.92	6.67	11.92	7.92
2. Travis AFB	1.58	----	6.17	3.42	3.58	10.50	5.08	8.58	8.00
3. Buckley ANGB	4.75	6.33	----	9.75	4.42	4.33	3.25	7.33	3.33
4. El Paso Intl	4.75	3.17	7.00	----	2.00	7.25	3.50	10.25	6.25
5. Kelly AFB	6.58	5.00	5.00	2.75	----	5.25	1.50	8.25	4.42
6. Wright-Patterson AFB	10.25	11.83	5.50	7.92	5.17	----	4.67	8.75	4.75
7. Keesler AFB	8.58	6.58	3.83	4.33	1.58	4.08	----	2.75	2.92
8. Norfolk NAS	12.75	9.00	8.00	10.42	8.33	8.25	4.17	----	0.58
9. Andrews AFB	10.00	8.42	4.17	5.75	3.42	8.83	4.75	0.58	----
Destination DoD Region	1	2	3	4	5	6	7	8	9

TABLE 14. INTERREGIONAL FLYING TIMES FOR URGENT CATEGORY PATIENTS

Origin DoD region/airdrome	Hours								
1. McChord AFB	----	8.75	7.75	8.83	9.17	8.67	9.42	9.83	10.00
2. Travis AFB	8.75	----	7.58	8.17	8.67	8.75	9.08	10.75	10.33
3. Buckley ANGB	7.75	7.58	----	5.33	5.33	5.33	5.50	6.92	6.67
4. El Paso Intl	8.83	8.17	5.33	----	5.25	6.33	6.00	7.75	7.58
5. Kelly AFB	9.17	8.67	5.33	5.25	----	5.00	4.58	6.50	6.42
6. Wright-Patterson AFB	8.67	8.75	5.00	6.25	5.00	----	4.00	3.92	3.75
7. Keesler AFB	9.42	9.08	5.50	6.00	4.58	4.00	----	5.08	5.08
8. Norfolk NAS	10.42	10.50	6.92	7.75	6.50	3.92	5.08	----	3.92
9. Andrews AFB	10.00	9.92	6.67	7.58	6.50	3.67	5.08	4.00	----
Destination DoD region	1	2	3	4	5	6	7	8	9

TABLE 15. INTERREGIONAL PER PATIENT TRANSPORTATION COST FOR ROUTINE CATEGORY PATIENTS--DoD USERS ($95.52/HR)

Origin DoD Region/airdrome	Dollar cost								
1. McChord AFB	---	151	437	478	430	852	637	1139	757
2. Travis AFB	151	---	589	327	342	1003	485	820	764
3. Buckley ANGB	454	605	---	931	422	414	310	700	318
4. El Paso Intl	454	303	669	---	191	693	334	979	597
5. Kelly AFB	629	478	478	263	---	501	143	788	422
6. Wright-Patterson AFB	979	1130	525	757	494	---	446	836	454
7. Keesler AFB	820	629	366	414	151	390	---	263	279
8. Norfolk NAS	1218	860	764	995	796	788	398	---	55
9. Andrews AFB	955	804	398	549	327	843	454	55	---
Destination DoD region	1	2	3	4	5	6	7	8	9

TABLE 16. INTERREGIONAL PER PATIENT TRANSPORTATION COST FOR URGENT CATEGORY PATIENTS--DOD USERS ($2025/HR)

Origin DoD Region/airdrome	Dollar cost								
1. McChord AFB	------	17,719	15,694	17,881	18,569	17,577	19,075	19,906	20,250
2. Travis AFB	17,719	------	15,349	16,544	17,557	17,719	18,387	21,769	20,918
3. Buckley ANGB	15,694	15,349	------	10,793	10,793	10,793	11,137	14,013	13,507
4. El Paso Intl	17,881	16,544	10,793	------	10,631	12,818	12,150	15,694	15,349
5. Kelly AFB	18,569	17,557	10,793	10,631	------	10,125	9,274	13,162	13,000
6. Wright-Patterson AFB	17,557	17,719	10,125	12,656	10,125	------	8,100	7,938	7,594
7. Keesler AFB	19,075	18,387	11,137	12,150	9,274	8,100	------	10,287	10,287
8. Norfolk NAS	21,100	21,262	14,013	15,694	13,162	7,938	10,287	------	7,938
9. Andrews AFB	20,250	20,088	13,507	15,349	13,162	7,432	10,287	8,100	------
Destination DoD region	1	2	3	4	5	6	7	8	9

The basic document for selection of hyperbaric entities was the Hyperbaric Oxygen Therapy - A Committee Report Undersea Medical Society Publication No. 30 CR (HBO) 1983, Jefferson C. Davis, MD, Chairman (8). In addition, after a thorough literature search, other diagnoses were added. An initial list was compiled consisting of 49 diagnoses or procedures. Certain diagnoses had to be grouped to conform to ICD9/ICP code criteria. As a result, 42 diagnostic or procedure related categories were subsequently assigned a numeric code from 1 to 42 to facilitate the required data analysis (Appendix A--Diagnosis by Code Number).

Based on the aforementioned identified diagnoses or procedures, an initial survey of the DoD modified ICD 9 codes resulted in the identification of 267 separate codes. These codes were reviewed with deletions and additions as deemed appropriate. For the 42 diagnoses and procedures there were 115 distinct diagnostic codes and/or range of codes.

Many times the individual diagnosis or procedure was associated with ICD9/ICP codes in multiple areas within the classification schema. As a result, an attempt was made to get as definitive a group referent to that diagnosis or procedure as possible. This is the first attempt to produce a definitive listing with associated codes. However, it is understood that additions and/or deletions will, in all likelihood, be made in the future (Appendix B--Diagnosis By Code Number And Associated ICD9/ICP Codes).

Since OASD/HA required the reporting of biometric data by DoD region, an initial assignment of the medical treatment facility (MTF) to the appropriate region was made. There are nine CONUS DoD regions, with PACAF and USAFE considered to be "regions" to simplify the data analysis (Fig. 23).

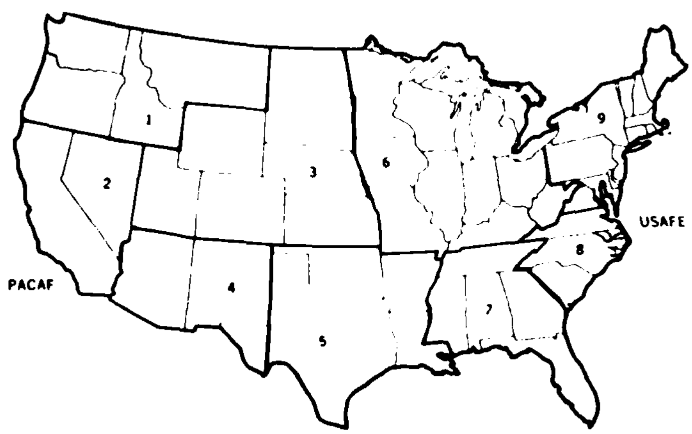

Figure 23. DoD Conus Regions.

Difficulty arose in the assignment of Alaskan Air Command facilities. This was resolved by assigning them to the PACAF "region". The rationale being that all air evacuation would proceed through or from the west coast (Appendix C - Medical Treatment Facility to Region Assignment).

An initial extract from the AIDS files, both demographic and diagnosis portions, was done. The data extracted was defined by the identified ICD9/ICP codes and the MTF assignments. It was further subdivided by the duty status of the patient (i.e., active duty military, retired military, dependents of active duty military, dependents of retired / deceased military, and other). The "other" category was reserved for civilian, Veterans Administration Hospital patients, and foreign national treatments (Appendix D).

The United States Air Force population estimates were determined in two ways: (1) an inpatient catchment area population defined by a 40-mile radius around hospitals; and (2) an ambulatory catchment area which was defined by 20-mile radius around all medical treatment facilities (i.e., clinics and hospitals). The estimates were for CONUS only, including Alaska and Hawaii (table 17).

TABLE 17. CATCHMENT AREA POPULATION ESTIMATES OF BENEFICIARY CATEGORY

	Active Duty	Dependents Active Duty	Retired	Dependents of Retired/ Deceased	Total
Inpatient	404,599	619,887	346,937	685,858	2,057,281
Ambulatory	433,800	666,106	307,294	614,006	2,021,206

Also from OASD/HA Resource Analysis and Planning System (RAPS), Version 3.31, we received tri-service estimates of a base population for FY 82 of 6,083,270 (Fig. 24).

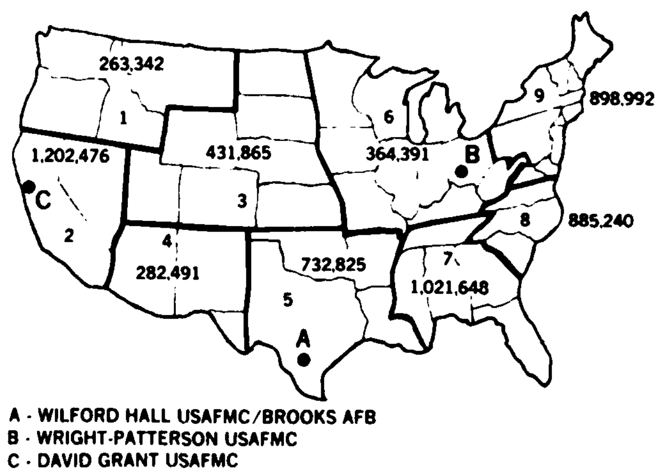

Figure 24. Projected FY 82 Population Data by DoD Region

An algorithm was developed to define those variables necessary to adequately determine a realistic potential work-load. The four variables of primary importance are:

M_1 - What is the <u>true</u> prevalence of the diagnostic entity in question--recalling that we were dealing only with inpatient counts?

M_2 - What percent of the above patients would benefit from hyperbaric oxygen treatment?

M_3 - What is the treatment space required based upon the patient's physical status (i.e., ambulatory vs litter)?

M_4 - What constitutes an adequate and appropriate treatment series for a particular diagnosis?

The variables are then incorporated into a work-load projection formula as M_1, M_2, M_3, and M_4 multipliers respectively.

In addition to the aforementioned variables, interim values obtained are assigned a P-prefix.

P_1 - The initial patient prevalence rate as extracted from AIDS.

P_2 - The "true" prevalence rate.

P_3 - The number of patients requiring treatment.

P_4 - The space requirement adjustment.

P_5 - The total patient-treatments required. In the text that follows, the variables and interim values will be further defined.

1. (M_1): $P_1 \times M_1 = P_2$. M_1, equivalent to an outpatient multiplier, attempts to answer the question: for every patient hospitalized with a particular diagnosis, how many non-hospitalized patients exist with the same condition? M_1 ranges were initially estimated to range from 1 to 10. For example, if M_1 were 1 all patients with the diagnosis were hospitalized. At the other end of the spectrum, if it were 10, there were 9 additional patients being treated as outpatients. In reality, an upper range could be in excess of the arbitrarily assigned one. This multiplier was subsequently assigned a value of 1 since no reasonable estimate could be made of the outpatient population. The data base did not exist, nor could it be extrapolated from extant disease census data with any reasonable accuracy. As previously stated, the P_1 variable was equal to the number of patients hospitalized with a particular confirmed diagnosis in CY 82. Therefore, $P_1 \times M_1$ equals the number of patients with a diagnosis times the outpatient multiplier (always one) which gives the beginning patient prevalence base for a particular diagnosis, and is equivalent to the P_2 variable.

2. (M_2): $P_2 \times M_2 = P_3$. M_2, an HBO indicator multiplier, delineates the ratio of those patients with a particular diagnosis who are candidates for

treatment. M_2 was assigned a range of .001 (0.1%) to 1 (100%). This multiplier was defined for each of the 42 diagnostic codes by polling eight experienced hyperbaric medicine physicians, for percentage estimates. The high and low values were discarded and the average of the remaining six values taken (Appendix E). This multiplier was then applied to the $P_2 \times M_2$ segment of the formula resulting in P_3, which is the total number of patients with a particular diagnosis actually needing HBO. It should be noted that the physicians surveyed were asked to respond as conservatively as possible.

3. (M_3): $P_3 \times M_3 = P_4$. M_3 is the litter multiplier. This variable had to be taken into account, since one litter takes two treatment spaces in the chamber (upright cylinder). This multiplier was used to determine the number of chamber spaces required and was based on the percentage of time a patient occupied a litter. An actual estimate was assigned only for those entities for which a good historical record existed (table 18). If it was not available, the litter multiplier became one if the patient could reasonably be expected to be ambulatory for the entire time. When the diagnosis was such that the patient's condition would warrant a litter for the entire treatment series, it was assigned a value of 2. We know for a fact that, in the majority of the diagnoses assigned a (1), many times full ambulatory status did not occur. This multiplier was taken times P_3 resulting in P_4 giving the total number of chamber spaces (ambulatory) required for all HBO amenable patients with a particular diagnosis.

TABLE 18. FRACTION OF TOTAL CLINICAL COURSE SPENT AS LITTER PATIENT*

DX Code	Description	% As Litter patient
8	Meningitis	66.5
9	Abscess, intraabdominal/intracranial	93.5
12	Retinopathy and retinal detachment	66.5
19	Radiation cystitis	60.0
23	Fracture healing	90.0
25	Burns	66.5
32	Radiation enteritis/myelitis/proctitis	70.0
34	Skin grafts/flaps, compromised	93.5
39	Necrotizing fasciitis	83.5
41	**Pseudomembranous colitis**	83.5
42	Pyoderma gangrenosum	83.5

*See Appendix F--Alphabetic Listings of Diagnoses with Associated M Values for complete M_3 Values.

4. (M_4): $P_4 \times M_4 = P_5$. M_4 is the average number of HBO treatments required for a particular diagnosis. This was based on the UMS Committee Report of Clinical Hyperbaric Oxygen. If none existed, a survey was made of the Brooks AFB Hyperbaric Medicine Division physician staff regarding each individual diagnosis as to the best estimate of the average number of treatments prescribed for that diagnosis (Appendix F). This multiplier was then applied to the prior P_4 value, equivalent to total number of spaces required giving P_5 which is the total number of HBO patient treatments required for a population with those diagnoses.

A summary of the identified variables follows:

P_1 = A count of the confirmed discharge diagnoses and equivalent to the prevalence rate of the entity in question for CY 82.

M_1 = An outpatient multiplier, equal to (1) due to the lack of a total patient data base.

P_2 = Total patients with a particular diagnosis.

M_2 = Percentage of those patients identified by P_2 amenable to adjunctive HBO.

P_3 = Total hyperbaric patients with a particular diagnosis.

M_3 = The percentage a patient remains litter bound during a treatment series.

P_4 = Total "ambulatory" patients with a particular diagnosis.

M_4 = The average number of treatments necessary to complete therapy for a given diagnosis.

P_5 = The total number of patient-treatments for the identified population.

$$P_1 \, (M_1)(M_2)(M_3)(M_4) = P_5$$

The Department of Defense required that reports be broken out by region and status grouping as well as individual diagnosis. A major programming effort resulted in the design, development, and verification of approximately 36 programs (Appendix G). The reports were generated by patient's status, status groupings, diagnosis, and DoD region. As stated at the beginning of this section, the data is limited to USAF data only and as such is not an overall reflection of the true prevalence in the DoD. However, the algorithm employed can be readily adapted to extract the basic biometric data required for analysis from the other services AIDS data base equivalent. It would also be reasonable to extrapolate tri-service need using estimates of prevalence per 1 million USAF population. A reasonable assumption can be made that the demography of the patient populations in the other services would not be significantly different. In the following tables, there is no diagnostic category in the ICD9/ICP coding schema for Wound Healing Enhancement (a major accepted UMS category). Therefore, those diagnoses or procedures were included in the experimental category. Tables 19-21 readily reveal a potential for 142,257 treatments for all UMS categories, of which 17,992 were in the fully accepted category. If Wound Healing Enhancement entities, i.e., Diabetic Ulcer, Venous Stasis Ulcer, Decubitus Ulcer, Arterial Ulcer, were included in this analysis, another 101,960 accepted treatments is predicted. Table 22 emphasizes the fact that active duty and dependents have a significant impact on the number of peacetime treatments required (i.e., 43,335 of the total treatments in all categories). In tables 23-25, an analysis of treatment capacity versus need emphasizes the disparity given a conservative estimate.

TABLE 19. P_1 THROUGH P_5 VALUES BY DoD REGION (UMS ACCEPTED CATEGORIES)

Region	P_1 (Inpatient)	P_2 (Population)	P_3 (Rx population)	P_4 (Rx spaces)	P_5 (Rx)
1	112	112	20	32	350
2	536	536	100	151	2,160
3	316	316	45	61	1,068
4	436	436	85	126	1,952
5	1,167	1,167	258	388	5,960
6	205	205	38	57	846
7	676	676	117	177	2,336
8	132	132	20	28	552
9	286	286	45	68	916
PACAF	359	359	45	65	814
USAFE	289	289	45	65	1,038
	4,514	4,514	818	1,218	17,992

TABLE 20. P_1 THROUGH P_5 VALUES BY DoD REGION (UMS EXPERIMENTAL CATEGORIES)

Region	P_1 (Inpatient)	P_2 (Population)	P_3 (Rx Population)	P_4 (Rx Spaces)	P_5 (Rx)
1	329	329	65	76	2,368
2	2,280	2,280	491	553	8,451
3	1,062	1,062	193	227	7,031
4	1,669	1,669	329	382	12,015
5	3,638	3,638	785	886	29,577
6	968	968	220	247	8,281
7	2,742	2,742	607	683	22,767
8	607	607	107	124	3,878
9	1,249	1,249	248	287	9,543
PACAF	961	961	162	203	5,853
USAFE	1,087	1,087	133	172	4,501
	16,592	16,592	3,340	3,840	114,265

TABLE 21. P_1 THROUGH P_5 VALUES BY DoD REGION (UMS ALL CATEGORIES)

Region	P_1 (Inpatient)	P_2 (Population)	P_3 (Rx Population)	P_4 (Rx Spaces)	P_5 (Rx)
1	441	441	85	108	2,718
2	2,816	2,816	591	704	20,611
3	1,378	1,378	238	288	8,099
4	2,105	2,105	414	508	13,967
5	4,805	4,805	1,043	1,274	35,537
6	1,173	1,173	258	304	9,127
7	3,418	3,418	724	860	25,103
8	739	739	127	152	4,430
9	1,535	1,535	293	355	10,459
PACAF	1,320	1,320	207	268	6,667
USAFE	1,376	1,376	178	237	5,539
	21,106	21,106	4,158	5,058	142,257

TABLE 22. PATIENT TREATMENTS

	UMS Accepted Categories	UMS Experimental Categories	UMS All Categories
AD AF/Dep	9,136	34,199	43,335
Retired & others	8,938	90,056	98,994
Total beneficiaries	18,074	124,255	142,329

TABLE 23. USAF PROJECTED HYPERBARIC OXYGEN THERAPY WORK LOAD/CAPACITY (UMS ACCEPTED CATEGORIES)

Year	Patient dives (P_5)*	Location: Brooks AFB	Location: Wright-Patterson AFB	Location: Travis AFB	Total patient treatment capacity	Ratio W/C
1982	17,992	2,000			2,000	9/1
1985	19,235	2,000	9,000		11,000	2/1
1987	20,111	2,000	9,000	9,000	20,000	1/1

*P_5 increases 2.25%/year over 1982 base (Hq USAF/SGHC)

TABLE 24. USAF PROJECTED HYPERBARIC OXYGEN THERAPY WORK LOAD/CAPACITY (UMS EXPERIMENTAL CATEGORY)

Year	Patient dives (P_5)*	Location: Brooks AFB	Location: Wright-Patterson AFB	Location: Travis AFB	Total patient treatment capacity	Ratio W/C
1982	124,265	2,000	————	————	2,000	62/1
1985	132,844	2,000	9,000	————	11,000	12/1
1987	138,890	2,000	9,000	9,000	20,000	7/1

*P_5 increases 2.25%/year over 1982 base (Hq USAF/SGHC)

TABLE 25. USAF PROJECTED HYPERBARIC OXYGEN THERAPY WORK LOAD/CAPACITY (UMS ALL CATEGORIES)

Year	Patient dives (P_5)*	Location: Brooks AFB	Location: Wright-Patterson AFB	Location: Travis AFB	Total patient treatment capacity	Ratio W/C
1982	142,257	2,000	————	————	2,000	71/1
1985	152,078	2,000	9,000	————	11,000	14/1
1987	158,998	2,000	9,000	9,000	20,000	8/1

*P_5 increases 2.25%/year over 1982 base (Hq USAF/SGHC)

As part of readiness capability in the event of war, the possible impact on clinical HBO from the numbers and kinds of patients likely to result from this activity was addressed. The U.S. Army has developed a computer-based algorithm (combat zone area requirements - CZAR) projecting casualties in the NATO/European sphere. This data was subsequently extracted for those diagnoses for which adjunctive HBO might be useful. A scenario of conventional warfare was selected as most conservative. Table 26 shows the impact on clinical HBO requirements which are significantly greater than our foreseeable near-term capability.

TABLE 26. EUROPEAN NATO NON-NUCLEAR SCENARIO

- Casualties: 20,000/Day For 1C Days = 200,000
- Casualties by category* for CONUS evacuation

1.	Abdominal wounds	55,317
2.	Burns, thermal	6,880
3.	Cerebral trauma	3,084
4.	Crush injuries	5,841
5.	Fractures	56,426
		127,548

*Source: CZAR (Combat Zone Area Requirements) UNCLASSIFIED

ACKNOWLEDGEMENTS

The authors wish to express sincere gratitude to Mrs. Zette P. Rouse for her dedication to this project. Without her diligence and concern, the preparation of this report would have been impossible.

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APPENDIX A

DIAGNOSIS BY CODE NUMBER

1. Leprosy
2. Mycosis, selected refractory
3. Gas gangrene
4. Soft tissue infection
5. Diabetic ulcer
6. Sickle cell crisis/hematuria
7. Anemia due to exceptional blood loss
8. Meningitis
9. Abscess, intraabdominal/intracranial
10. Multiple sclerosis
11. Cerebral edema, acute
12. Retinopathy and retinal detachment
13. Myocardial infarction with shock
14. Gas embolism, acute
15. Peripheral arterial insufficiency, acute
16. Venous stasis ulcer
17. Osteoradionecrosis
18. Mesenteric thrombosis, acute
19. Radiation cystitis
20. Decubitus ulcer
21. Scleroderma
22. Osteomyelitis, refractory
23. Fracture healing
24. Crush injury
25. Burns
26. Head and spinal cord injury
27. Carbon tetrachloride poisoning, acute
28. Cyanide poisoning, acute
29. Carbon monoxide poisoning
30. Soft tissue radionecrosis
31. Decompression sickness
32. Radiation enteritis/myelitis/proctitis
33. Bone grafts-noninfected/nonunions
34. Skin grafts/flaps, compromised
35. Arterial ulcer
36. Corneal grafts, failing
37. Cerebral vascular accidents, acute
38. Hydrogen sulfide poisoning, acute
39. Necrotizing fasciitis
40. Pneumocystosis
41. Pseudomembranous colitis
42. Pyoderma gangrenosum

APPENDIX B

DIAGNOSIS BY CODE NUMBER AND ASSOCIATED ICD9/ICP CODES

1. Leprosy

   03000
   03010
   03020
   03030
   03080
   03090

2. Mycosis, selected refractory

   03930
   11280
   11290
   11740
   11770
   11790

3. Gas gangrene

   04000

4. Soft tissue infection

   04180
   04190
   68200
   68210
   68220
   68230
   68240
   68250
   68260
   68270
   68280
   68290

5. Diabetic ulcer

   25060
   25061
   25069

6. Sickle cell crisis/hematuria

   28250
   28260

7. Anemia due to exceptional blood loss

28510

8. Meningitis

32040
32070
32080
32090
32290

9. Abscess, intraabdominal/intracranial

32400
32410
32490
99850

10. Multiple sclerosis

34000

11. Cerebral edema, acute

34850
43710
43790

12. Retinopathy and retinal detachment

36100
36180
36190

13. Myocardial infarction with shock

41000

14. Gas embolism, acute

43410
44420
63460
63561
63562
63660
63760
63860
63960
67300
95800
99670
99910

15. Peripheral arterial insufficiency, acute

44710

16. Venous stasis ulcer

45400
45420

17. Osteoradionecrosis

52640
52680

18. Mesenteric thrombosis, acute

55700

19. Radiation cystitis

59580

20. Decubitus ulcer

70700

21. Scleroderma

71010
71090

22. Osteomyelitis, refractory

73010
73011
73012
73013
73014
73015
73016
73017
73018
73019

23. Fracture healing

80000-82910

24. Crush injury

92500-92990

25. Burns

94100
94130-94200
94230-94300
94330-94400
94430-94500
94530-94600
94630-94900
94930-94940

26. Head and spinal cord injury

95300-95390

27. Carbon tetrachloride poisoning, acute

98210

28. Cyanide poisoning, acute

98510
98770
98780
98900

29. Carbon monoxide poisoning

98600

30. Soft tissue radionecrosis

99000

31. Decompression sickness

99330

32. Radiation enteritis/myelitis/proctitis

3712
3713
3749
3829
3899

33. Bone grafts-noninfected/nonunions

5786

34. Skin grafts/flaps, compromised

5891-5898

35. Arterial ulcer

44720

36. Corneal grafts, failing

5125

37. Cerebral vascular accidents, acute

43600

38. Hydrogen sulfide poisoning, acute

98780

39. Necrotizing fasciitis

72940

40. Pneumocystosis

13630

41. Pseudomembranous colitis

56410

42. Pyoderma gangrenosum

68600

APPENDIX C

MEDICAL TREATMENT FACILITY TO REGION ASSIGNMENT

DoD REGION 1
CODE FACILITY

1651 Mountain Home AFB ID
4152 Kingsley FLD OR
5351 Fairchild AFB WA
5354 McChord AFB WA
5652 F E Warren AFB WY

DoD REGION 2
CODE FACILITY

0652 Beale AFB CA
0653 Castle AFB CA
0654 Edwards AFB CA
0655 George AFB CA
0658 March AFB CA
0659 Mather AFB CA
0661 McClellan AFB CA
0662 Norton AFB CA
0664 Travis AFB CA
0670 Vandenberg AFB CA
0671 Los Angeles AFS CA
0672 35 TAC Hosp
0673 22 TAC Hosp
3251 Nellis AFB NV

DoD REGION 3
CODE FACILITY

0855 Lowry AFB CO
0857 USAF Academy CO
0859 ADC Med Aid Sta Sum
0860 Peterson AFB CO
2057 McConnell AFB KS
3051 Malmstrom AFB MT
3151 Offutt AFB NE
3153 SAC Med Aid Sta Sum
3851 Grand Forks AFB ND
3852 Minot AFB ND
4651 Ellsworth AFB SD
4951 Hill AFB UT

DoD REGION 4
CODE FACILITY

0451 Davis-Monthan AFB AZ
0452 Luke AFB AZ
0454 Williams AFB AZ

DoD REGION 4
CODE FACILITY

0456 58 TAC Hosp
0457 832 TAC Hosp
0551 Blytheville AFB AR
0553 Little Rock AFB AR
3551 Holloman AFB NM
3552 Kirtland AFB NM
3554 Cannon AFB NM
3557 49 TAC Hosp
3952 Rickenbacker AFB OH
3954 Wright-Patterson AFB OH

DoD REGION 5
CODE FACILITY

2251 England AFB LA
2252 Barksdale AFB LA
2256 23 TAC HOSP
4052 Tinker AFB OK
4053 Vance AFB OK
4057 Altus AFB OK
4852 Bergstrom AFB TX
4854 Webb AFB TX
4855 Brooks AFB TX
4857 Carswell AFB TX
4860 Goodfellow AFB TX
4864 Kelly AFB TX
4865 Lackland AFB TX
4868 Randolph AFB TX
4869 Reese AFB TX
4871 Sheppard AFB TX
4877 Laughlin AFB TX
4879 Dyess AFB TX
4882 ATC MED AID STA SUM

DoD REGION 6
CODE FACILITY

1752 Chanute AFB IL
1756 Scott AFB IL
1757 MAC Med Sta Sum
1854 Grissom AFB IN
2652 Wurtsmith AFB MI
2655 Kincheloe AFB MI
2656 K I Sawyer AFB MI
2751 Duluth IAP MN
2954 Whiteman AFB MO
2955 Richards-Gebour AFB MO

DoD REGION 7
CODE FACILITY

0153 Craig AFB AL
0155 Maxwell AFB AL
1252 Eglin AFB FL
1253 Macdill AFB FL
1256 Patrick AFB FL
1258 Tyndall AFB FL
1263 Homestead AFB FL
1355 Moody AFB GA
1356 Robins AFB GA
2851 Columbus AFB MS
2853 Keesler AFB MS

DoD REGION 8
CODE FACILITY

3752 Pope AFB NC
3753 Seymour Johnson AFB NC
4552 Shaw AFB SC
4553 Charleston AFB SC
4554 Myrtle Beach AFB SC
4555 354 TAC Hosp
4556 363 TAC Hosp
5151 Langley AFB VA
5152 1 TAC Hosp
5153 TRAC Med Aid Sta Sum

DoD REGION 9
CODE FACILITY

1051 Dover AFB DE
2352 Loring AFB ME
2451 Andrews AFB MD
2452 SYS Med Aid Sta Sum
2551 Hanscom AFB MA
3352 Pease AFB NH
3453 McGuire AFB NJ
3653 Griffiss AFB NY
3660 Hancock FLD NY

DoD REGION PACAF
CODE FACILITY

0251 Eielson AFB AK
0252 Elmendorf AFB AK
0254 Shemya AFB AK
0256 AAC Med Aid Sta Sum
1551 Hickam AFB HI
1553 PAF Med Aid Sta Sum

DoD REGION PACAF
CODE FACILITY

CA55 TAC Med Aid Sta Sum
GQ51 Anderson AB GU
JA56 Misawa AFB JA
JA63 Yokota AFB JA
JA71 655 TAC Hosp
JA73 Kadena AFB JA
KS54 Kunsan AB KS
KS55 Osan AB KS
KS59 Taegu ABS KS
TW53 SHU Lin Kou Tw
PQ51 Howard AFB PQ
RP51 Clark AB RP
RP54 656 TAC Hosp
RP55 657 TAC Hosp

DoD REGION USAFE
CODE FACILITY

GE02 Geilenkirchen AB GE
GE55 Rhein-Main AB GE
GE56 Weisbaden GE
GE59 Bitburg AB GE
GE60 Hahn AB GE
GE61 Sembach AB GE
GE62 Spanudahlem AB GE
GE64 Ramstein AB GE
GE72 AFE Med Aid Sta Sum
GE73 Zweibrucken AB GE
GE74 50 TAC Hosp
GE75 86 TAC Hosp
GE76 36 TAC Hosp
GL52 Sondrestrom AB GL
GL53 Thule AB GL
GR51 Hellenikon AG GR
GR53 Iraklion AS GR
GR54 7206 TAC Hosp
IT52 Aviano AB IT
IT54 San Vito Dei Normanni IT
IT55 Comiso AB IT
NL51 Camp New Amsterdam NL
PO51 Lajes AB PO
SP51 Torrejon AB SP
SP53 Zaragosa AB SP
SP74 401 TAC Hosp
TU51 Incirlik AB TU
TU52 Izmir TU

DoD REGION USAFE
CODE FACILITY

TU53	Ankara TU
TU54	Karamursel TU
UK53	RAF Bentwaters UK
UK57	RAF Fairford UK
UK58	RAF Greenham Common UK
UK59	RAF Lakenheath UK
UK63	RAF Upper Heyford UK
UK65	RAF Chicksands UK
UK73	RAF Alconbury UK
UK81	48 TAC Hosp
UK82	20 TAC Hosp

APPENDIX D

*BASE DATA FOR ANALYSIS BY REGION, DIAGNOSIS, AND STATUS**

Region 1

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	0	0	0	0	0	0
2	0	0	0	1	0	1
3	0	0	0	0	0	0
4	14	26	15	12	0	67
5	3	12	46	50	1	112
6	0	4	0	0	0	4
7	2	8	0	0	0	10
8	2	7	4	2	0	15
9	3	3	1	5	0	12
10	0	4	1	1	0	6
11	0	0	0	1	0	1
12	0	0	0	2	0	2
13	5	0	27	3	0	35
14	1	0	3	1	0	5
15	0	0	0	0	0	0
16	0	0	0	0	0	0
17	0	0	1	1	0	2
18	0	0	0	0	0	0
19	0	0	0	2	0	2
20	0	0	2	3	0	5
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	69	15	8	14	0	106
24	1	1	0	0	0	2
25	7	6	3	3	0	19
26	1	0	0	0	0	1
27	0	0	0	0	0	0
28	1	0	0	0	0	1
29	0	0	0	0	0	0
30	0	0	0	1	0	1
31	3	0	0	0	0	3
32	0	0	0	0	0	0
33	0	0	0	0	0	0
34	7	7	6	9	0	29
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	119	93	117	111	1	441

*Source: Biometric Division, SG Director of Health Care Support, Brooks AFB, TX

Region 2

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	0	0	0	0	0	0
2	2	2	5	1	0	10
3	0	0	0	0	0	0
4	79	72	72	76	0	299
5	68	72	457	387	2	986
6	4	4	0	4	0	12
7	1	3	2	3	0	9
8	7	36	3	5	0	51
9	9	28	23	29	1	90
10	5	6	11	11	0	33
11	0	2	11	7	0	20
12	1	2	4	0	0	7
13	13	2	164	40	5	224
14	2	5	15	6	0	28
15	0	0	7	2	0	9
16	1	1	4	2	0	8
17	8	2	1	3	0	14
18	1	0	3	2	0	6
19	0	1	0	0	0	1
20	1	0	14	4	0	19
21	1	0	7	9	0	17
22	1	3	6	1	0	11
23	393	103	59	156	3	714
24	1	0	0	1	0	2
25	32	22	5	6	0	65
26	1	0	0	0	0	1
27	0	0	0	0	0	0
28	2	3	1	0	0	6
29	1	0	0	1	0	2
30	0	0	4	1	0	5
31	5	0	0	0	1	6
32	0	2	10	7	0	19
33	5	2	0	2	0	9
34	23	38	32	39	1	133
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
TOTAL	667	411	920	805	13	2816

Region 3

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	0	0	0	0	0	0
2	0	0	1	1	0	2
3	0	0	0	0	0	0
4	112	61	29	24	5	231
5	21	74	116	92	27	330
6	2	9	0	1	0	12
7	9	25	1	5	2	42
8	2	28	0	2	0	32
9	15	13	8	16	0	52
10	2	2	3	4	1	12
11	1	2	0	1	0	4
12	0	0	0	0	1	1
13	13	2	53	15	8	91
14	0	1	1	1	1	4
15	0	0	0	0	0	0
16	1	0	2	0	0	3
17	2	1	2	0	0	5
18	1	1	0	0	0	2
19	1	2	0	2	0	5
20	0	1	1	1	1	4
21	0	0	0	0	0	0
22	1	0	1	5	0	7
23	204	96	34	44	27	405
24	1	0	1	0	0	2
25	23	18	5	14	1	61
26	0	0	0	0	0	0
27	1	0	0	0	0	1
28	4	1	0	1	0	6
29	2	0	0	0	0	2
30	0	0	0	0	0	0
31	3	0	0	0	0	3
32	0	0	0	0	0	0
33	5	3	1	0	0	9
34	23	12	2	9	4	50
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	449	352	261	238	78	1378

Region 4

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	0	0	0	0	0	0
2	0	3	2	1	0	6
3	0	0	0	0	1	1
4	83	69	53	56	3	264
5	33	75	251	235	16	610
6	7	21	0	8	0	36
7	0	5	0	3	0	8
8	15	29	1	2	1	48
9	20	25	8	10	0	63
10	1	3	18	7	0	29
11	0	2	5	3	1	11
12	0	0	0	0	0	0
13	20	6	124	31	7	188
14	2	1	8	6	0	17
15	1	1	2	5	0	9
16	0	1	4	4	0	9
17	6	2	3	5	0	16
18	1	0	1	2	0	4
19	0	0	1	0	0	1
20	1	3	4	8	0	16
21	2	0	0	3	0	5
22	3	1	4	0	0	8
23	294	103	48	90	14	549
24	6	1	1	1	0	9
25	36	19	8	5	0	68
26	1	0	0	0	0	1
27	0	0	0	0	0	0
28	3	1	1	0	0	5
29	2	1	0	1	0	4
30	0	1	1	2	0	4
31	8	0	0	0	0	8
32	0	0	0	0	0	0
33	18	4	3	0	0	25
34	29	26	15	13	0	83
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	592	403	566	501	43	2105

Region 5

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	1	0	1	0	0	2
2	2	8	7	12	1	30
3	0	2	0	1	0	3
4	269	129	104	138	1	641
5	66	184	683	632	8	1573
6	6	13	1	14	1	35
7	2	8	3	5	0	18
8	20	58	9	13	0	100
9	39	29	33	46	2	149
10	6	7	12	6	0	31
11	3	1	18	10	0	32
12	15	10	38	12	0	75
13	19	3	192	39	5	258
14	10	17	31	28	0	86
15	0	3	17	14	0	34
16	1	1	10	12	0	24
17	18	6	22	12	0	58
18	1	1	2	1	2	7
19	1	1	5	9	0	16
20	0	1	21	20	0	42
21	2	12	3	8	0	25
22	3	4	6	5	0	18
23	418	228	121	255	50	1072
24	2	1	1	2	0	6
25	25	28	13	19	7	92
26	2	0	3	0	1	6
27	0	0	0	0	0	0
28	1	1	1	1	0	4
29	5	4	0	1	0	10
30	2	5	3	10	0	20
31	9	0	0	0	0	9
32	1	9	9	15	0	34
33	22	8	4	10	1	45
34	63	66	59	60	2	250
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	1034	848	1432	1410	81	4805

Region 6

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	0	0	0	0	0	0
2	2	2	1	2	0	7
3	0	0	0	0	0	0
4	51	27	18	23	2	121
5	15	65	175	172	3	430
6	8	6	0	2	0	16
7	7	10	1	4	0	22
8	9	17	0	5	1	32
9	8	11	15	12	0	46
10	0	3	4	4	0	11
11	0	0	3	1	0	4
12	0	0	0	1	0	1
13	12	2	40	11	6	71
14	0	0	6	3	0	9
15	0	0	0	0	0	0
16	0	0	5	2	0	7
17	2	0	5	1	0	8
18	1	0	0	1	0	2
19	0	0	0	0	0	0
20	0	0	2	3	0	5
21	3	0	1	0	0	4
22	2	0	0	1	0	3
23	149	50	28	32	7	266
24	2	0	0	0	0	2
25	20	22	2	2	1	47
26	1	0	0	0	0	1
27	0	0	0	0	0	0
28	5	2	0	0	0	7
29	0	1	0	0	0	1
30	0	0	0	0	0	0
31	0	0	0	0	0	0
32	1	0	0	1	0	2
33	1	2	0	2	0	5
34	13	14	7	8	1	43
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	312	234	313	293	21	1173

Region 7

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	0	0	0	0	0	0
2	1	10	6	5	0	22
3	0	0	0	0	0	0
4	117	82	95	86	3	383
5	45	144	488	532	6	1215
6	8	11	3	11	0	33
7	2	12	5	6	0	25
8	11	44	7	6	1	69
9	37	17	28	25	1	108
10	4	4	2	5	0	15
11	0	1	19	11	0	31
12	2	0	6	1	0	9
13	25	10	207	41	7	290
14	4	4	24	7	1	40
15	0	3	4	2	0	9
16	0	1	8	3	0	12
17	5	1	2	6	0	14
18	0	1	2	1	0	4
19	1	[illegible]	0	3	0	6
20	1	2	5	14	0	22
21	0	2	2	6	0	10
22	2	1	6	1	1	11
23	418	144	86	130	12	790
24	2	0	0	0	1	3
25	52	20	13	9	0	94
26	1	0	0	1	0	2
27	0	0	0	0	0	0
28	4	0	1	0	0	5
29	0	0	0	0	0	0
30	0	0	1	2	0	3
31	2	0	0	0	0	2
32	0	0	3	3	0	6
33	12	5	2	4	0	23
34	48	56	30	28	0	162
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	804	577	1055	949	33	3418

Region 8

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	0	0	0	0	0	0
2	0	2	0	0	0	2
3	0	0	0	0	0	0
4	29	19	14	21	0	83
5	7	40	97	63	0	207
6	0	6	1	4	0	11
7	0	2	1	1	0	4
8	4	9	0	1	0	14
9	5	7	2	7	0	21
10	2	8	1	1	0	12
11	0	0	3	1	0	4
12	0	0	0	0	0	0
13	10	2	58	28	1	99
14	0	0	1	0	0	1
15	0	0	0	0	0	0
16	1	0	0	3	0	4
17	3	1	0	2	0	6
18	0	0	1	0	0	1
19	0	0	0	0	0	0
20	0	1	0	2	0	3
21	1	1	1	0	0	3
22	1	0	0	0	0	1
23	97	37	22	50	3	209
24	2	0	0	1	0	3
25	6	5	1	1	0	13
26	0	1	0	0	0	1
27	0	0	0	0	0	0
28	1	1	0	0	0	2
29	0	0	0	0	0	0
30	0	0	0	0	0	0
31	2	0	0	0	0	2
32	0	0	0	0	0	0
33	1	2	1	1	0	5
34	15	6	1	6	0	28
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	187	150	205	193	4	739

Region 9

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	0	0	0	0	0	0
2	0	2	3	2	0	7
3	0	0	0	0	0	0
4	49	34	34	21	0	138
5	23	55	194	178	5	455
6	2	7	1	1	0	11
7	4	7	1	1	0	13
8	11	19	0	4	0	34
9	7	8	9	6	0	30
10	0	5	5	4	0	14
11	1	0	1	3	0	5
12	2	0	1	1	0	4
13	9	4	84	20	5	122
14	0	1	7	2	1	11
15	0	0	2	1	0	3
16	0	0	5	3	0	8
17	2	0	2	0	0	4
18	0	0	1	1	0	2
19	1	0	0	0	0	1
20	1	6	8	3	0	18
21	0	2	0	2	0	4
22	1	0	2	0	0	3
23	217	85	41	71	6	420
24	0	0	0	0	0	0
25	9	18	4	1	0	32
26	0	0	0	0	0	0
27	0	0	0	0	0	0
28	0	0	1	2	0	3
29	0	0	0	0	0	0
30	0	2	3	2	0	7
31	2	0	0	0	0	2
32	5	6	37	17	0	65
33	6	2	1	4	0	13
34	33	27	25	21	0	106
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	385	290	472	371	17	1535

Region PACAF

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	2	2	0	0	0	4
2	4	2	0	0	0	6
3	1	0	0	0	0	1
4	151	62	18	10	12	253
5	19	57	49	54	19	198
6	5	4	0	0	0	9
7	8	19	2	3	0	32
8	8	31	0	4	3	46
9	19	10	1	2	2	34
10	0	4	1	3	2	10
11	1	3	2	0	2	8
12	3	1	0	1	0	5
13	10	2	22	7	8	49
14	3	1	0	1	1	6
15	1	0	0	0	1	2
16	0	4	2	0	2	8
17	1	1	0	0	0	2
18	0	0	1	2	1	4
19	8	2	0	0	3	13
20	0	0	1	2	3	6
21	0	0	0	0	0	0
22	2	0	0	0	0	2
23	237	110	22	21	42	432
24	3	0	0	0	0	3
25	42	38	2	0	13	95
26	0	0	0	0	0	0
27	0	0	0	0	0	0
28	1	1	0	0	0	2
29	5	1	1	0	0	7
30	0	0	0	1	0	1
31	1	0	0	0	0	1
32	0	1	0	0	0	1
33	7	5	0	1	0	13
34	32	25	3	4	3	67
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	574	386	127	116	117	1320

Region USAFE

DX Code	AD Mil	Depn AD Mil	Ret Mil	Depn Ret /Dec Mil	All Others	Total
1	0	0	0	0	0	0
2	1	1	0	0	0	2
3	0	0	0	0	0	0
4	120	50	13	7	4	194
5	42	66	31	6	13	158
6	2	14	0	0	1	17
7	7	25	0	0	3	35
8	8	23	0	1	2	34
9	23	29	1	2	2	57
10	3	1	1	0	0	5
11	0	0	0	1	1	2
12	0	0	0	0	0	0
13	8	5	9	1	7	30
14	1	0	0	1	0	2
15	0	0	0	0	0	0
16	1	0	0	0	0	1
17	6	2	0	0	0	8
18	0	0	0	0	1	1
19	4	7	0	1	0	12
20	1	0	1	1	0	3
21	0	3	0	0	0	3
22	2	1	0	0	0	3
23	444	154	7	10	39	654
24	12	2	0	0	0	14
25	35	22	1	0	1	59
26	1	0	0	0	0	1
27	0	0	0	0	0	0
28	5	0	0	0	0	5
29	3	0	0	0	0	3
30	0	0	1	0	0	1
31	5	0	0	0	0	5
32	0	0	0	0	0	0
33	12	5	0	0	0	17
34	28	19	1	1	1	50
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0
Total	774	429	66	32	75	1376

APPENDIX E

HYPERBARIC MEDICINE PHYSICIAN SURVEY DATA WITH AVERAGE BY DX

DX Code	Physician - % Indicated 1	2	3	4	5	6	7	8	Average*
1	100.0	1.0	.1	0.0	50.0	100.0	50.0	100.0	50.2
2	0.0	.1	.1	100.0	10.0	20.0	20.0	20.0	11.7
3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
4	4.0	1.0	5.0	80.0	10.0	10.0	5.0	10.0	7.3
5	80.0	5.0	50.0	50.0	50.0	30.0	30.0	30.0	40.0
6	50.0	90.0	1.0	0.0	10.0	5.0	5.0	5.0	12.7
7	.1	.1	.1	0.0	0.0	0.0	0.0	0.0	.1
8	1.0	1.0	1.0	0.0	1.0	10.0	0.0	10.0	2.2
9	80.0	1.0	.1	30.0	5.0	5.0	0.0	5.0	7.7
10	100.0	1.0	.1	0.0	20.0	0.0	0.0	0.0	3.5
11	70.0	20.0	10.0	20.0	1.0	10.0	10.0	10.0	13.3
12	.1	.1	.1	0.0	1.0	0.0	0.0	0.0	.1
13	.1	10.0	1.0	0.0	5.0	10.0	0.0	10.0	4.4
14	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
15	10.0	1.0	50.0	50.0	20.0	30.0	0.0	30.0	23.5
16	80.0	1.0	30.0	50.0	25.0	30.0	30.0	30.0	32.5
17	100.0	95.0	100.0	60.0	40.0	80.0	60.0	80.0	79.2
18	2.0	50.0	1.0	0.0	10.0	10.0	10.0	0.0	5.5
19	100.0	50.0	10.0	30.0	25.0	20.0	20.0	20.0	27.5
20	2.0	1.0	1.0	20.0	5.0	5.0	5.0	5.0	3.8
21	5.0	10.0	1.0	50.0	2.0	1.0	1.0	1.0	3.3
22	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
23	1.0	5.0	1.0	30.0	5.0	5.0	5.0	5.0	4.3
24	50.0	30.0	20.0	100.0	50.0	30.0	30.0	30.0	36.7
25	50.0	50.0	10.0	90.0	100.0	10.0	50.0	50.0	50.0
26	100.0	10.0	.1	10.0	0.0	0.0	0.0	0.0	3.4
27	.1	50.0	1.0	50.0	1.0	10.0	0.0	10.0	12.0
28	100.0	100.0	100.0	50.0	30.0	20.0	20.0	20.0	53.3
29	75.0	100.0	100.0	80.0	50.0	50.0	50.0	50.0	67.4
30	100.0	80.0	20.0	100.0	94.0	10.0	40.0	10.0	57.3
31	30.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
32	100.0	50.0	10.0	30.0	25.0	20.0	20.0	20.0	27.5
33	5.0	5.0	5.0	5.0	10.0	1.0	0.0	1.0	3.7
34	75.0	1.0	20.0	80.0	90.0	90.0	90.0	90.0	74.2
35	70.0	1.0	10.0	0.0	25.0	30.0	30.0	30.0	20.8
36	50.0	50.0	0.0	50.0	100.0	50.0	50.0	50.0	50.0
37	90.0	5.0	.1	5.0	10.0	20.0	20.0	20.0	13.3
38	10.0	10.0	.1	5.0	1.0	0.0	0.0	0.0	2.7
39	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
40	1.0	10.0	.1	0.0	0.0	0.0	0.0	0.0	.2
41	1.0	1.0	10.0	0.0	2.0	0.0	0.0	0.0	.6
42	90.0	50.0	10.0	50.0	50.0	30.0	30.0	30.0	33.3

*The average was determined by eliminating both the low and high estimates and averaging the remainder.

APPENDIX F

ALPHABETIC LISTINGS OF DIAGNOSES WITH ASSOCIATED M VALUES

Alphabetic Listing of UMS All Diagnoses By Category With Associated M Values

DX	M_1	M_2	M_3	M_4
Abscess, Intraabdominal/Intracranial (9)	1	.077	1.87	10
Anemia due to exceptional blood loss (7)	1	.001	2.00	1
Arterial ulcer (35)	1	.208	1.73	30
Bone grafts-noninfected/nonunions (33)	1	.037	1.00	20
Burns (25)	1	.500	1.33	30
Carbon monoxide poisoning (29)	1	.675	2.00	2
Carbon tetrachloride poisoning, acute (27)	1	.120	2.00	1
Cerebral edema, acute (11)	1	.133	2.00	5
Cerebral vascular accidents, acute (37)	1	.133	2.00	5
Corneal grafts, failing (36)	1	.500	1.00	5
Crush injury (24)	1	.367	2.00	10
Cyanide poisoning, acute (28)	1	.533	2.00	2
Decompression sickness (31)	1	1.000	2.00	1
Decubitus ulcer (20)	1	.038	2.00	40
Diabetic ulcer (5)	1	.400	1.00	40
Fracture healing (23)	1	.043	1.80	10
Gas embolism, acute (14)	1	1.000	2.00	2
Gas gangrene (3)	1	1.000	2.00	7
Head and spinal cord injury (26)	1	.034	2.00	5
Hydrogen sulfide poisoning, acute (38)	1	.027	2.00	1
Leprosy (1)	1	.502	1.00	10
Meningitis (8)	1	.022	1.33	5
Mesenteric thrombosis, acute (18)	1	.055	2.00	5
Myocardial infarction with shock (13)	1	.044	2.00	5
Multiple sclerosis (10)	1	.035	1.00	20
Mycosis, selected refractory (2)	1	.117	1.00	10
Necrotizing fasciitis (39)	1	.500	1.67	10
Osteomyelitis, refractory (22)	1	1.000	1.00	50
Osteoradionecrosis (17)	1	.792	1.00	60
Peripheral arterial insufficiency, acute (15)	1	.235	2.00	5
Pneumocystosis (40)	1	.002	2.00	10
Pseudomembranous colitis (41)	1	.006	1.67	5
Pyoderma gangrenosum (42)	1	.333	1.67	60
Radiation cystitis (19)	1	.275	1.20	40
Radiation enteritis/myelitis/proctitis (32)	1	.275	1.40	40
Retinopathy and retinal detachment (12)	1	.001	1.33	3
Scleroderma (21)	1	.033	1.00	40
Sickle cell crisis/hematuria (6)	1	.127	2.00	4
Skin grafts/flaps, compromised (34)	1	.074	1.87	10
Soft tissue infection (4)	1	.073	1.00	20
Soft tissue radionecrosis (30)	1	.573	1.00	40
Venous stasis ulcer (16)	1	.325	2.00	20

Alphabetic Listing of UMS Accepted Diagnoses With Associated M Values

DX	M_1	M_2	M_3	M_4
Carbon monoxide poisoning (29)	1	.675	2.00	2
Cerebral edema, acute (11)	1	.133	2.00	5
Crush injury (24)	1	.367	2.00	10
Cyanide poisoning, acute (28)	1	.533	2.00	2
Decompression sickness (31)	1	1.000	2.00	1
Gas embolism, acute (14)	1	1.000	2.00	2
Gas gangrene (3)	1	1.000	2.00	7
Mycosis, selected refractory (2)	1	.117	1.00	10
Osteomyelitis, refractory (22)	1	1.000	1.00	50
Osteoradionecrosis (17)	1	.792	1.00	60
Skin grafts/flaps, compromised (34)	1	.074	1.87	10
Soft tissue infection (4)	1	.073	1.00	20
Soft tissue radionecrosis (30)	1	.573	1.00	40

Alphabetic Listing of UMS Experimental Diagnoses With Associated M Values

DX	M_1	M_2	M_3	M_4
Abscess, Intraabdominal/Intracranial (9)	1	.077	1.87	10
Anemia due to exceptional blood loss (7)	1	.001	2.00	1
Arterial ulcer (35)	1	.208	1.73	30
Bone grafts-noninfected/nonunions (33)	1	.037	1.00	20
Burns (25)	1	.500	1.33	30
Carbon tetrachloride poisoning, acute (27)	1	.120	2.00	1
Corneal grafts, failing (36)	1	.500	1.00	5
Cerebral vascular accidents, acute (37)	1	.133	2.00	5
Decubitus ulcer	1	.038	2.00	40
Diabetic ulcer (5)	1	.400	1.00	40
Fracture healing (23)	1	.043	1.80	10
Head and spinal cord injury (26)	1	.034	2.00	5
Hydrogen sulfide poisoning, acute (38)	1	.027	2.00	1
Leprosy (1)	1	.502	1.00	10
Meningitis (8)	1	.022	1.33	5
Mesenteric thrombosis, acute (18)	1	.055	2.00	5
Myocardial infarction with shock (13)	1	.044	2.00	5
Multiple sclerosis (10)	1	.035	1.00	20
Peripheral arterial insufficiency, acute (15)	1	.235	2.00	5
Pneumocystosis (40)	1	.002	2.00	10
Pseudomembranous colitis (41)	1	.006	1.67	5
Pyoderma gangrenosum (42)	1	.333	1.67	60
Radiation cystitis (19)	1	.275	1.20	40
Radiation enteritis/myelitis/proctitis (32)	1	.275	1.40	40
Retinopathy and retinal detachment (12)	1	.001	1.33	3
Scleroderma (21)	1	.033	1.00	40
Sickle cell crisis/hematuria (6)	1	.127	2.00	4
Venous stasis ulcer (16)	1	.325	2.00	20

APPENDIX G

DATA ANALYSIS SUMMARY SHEETS

Region Summary Totals For - Active Duty/All Diagnoses

Region	P_1	P_2	P_3	P_4	P_5
1	119	119	15	24	294
2	667	667	87	120	2654
3	449	449	50	71	1378
4	592	592	80	117	2234
5	1034	1034	131	182	3592
6	312	312	38	54	1130
7	804	804	95	135	2806
8	187	187	20	29	568
9	385	385	36	50	1084
PACAF	574	574	70	99	1942
USAFE	774	774	90	130	2554
	5,897	5,897	712	1,011	20,236

Region Summary Totals For - Active Duty/Accepted Diagnoses

Region	P_1	P_2	P_3	P_4	P_5
1	27	27	7	13	54
2	124	124	24	35	596
3	149	149	19	27	388
4	142	142	31	48	686
5	387	387	67	95	1614
6	77	77	13	18	352
7	185	185	28	40	638
8	53	53	10	15	258
9	88	88	11	15	294
PACAF	205	205	26	38	484
USAFE	183	183	33	50	734
	1,620	1,620	269	394	6,098

Region Summary Totals For - Active Duty/UMS Experimental Categories

Region	P_1	P_2	P_3	P_4	P_5
1	92	92	8	11	240
2	543	543	63	85	2058
3	300	300	31	44	990
4	450	450	49	69	1548
5	647	647	64	87	1978
6	235	235	25	36	778
7	619	619	67	95	2168
8	134	134	10	14	310
9	297	297	25	35	790
PACAF	369	369	44	61	1458
USAFE	591	591	57	80	1820
	4,277	4,277	443	617	14,138

Region Summary Totals For - Active Duty/UMS Special Categories

Region	P_1	P_2	P_3	P_4	P_5
1	9	9	4	5	150
2	33	33	16	21	630
3	32	32	12	16	480
4	36	36	18	24	720
5	27	27	13	17	510
6	27	27	10	13	390
7	54	54	26	35	1050
8	6	6	3	4	120
9	13	13	5	7	210
PACAF	50	50	21	28	840
USAFE	42	42	18	24	720
	329	329	146	194	5,820

Summary By Diagnosis For Active Duty

DX Code	P_1 X M_1=	P_2 X M_2=	P_3 X M_3=	P_4 X M_4=	P_5
1	3	3	2	2	20
2	12	12	0	0	0
3	1	1	1	2	14
4	1074	1074	80	80	1600
5	342	342	136	136	5440
6	44	44	6	12	48
7	42	42	0	0	0
8	97	97	0	0	0
9	185	185	15	30	300
10	23	23	0	0	0
11	6	6	0	0	0
12	23	23	0	0	0
13	144	144	6	12	60
14	23	23	23	46	92
15	2	2	0	0	0
16	5	5	0	0	0
17	53	53	43	43	2580
18	5	5	0	0	0
19	16	16	3	3	120
20	5	5	0	0	0
21	9	9	0	0	0
22	18	18	18	18	900
23	2940	2940	126	225	2250
24	32	32	11	22	220
25	287	287	146	194	5820
26	8	8	0	0	0
27	1	1	0	0	0
28	27	27	17	34	68
29	18	18	11	22	44
30	2	2	1	1	40
31	40	40	40	80	80
32	7	7	1	1	40
33	89	89	2	2	40
34	314	314	24	46	460
35	0	0	0	0	0
36	0	0	0	0	0
37	0	0	0	0	0
38	0	0	0	0	0
39	0	0	0	0	0
40	0	0	0	0	0
41	0	0	0	0	0
42	0	0	0	0	0
	5,897	5,897	712	1,011	20,236

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