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Active Duty Access to Specialty Care

Within the Great Plains Regional Medical Command:

A Cost Benefit Analysis

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Abstract

This Graduate Management Project seeks to quantify the direct and indirect costs of specialty referrals for Active Duty members for the purpose of comparing alternative modes of care. The combination of TRICARE program policy on access standards and shrinking military resources necessitates thorough review of the business processes involved with delivering specialty care to the Active Duty patient population. Specific concerns of non-medical expenses i.e., lost productivity, travel, per diem, etc. were analyzed in addition to direct medical costs associated with other alternatives to referring patients to regional military medical centers. A six-month test was conducted to evaluate local contract specialty care as an alternative to regional medical facility referral. The end result was a net savings of nearly \$80,000 by way of increased usage of local contract care. However, non-medical savings were realized at expense of increased medical contract costs. Current funding policy needs modification in order to provide effective economic incentives for military health care managers to contract care locally.

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As reductions in military force structure continue, we can assume that some portion of the Military Health System (MHS) will also draw down. Base Realignment and Closure (BRAC) legislation has closed or downsized over 400 military facilities (GAO 1996). Reductions in MHS treatment capacity challenge one of the MHS's principal assumptions that Active Duty (AD) beneficiaries will receive health care exclusively in Military Treatment Facilities (MTFs) (Beaty, 1997). TRICARE, the Department of Defense's (DOD) managed care initiative, has established policy that also challenges this assumption by setting forth stringent access standards for specialty care (OASD(HA), 1997). The Assistant Secretary of Defense (Health Affairs) (OASD(HA)) policy has implemented a not to exceed fifty-mile or one-hour-drive distance limit for TRICARE Prime patient travel to specialty care. The combination of closing existing MTFs and limiting how far Active Duty patients can travel for specialty care pose a considerable challenge to military healthcare managers. In light of these constraints, the MHS has implemented alternative modes of care to meet Active Duty healthcare needs.

Conditions Which Prompted the Study

A representative example of the above mentioned phenomenon was the closure of Fitzsimmons Army Medical Center (FAMC) in Aurora, Colorado and the resulting change in specialty referral patterns at one of the regionally supported MTFs, Evans Army Community Hospital (EACH), Fort Carson, Colorado. The combination of revised TRICARE access standards and Fitzsimmons' closing in June 1996 (Bull, 1997), dramatically changed the referral

process at Fort Carson and set the stage for what became known as the "Pickler Project." The initiative was named after LTG Pickler, former installation commander of Fort Carson, whose concerns about lost productivity and spiraling Temporary Duty (TDY) costs prompted the initial review of outpatient care for Active Duty soldiers (Horne, 1997).

Prior to FAMC's closure, soldiers requiring specialty care that was not available at Evans were routinely referred to Fitzsimmons. EACH provided a military bus for round-trip transportation to and from FAMC. This arrangement allowed same-day access to care that was both convenient and inexpensive to users. By October of 1996, FAMC's outpatient specialty care clinics ceased to operate and patients were then sent to the Army's regional referral MTF for specialty care, Brooke Army Medical Center (BAMC) in San Antonio, Texas, via United States Air Force (USAF) Aeromedical Evacuation (AE) aircraft (Strait, 1997).

The great distance associated with this change in venue considerably increased travel time and associated temporary duty (TDY) expenses for lodging and per diem. Until that time, there had been negligible costs to EACH's supported organizations for routine outpatient specialty care provided to their soldier population. EACH's supported organizations suddenly incurred a substantial liability in the form of lost productivity and increased TDY costs. According to Chapter 2 of Department of the Army Regulation 40-3, outpatient travel is funded by the soldiers' organization (Dept of the Army, 1985). Theoretically, these non-medical expenses of travel and TDY per diem add to the Army's overall cost of providing care to the Active Duty beneficiary category. This issue was not unique to Fort Carson. All the facilities within the Great Plains Regional Medical Command (GPRMC) faced the a similar challenge of coordinating accessible, cost effective, quality care for Active Duty beneficiaries while trying to minimize the impact on supported line organizations (Burgess, 1997).

Dissatisfied with the prospects of losing additional soldier work days and operational funds to enable soldiers access to routine specialty care, the installation commander, LTG Pickler, directed the establishment of a Process Action Team (PAT). The team's primary objective was to find realistic alternatives that would reduce lost productivity and TDY expenditures.

One of the PAT recommendations included procuring routine outpatient care from local civilian providers. Under provisions specified in Chapter 55 of Title 10, United States Code MTFs are authorized to purchase or contract medical services from private, non-governmental health care providers. This little known and infrequently used alternative is formally called the Supplemental Care Program. According to OASD(HA), Supplemental Care Program (SCP) expenditures account for approximately 3.5 percent of the DOD's annual civilian health care costs (OASD(HA), 1997). In this instance, the local treatment facility allocates its medical operations funds to reimburse civilian providers for treatment or services rendered to their beneficiary population under the Supplemental Care Program.

As part of their overall analysis, the Fort Carson PAT took a sample of cases sent to BAMC and conducted a cost comparison between TDY/per diem expense and the cost of procuring the same care locally. The team referenced the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) reimbursement rate table for equivalent care from a provider located in Colorado Springs. They applied what's known as the CHAMPUS Maximum Allowable Charge (CMAC), a government mandated rate similar to that specified by the Health Care Finance Agency (HCFA) for MEDICARE reimbursement. The PAT concluded that up to 66 percent could be saved by sending patients to local providers (Horne, 1997). The PAT's supplemental care recommendation raised concerns among the leadership at Evans about the

adverse impact the increased expense would have on their facility's operating budget (Horne, 1997). These seemingly valid concerns prompted the tenant organizations on Fort Carson to offer the Army hospital their operational/TDY funds to offset costs incurred by Evans for locally purchased care (Clark, 1997). The transfer of funds was not pursued, due to a conflict with Title 31 of the United States Code dealing with the purpose for which funds were appropriated. In short, Federal law does not authorize expenditure of non-medical funds to procure medical care.

In late August 1997, Major General Cuddy, the U.S. Army Deputy Surgeon General, learned about the Process Action Team's recommendation and directed his staff to fund a \$50,000 demonstration project at Fort Carson to test the feasibility of accessing care locally (Clark, 1997). Along with the additional \$50,000 came the requirement to track and measure overall cost avoidance for the purpose of fiscal justification. On the first of October 1997, EACH and the GPRMC formally implemented the Pickler Project demonstration to test the supplemental care solution for Active Duty outpatient care. Eventually, interest in the test became more intense with the issuing of the previously mentioned access standards for Active Duty service members (OASD(HA), 1997). Health Affairs policy, almost by default, makes supplemental care the alternative of choice for Active Duty who reside outside the specified travel limit from specialty care.

There were a number of potential outcomes from the Pickler Project that could possibly influence a number of business practices within the GPRMC. The primary consideration was cost. The idea of contracting care in the adjacent civilian community had the same effect of increasing overall medical treatment capacity and expense. Establishing and using additional sources of care while forgoing equivalent but distant capacity runs counter-intuitive, during a time of organizational downsizing and fiscal reductions. There was also no immediately

available historical data from which region-wide potential usage of supplemental care could be predicted. Therefore, the estimated demand and cost of using supplemental care were unknown. Additionally, using the SCP to contract services locally was just one of many possible solutions to the predicament at Fort Carson. Other cost effective alternatives, or combination thereof, could produce the same effect of reducing TDY costs and lost productivity while achieving the one-hour access travel constraint. Amongst the other alternatives to SCP were: sharing providers between MTFs, a.k.a. Circuit Riders (CR), e.g. sending an orthopedic surgeon to EACH from BAMC instead of patients to BAMC; using telemedicine (TMED) or videoteleconferencing (VTC); changing AE mission schedules; and or a combination of all the above. The expenses associated with other alternatives needed to be collected for a cost benefit analysis or comparison with the supplemental care initiative.

A secondary but somewhat distant concern was what effect changing the current referral pattern might have on the Graduate Medical Education (GME) programs at receiving Medical Centers (MEDCENs) like BAMC. There was genuine concern about the change in patient mix that would occur if the MEDCENs were to lose Active Duty referrals from regional MTFs. Here again, there was no readily available data from which to predict the type and amount of cases the MEDCENs might not receive, when various alternative modes were employed.

In light of these concerns, BG Timboe, Commander of Brooke Army Medical Center and the Great Plains Regional Medical Command, directed an initial retrospective study of Active Duty outpatient referral patterns within the command and the gathering of all relevant cost data (Timboe, 1997).

Statement of the Problem or Question

Given the existing military medical infrastructure capacity and mandated access policy, what is the most cost-effective mode of delivering specialty care to Active Duty outpatients within the GPRMC area of responsibility? This broad and all encompassing statement requires assessment of the demand and direct costs for specialty care through the alternative modes of supplemental care, circuit rider, and telemedicine for comparison to that associated with the default mode of referring patients to regional military referral centers. Additionally, alternative modes must be examined and compared in terms of quality and access, e.g., telemedicine may not duplicate the conditions required for a physical examination and therefore may be an inappropriate mode for certain specialty referrals. In contrast, radiology consults may prove to be of equal quality and acceptable access using telemedicine. Finally, the indirect or non-medical costs of productivity, TDY, and travel must be quantified and integrated into the overall analysis of cost effectiveness. For the purpose of this study, in depth analysis of cost, quality, and access aspects will focus on the findings derived from the Pickler Project demonstration.

Literature Review

Prior to implementation of TRICARE, specialty referrals within the MHS conformed to what can be described as an ad hoc policy. Active duty patients requiring specialty care that was not available at their local military clinic/hospital could be referred out to other regional MTFs or in certain cases they might be sent to local civilian providers at the expense of the referring facility (OASD(HA), 1995). In a closed health care system, such as military medicine, the ability to identify the frequency, urgency, and destination of referrals can affect resource

allocation as the facility seeks to meet patient care demands (Cortazzo, Guertler, and Rice, 1993, Sox, 1996).

Distance considerations.

Existing literature, albeit somewhat dated, examines the aspects of distance and utilization in accessing healthcare. However, the military unique insensitivity to non-medical costs such as travel or individual out-of-pocket expenses and direct care costs, preclude a one-to-one comparison of the variables used (Shannon, G.W., Bashsur, R.L., and Metzner, C.A., 1969). For instance McGuirk and Powell observed that as third-party health insurance coverage reduced out-of-pocket medical costs, travel time and wait duration became primary determinants of demand and choice of medical facility (McGuirk and Powell, 1984). This work's finding supports the commonly accepted notion that non-medical costs do matter. This may also explain the heightened sensitivity to lost days of worker productivity; however, the cited work is somewhat irrelevant due to the Active Duty patients' lack of personal choice in facility and provider selection. This is primarily due to military unique circumstances and the default health plan membership.

In a related work, Shannon further examines the central place theory and its application to a spatial hierarchy, from lower to higher, where the military medical centers would provide the entire range of services from a central location (Shannon and Dever, 1974). In concept the work corroborates what currently exists within the GPRMC where the smaller regional clinics and community hospitals are not staffed to the level of a medical center and therefore must refer patients to larger facilities capable of providing a greater range of services.

Patient population.

In order to gain some insight to the magnitude of the problem, it was necessary to study the specialty referral process within the GPRMC. First, it was essential to ascertain what the volume of activity might be. To rapidly quantify aspects of the study population, I conducted a very limited retrospective analysis of aeromedical evacuations to BAMC during the period of 15 October 96 through 31 December 96. The results showed that the majority of patients transferred, 59 percent, were Active Duty. This statistic was drawn from BAMC manifest data collected by the AE clerk in Patient Administration (PAD) that included 154 individuals. Further breakdown of the Active Duty aeromedical evacuations revealed that nearly 75 percent were outpatients. The preliminary statistics made light of the fact that the majority of patients referred into BAMC were Active Duty outpatients. Review of the referring MTFs and patient arrival and departure dates revealed that Fort Carson was not the only installation incurring considerable non-medical expenses in the form of lost productivity and travel per diem. This study will derive more comprehensive statistics from existing patient movement and ambulatory patient data systems, in order to ascertain more accurately the magnitude of the Active Duty outpatient referral issue.

A similar analysis was conducted at Reynolds Army Community Hospital, Fort Sill Oklahoma (Hale, 1997). During the March to August 1997 time period 346 soldiers were referred to other MTFs traveling by air aboard USAF/Commercial aircraft and on ground using their automobiles. Hale estimated the local procurement cost for equivalent care to be approximately \$250,000. The non-medical costs of travel and per diem were estimated to total around \$60,000. This study also determined that roughly 63 percent or 219 of the patients'

treatment would have cost less than \$500 per patient encounter with providers at local clinics. These findings suggested that there were overall medical cost savings realized by referring soldiers to other military facilities instead of local civilian providers. Clearly, the few in number but high-cost surgical procedures tend to skew the overall expense of obtaining care from local civilian contract providers. A shortcoming of Hale's analysis is the lack of consideration given to the value of lost productivity. He accounted for only 34 percent of the soldiers' absence from their place of duty and did not assign any dollar value to the 552 known days lost while obtaining care via the USAF AE system. According to Gilbert, productivity must measure the time it takes to do work and the time available to perform work (Gilbert, 1990). Finkler defines productivity as a measure of output per labor hour (Finkler, 1994). In this analysis, the time away from the work center is considered lost productivity.

Non-medical cost.

To derive an initial estimate of the duration of TDY for Active Duty outpatients referred to BAMC, data was collected from reconciled travel vouchers filed through finance and accounting offices at the referring MTF's installation. The self-reported data from some of the referring MTFs provided a rough idea of the length of time Active Duty outpatients spend away from their home station while receiving specialty care at other Military Treatment Facilities. The overall mean duration was 4.76 days and ranged from an installation average low of 2.56 days for Fort Hood, TX to an average high of 8.79 days from Fort Leonard Wood, MO. In terms of data quality, it is important to stress that these initial statistics were preliminary and their validity unverified, due to missing or otherwise unavailable data from some installations and MTFs. However, in contrast to the considerable work day savings that other local alternatives may offer, these statistics were noteworthy.

To gain a perspective of non-medical cost, expense data was collected from the travel vouchers of Active Duty outpatients referred to BAMC. Table 1 provides a summary of TDY costs reported by a sampling of installation resource managers. Table 1 shows the number of TDY trips that had costs reported for the period of 1 April 1997 through 30 September 1997. As previously stated above, these are costs to the soldiers' organizations for travel and per diem in accordance with Department of the Army Regulation 40-3. The differences among installations can be accounted for by a variety of variables that included cost avoidance measures such as: travel orders specifying restrictions on travel, lodging, and meals; the use of Privately Owned Vehicle (POV) versus commercial or military air transportation; the proximity to referral facility, etc. In explanation of some of the variance, a known variable that skewed the cost at Fort Carson was the use of commercial air for return travel instead of USAF air transport.

Table 1.

TDY Cost By Installation.

STATION	# TDY	\$ COST	AVG COST
CARSON	30	\$22,193	\$734
LEVWRTH	22	\$9,176	\$417
HOOD	353	\$83,044	\$235
SILL	330	\$79,963	\$239
LENRDWD	109	\$41,950	\$384
RILEY	49	\$19,542	\$398
TOTAL	893	\$255,867	\$287

Referral costs.

Other expenses that are part of this study include the direct costs of care provided to Active Duty outpatients. This variable includes the direct cost of care provided by the referral facility (BAMC) for outpatient specialty care. It will also include the supplemental cost to the referring MTF, when care is procured locally. For comparison purposes in the Pickler Project,

the historical or currently known expense for a given treatment or procedure was the cost figure used for supplemental care estimates in the Colorado Springs locality. This was due to the varying rates negotiated among the competing specialty providers in the Pikes Peak region. Studies suggest that for each dollar generated by a primary care manager (PCM), two dollars are generated by the consultant physician, and four dollars by the associated hospital (Nutting, Franks, and Clancy, 1992). This work implies that the referring physician has control of substantial economic consequences. According to Nutting et al., for a system to remain financially viable, primary care physicians must become involved in controlling referrals in terms of frequency and destination. In managed care, PCMs are placed at financial risk for referral and hospitalization costs. This implies that financial incentives are necessary to influence referrals. The application to military medicine is abstract and relates primarily to the resource manager's domain. Military medicine is somewhat cost conscious; however, there are no profit margins or economic incentives to influence providers who are the referral decision-makers.

Referred specialties.

In order to assess the specific type of care received by referred patients, it was necessary to categorize referrals by the type of specialty clinic. Essentially, there are two types of referral: diagnostic, which include special procedures and evaluations; and therapeutic, which proscribe therapy or determine a disposition (Cortazzo, et al., 1993). Table 2 lists the top ten clinics receiving outpatients referred from regional MTFs. This information was initially drawn from patient movement requests submitted to the Global Patient Movements Requirements Center (GPMRC) at Scott AFB, IL for Active Duty outpatients referred to BAMC for the period of 1 April 1997 to 30 September 1997. The data revealed that orthopedic specialties and

subspecialties far outnumbered the other clinic visits and accounted for over a quarter of all visits. Neurology and neurosurgery were also high on this list. In contrast, Oncology services comprised the majority of referrals in a similar list containing the aggregate beneficiary categories of dependants and retirees.

According to Froom, Feinbloom, and Rosen, referrals provide substantial benefits such as access to expert knowledge, experience, and advance technical skills otherwise not available

Table 2.

Top Ten Specialty Frequency Distribution.

CODE	FREQ	MEDICAL SPECIALTY
SOO	82	ORTHOPEDIC SURGERY
MMN	37	NEUROLOGY
SSN	32	NEUROSURGERY
SSU	22	UROLOGY
SOOH	20	HAND SURGERY
MMU	17	PULMONARY DISEASE
SOOL	13	DISC SURGERY (LUMBAR)
MMC	12	CARDIOLOGY
SSO	11	OPHTHAMOLOGY
MMR	10	RHEUMATOLOGY

(Froom, Feinbloom, and Rosen, 1984). As is the case with Brooke Army Medical Center's one-of-a-kind burn treatment unit and other unique treatment capacity, like bone marrow transplant, military referral offer an advanced array of diagnostic and therapeutic regimens for patients assigned to distant localities. Further analysis of referral trends like those shown will enable demand projection for services upon which other alternatives can be examined.

Referral process.

Since a large majority of the Active Duty outpatients referred to BAMC from distant MTFs travel onboard USAF C-9 aircraft, it was helpful to become familiar with the Aeromedical

Evacuation (AE) system in relation to the overall referral process. The AE process can be described as four non-mutually exclusive loops that have concurrent sub processes termed referral generation, referral appointment, AE manifesting, and AE travel (see Figure 1). In the typical MTF, primary care providers usually initiate appointments after a patient encounter. In a managed care environment, the local health care finder (HCF) processes the generated referral and considers the patient's needs, service availability, access standards, and cost of alternatives when arranging patient appointments. If the appointment is booked locally, the process is complete. However, if the referred service is not available locally, the process continues with the appointing process.

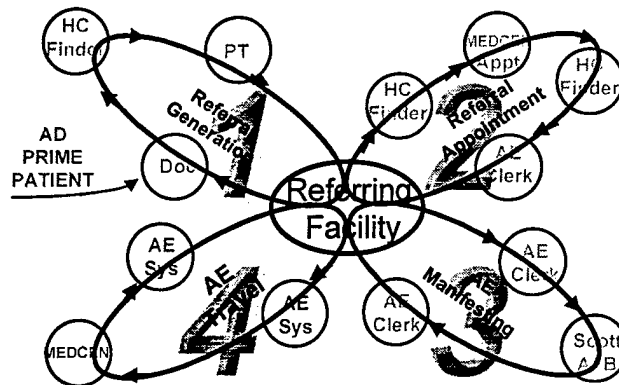


Figure 1. Referral Process Diagram.

The second step interfaces with the referral treatment facility, usually a medical center. The HCF works with the central appointments clerk or separate specialty clinic at the MTF to schedule a TRICARE prime appointment slot that meets the patient's requirements. After the patient is appointed, the AE clerk is responsible for making travel arrangements at those locations served by USAF aeromedical evacuation aircraft. The third step is AE manifesting. At this point, the AE clerk enters the patient in to the Defense Medical Regulating Information

System (DMRIS) computer and processes him or her to the referral facility. In Fort Carson's case, flights depart on Mondays and Wednesdays with returning flights from BAMC/Kelly, AFB on the afternoons of Mondays and Wednesdays. This flight schedule requires a minimum of three days TDY, if the patient's appointments have been synchronized. Otherwise, the patient will have to remain until the following Monday afternoon for a return flight aboard a C-9. This accounts for the previously mentioned increased use of commercial air travel returning to Fort Carson. Instead of waiting for the following week's AE mission, patients would return via scheduled airlines.

The last phase is where most delays occur, thereby extending the time-away-from-station. Whether it's aircraft breakdowns, cancelled appointments, or delayed manifesting for the return trip, any hitch in this final loop of the process can potentially double the TDY duration. In defense of the AE system, it became readily apparent that it was not the principal cause of the problem with extended TDY duration. However, the AE system may become an issue if ever there are constraints placed on Air Force flight hour programs. Travel costs would increase substantially from zero to hundreds of dollars, if remotely located units were to rely solely upon commercial air to transport patients.

Analysis of the military referral process included the internal policy documented at the Army Community Hospital on Fort Carson which provided a flow chart decision matrix for referrals that included a supplemental care alternative. Figure 2 diagrams the methodology used by the medical staff for internal decision making on referrals of Active Duty outpatient for treatment or evaluation. This process follows a logical path beginning with the provider generating an electronic consult that is forwarded to the TRIWEST health care finder who checks availability within the local military medical network that includes Peterson AFB and the

Air Force Academy clinics. The next resource checked is the TRIWEST local civilian provider network. If the local civilian network is unable to provide the care, the third resource, local out-of-network providers are surveyed. The final resource is the MHS referral center. As a step to ensure quality control, the Deputy Commander for Clinical Services (DCCS) reviews and approves all cases where care is accessed locally. Also, the MTF Resource Management

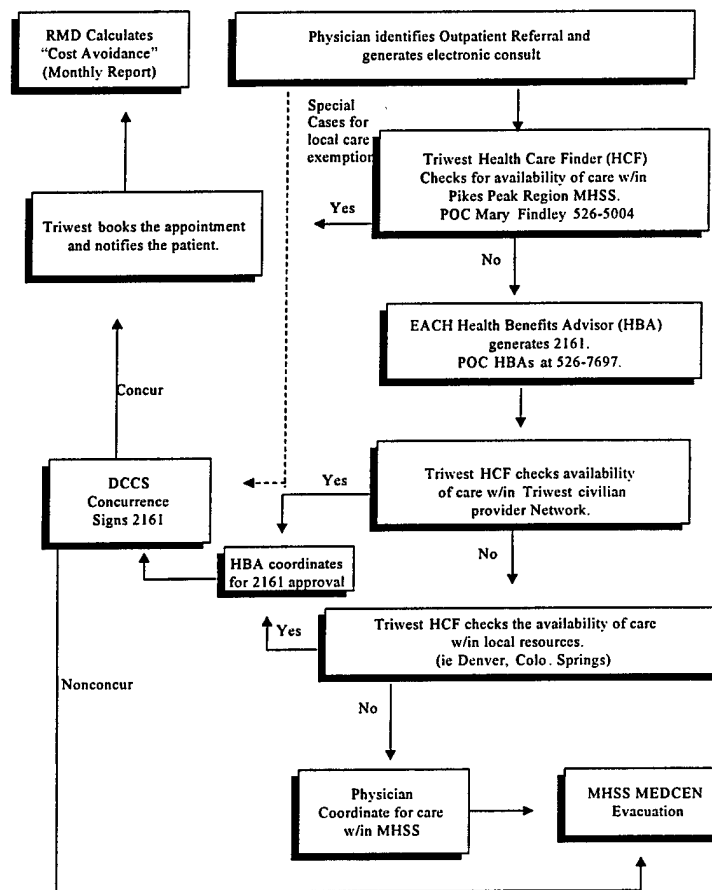


Figure 2. Referral Process Diagram, Evans Army Community Hospital.

Division (RMD) tracks all local referral for cost avoidance and expenditure justification purposes. To address cases where there is a military unique circumstance, e.g., Persian Gulf Syndrome, Medical Evaluation Boards, etc., there is a decision loop allowing for these type of

exceptions. Another management aspect of the matrix is that there are specified suspense timelines to expedite process and meet appointment access standards.

The review of existing literature, similar studies, and analysis of documented processes further defined the problem and revealed managerial methodology and metrics. For the most part, the available literature addressed aspects of specialty referrals that were not directly applicable to the entirety of this study. This was due mostly to the general insensitivity of referral decision-makers to direct and indirect expenses. The remainder of the literature identified cost and productivity measures that are part of generally accepted accounting principles. Analysis of readily available preliminary data proved most useful in quantifying the magnitude of the issue and the various parameters that determine the number and type of referrals.

Purpose (Variables/Working Hypothesis)

This is a multifaceted and somewhat complex problem. The purpose of this study is to determine the cost-effective mode or modes for delivering specialty care to Active Duty outpatients where there is no local military alternative available. The generally accepted measure of cost-effectiveness is the compared amount of direct and indirect expense associated with alternatives, given equal quality in outcomes (Finkler, 1994). This study will measure and analyze the costs and benefits of supplemental care, circuit rider, telemedicine, and military MEDCEN referral as alternative modes for delivering outpatient specialty care to Active Duty. The underlying objectives of this study are to determine the following: precisely who has been referred to BAMC, from where, and for what specialties. With that data, the costs of travel, per diem, lost productivity, and specialty care can be subsequently determined and compared.

My null hypothesis (H_0): the alternative modes of supplemental care, circuit rider, or telemedicine are significantly less expensive than military MEDCEN referral, given the mode has equal appropriateness and quality outcome.

My first alternate hypothesis (H_a): the alternative modes of supplemental care, circuit rider, or telemedicine are significantly more expensive than military MEDCEN referral, given the mode has equal appropriateness and quality outcome.

My second alternate hypothesis (H_a): there is no significant difference in expense between military MEDCEN referral and the alternative modes of supplemental care, circuit rider, or telemedicine, given equal appropriateness and quality outcome.

The dependent variable is the total cost associated with the clinical visit and primary procedure. This includes indirect non-medical costs of travel, per diem, estimated value of lost productivity, and the direct medical costs of doctor's fees, medical supplies, equipment and shared clinic expenses. I have identified the following independent variables: mode of travel, availability of USAF AE support, referring MTF treatment capacity and location, availability of network or supplemental care providers, clinical specialty referred to, treatment procedure required, referral MEDCEN appointment date and time, availability of military specialty providers, and availability of videoteleconferencing resources.

Method and Procedures

The population of this study was comprised of two groups. The first consisted of outpatient clinic referrals to BAMC by Active Duty service members from Evans Army Community Hospital during the period of 1 April 1997 to 30 September 1997. This group served as the control group against which the test group was compared. The second group consisted of the same category as the first, but visited BAMC from 1 October 1997 through 31

March 1998. This group was the study group, affected by the change in DOD HA policy implementing stringent access standards and the Pickler Project test of supplemental care at Fort Carson, CO. The control group referrals $n = 93$ and the test group $n = 54$.

This study employed a non-experimental design using existing patient and cost data. Research data was obtained from the following sources: the Ambulatory Data System (ADS); the Defense Medical Regulating Information System (DMRIS); the Composite Health Care System (CHCS); the Corporate Executive Information System (CEIS); the Army Military Civilian Cost System (AMCOCS); and the Defense Finance and Accounting System (DFAS). To determine the extent of differentiation, I analyzed costs for similar episodes of care delivered in alternative modes. In comparing the two groups, this study used descriptive statistics and a z-test to compare sample means of visit frequency and duration.

The initial data set included patient name, station, and social security numbers, in order to index and verify specific cost data from the disparate databases and associated clinic appointment records. After accumulation and indexing of the required data, patient identification was eliminated for the purpose of safeguarding information protected by the Privacy Act. Additionally, the geographic dislocation of the researcher from the patient's home station enhanced patient anonymity. All taken together, these steps eliminated potential ethical dilemmas with research involving patient records.

With respect to concerns about validity and reliability, this study considered the source of data used. By using data from established Department of Defense databases, I assumed the content was reasonably valid. Even though ADS compliance ranged from 54 percent to 85 percent during the control and test period, there were no other systematic means of gathering ambulatory patient visit data at the time of the study. To determine reliability, data was

compared between independent sources. For example, AE travel data was verified with corresponding appointment records in CHCS. Likewise, ADS data was compared with dates on travel voucher reconciliation and passenger manifests. Each source of data had corresponding links to another data source. Records were assessed to locate missing data. In cases where there was incomplete information, e.g., travel costs not available but TDY duration is known, historical averages were used. Each incomplete record was reviewed to determine its appropriateness for inclusion in the study. Those records deemed inappropriate were excluded.

The Results

Volume and Variety

Give the inclusion of the non-medical costs of lost work days and TDY/per diem expenses, it seemed initially hopeful that the alternative mode of supplemental care was significantly less expensive than military MEDCEN referral. To start with, this study reviewed the patients regulated to Brooke Army Medical Center from all the referring MTFs world-wide. This was done in order to ascertain the magnitude of the issue. Figure 3 graphically depicts the

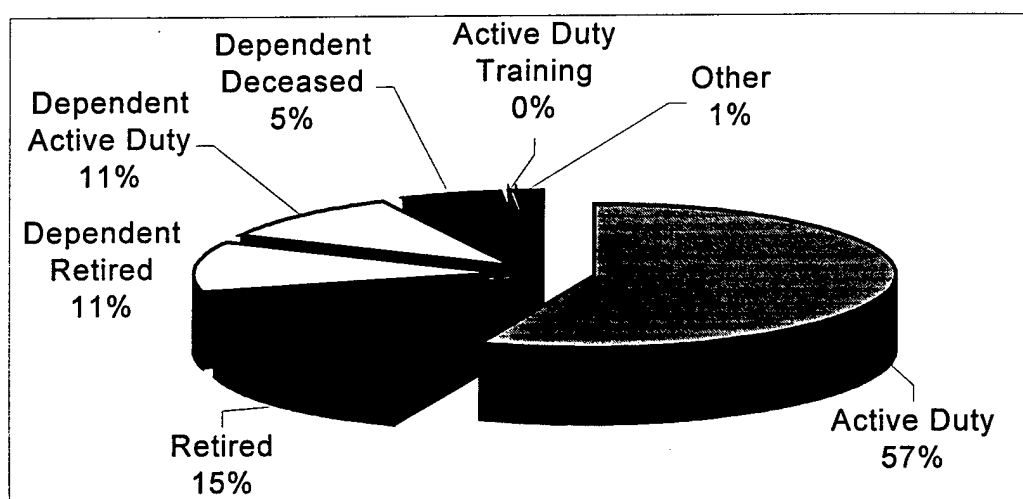


Figure 3. Beneficiary Population Categories.

category of patients according to beneficiary status. These findings were consistent with the preliminary statistics derived from earlier BAMC manifest data. Comprising a little over 56 percent of the total patient population sent to BAMC via the AE system, the Active Duty

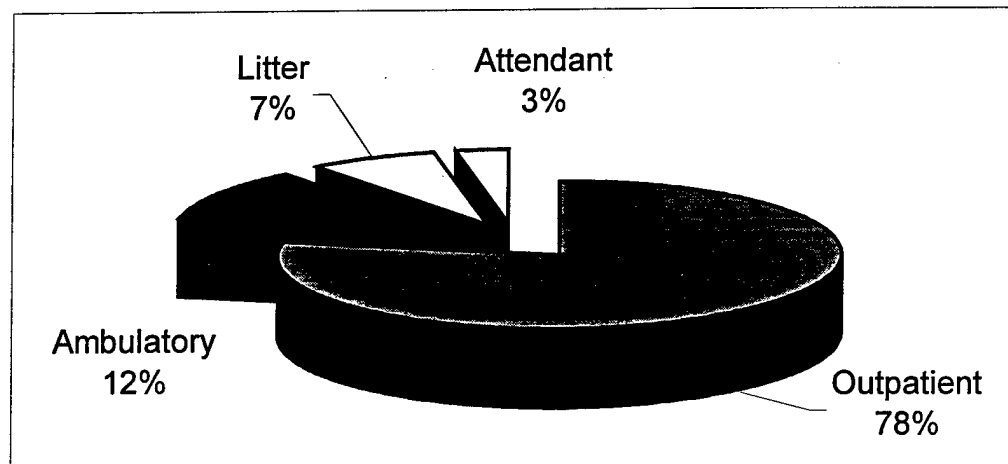


Figure 4. Active Duty Patient Categories.

beneficiary population is mostly characterized as being outpatients (see Figure 4). The last two figures identify the Active Duty outpatient population as the largest of the patient groups referred to BAMC, according to the USAF DMRIS database

Table 3 reflects the number and origin of Active Duty patients from the top ten referring facilities. This was derived from a comprehensive list of all patient movements to and from BAMC for the period of 1 April 1997 through 31 March 1998, as provided by the Global Patient Movement Requirements Center, Scott Air Force Base, IL. The 837 patients represent 85 percent of the Active Duty outpatient population referred to BAMC through the USAF GPMRC.

Table 3.

Top Ten Referring MTFs According to DMRIS Database

Patients	Referring Military Treatment Facility
244	IRWIN ACH, FORT RILEY, KS
165	REYNOLDS ACH, FORT SILL, LAWTON, OK
119	EVANS ACH, FORT CARSON, CO
82	BAYNE-JONES ACH, FORT POLK, LA
55	USAFB, HOWARD AFB, PQ
46	GENERAL LEONARD WOOD ACH, FORT LEONARD WOOD, MO
46	GORGAS ACH, ANCON, PQ
33	MUNSON ACH, FORT LEAVENWORTH, KS
28	CIVILIAN HOSPITAL
19	2ND GENERAL HOSPITAL, LANDSTUHL, GE

In a comparative analysis, patient appointment data from the Ambulatory Data System for all catchment areas outside of BAMC's catchment area were totaled for the same time period. Table 4 shows the number of Active Duty outpatient appointments that were kept at BAMC by the top ten referring catchment areas. It is plainly evident that Fort Hood and Lackland Air Force Base outnumber all other referring MTFs by a considerable margin and together account for 32 percent of the nearly 26,000 total Active Duty patient appointments from outside BAMC's catchment area.

Table 4.

Top Ten Catchment Areas from ADS Database

Patients	Referring Military Treatment Facility
4676	DARNALL ACH FT. HOOD
3624	59th MEDICAL WING LACKLAND AFB
2808	EASTERN TEXAS
1069	BAYNE-JONES ACH FT. POLK
982	REYNOLDS ACH FT. SILL
860	IRWIN ACH FT. RILEY
471	GORGAS ACH
460	NH CORPUS CHRISTI
311	EVANS ACH FT. CARSON
260	L. WOOD ACH FT. LEONARD WOOD

Table 5 is a summary of appointments from the referring facilities within the Great Plains Regional Medical Command by the four calendar quarters of this study. The total number of appointments account for nearly one third of all out-of-catchment-area referrals for Active Duty outpatients seen or treated at BAMC. Next, the data was queried and sorted to determine the type of specialty care received by all referred Active Duty outpatients. In a similar fashion to the preceding analysis, the frequency and type of medical specialties were rank ordered according to the top twenty categories. As found in the referring facility ranking, there are some clear differences between the respective DMRIS and ADS databases. Tables 6 & 7 show the ranked mix of specialties with orthopedics at or near the top of both lists.

Table 5.

Regional Referrals to BAMC from April 97 through March 98

	Active Duty Population	Apr-Jun 97 Outpatient Episodes	Jul-Sep 97 Outpatient Episodes	Oct-Dec 97 Outpatient Episodes	Jan-Mar 98 Outpatient Episodes	Total
Carson	14K	87	98	62	64	311
Riley	10K	227	167	235	229	858
Lvnwrth	8K	41	73	29	0	143
Lnrld Wd	14K	71	30	90	69	260
Polk	12K	228	307	235	295	1065
Sill	17K	260	298	183	241	982
Hood	42K	1443	1205	932	1187	4767
Huachuca	6K	5	19	7	0	31
Bliss	9K	17	22	19	20	78
Total	132K	2379	2219	1792	2105	8495

Table 6.

Top Twenty Medical Specialties Seen By AD Outpatients DMRIS

Code	Patients	Specialty
SOO	162	Orthopedic Surgery
SSN	91	Neurosurgery
MMN	63	Neurology
SSU	56	Urology
MMG	44	Gastroenterology
MMC	43	Cardiology
SOOL	43	Disk Surgery (Lumbar)
SSR	42	Otorhinolaryngology
MMO	37	Oncology (Medical)
MMU	36	Pulmonary Disease
SOOH	31	Hand Surgery
SSO	27	Ophthalmology
SSL	24	Plastic Surgery
MMFB	21	AIDS (Evaluation)
MMR	21	Rheumatology
MMI	18	Internal Medicine
MEA	17	Medical Attendant
SBN	16	Burns
MMD	12	Dermatology
SSCT	11	Thoracic Surgery

The two same databases contained patient primary diagnosis coding compliant with the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM). Patient diagnosis were tabulated and ranked. Table 8 summarizes diagnosis data from the DMRIS database; while Table 9 contains a similar ranking derived from ADS appointments. In comparison, the two database lists appear mismatched. In the discussion portion of this study, explanations will be offered to resolve this apparent discrepancy. An additional data field available in the ADS appointment database was the Evaluation and Management (E&M) code specified in the Physicians' Current Procedural Terminology (CPT) manual by the American Medical Association. The top fifteen E&M codes were counted and rank ordered for all the

Active Duty outpatients referred to BAMC for the entire study period. Table 10 summarizes these findings.

Table 7.

Top Twenty Medical Specialties Seen By AD Outpatients ADS

Specialty Clinic	Appointments
BLA-PHYSICAL THERAPY	2583
BEA-ORTHOPEDICS	2411
BFE-SOCIAL WORK	1668
BHA-PRIMARY CARE	1616
BCB-GYNECOLOGY	1416
BAP-DERMATOLOGY	1107
BIA-EMERGENCY MED	1099
BFB-PSYCHOLOGY	783
BEE-ORTHOTIC LAB	766
BAM-ONCOLOGY	737
BFC-CHILD GUIDANCE	703
BBI-UROLOGY	667
BAG-GASTROENTEROLOGY	665
BBF-OTOLARYNGOLOGY	649
BAK-NEUROLOGY	604
BBC-NEUROSURGERY	597
BBD-OPHTHALMOLOGY	561
BBA-GENERAL SURGERY	532
BAC-CARDIOLOGY	486
DGE-AMB NURSING SVCS	474

Moving from the macro to the micro, the next series of tables show data for Active Duty outpatients sent to BAMC from Fort Carson. Table 11 lists the frequency and type of clinical specialties seen by soldiers referred by providers at EACH for the control and study period. This list is similar to the preceding specialty list derived from DMRIS, with orthopedic

Table 8.

Top Twenty Patient Primary Diagnosis from DMRIS

ICD-9-CM	Patients	Diagnosis
722.2	55	Displacement of intervertebral disc, site unspecified, without myelopathy
722.1	43	Displacement of thoracic or lumbar intervertebral disc without myelopathy
722.52	24	Lumbar or lumbosacral intervertebral disc
724.2	20	Lumbago
780.3	19	Convulsions
414	13	Other forms of chronic ischemic heart disease
389.14	13	Central hearing loss
V73.72	9	Screening for viral and chlamydial disease
722.0	9	Displacement of intervertebral disc, without myelopathy
174.9	9	Malignant neoplasm of female breast, unspecified
786.5	8	Chest pain
780.57	8	Other unspecified sleep apnea
719.43	8	Pain in joint, forearm
599.7	8	Hematuria
784.0	7	Headache
780.2	7	Syncope and collapse
202.8	7	Other lymphomas
808.0	6	Fracture of pelvis, acetabulum, closed
756.12	6	Spondylolisthesis
729.1	6	Myalgia and myositis, unspecified

subspecialties filling out the top half. Also noteworthy was the marginally lower number of referrals, 93 versus 54, from the preceding six month period. A same season comparison will help clarify whether this change was due to seasonal fluctuations or actual change in referral patterns.

Table 9.

Top Twenty Patient Primary Diagnosis from ADS

ICD-9-CM	Appts	Primary Diagnosis
V62.89	627	Unspecified psychological or physical stress, not elsewhere classified
V57.1	594	Other physical therapy
V60.8	570	Other specified housing or economic circumstance
724.2	525	Lumbago
V61.20	398	Counseling for parent-child problem, unspecified
V58.49	314	Encounter for other specified aftercare following surgery
719.46	309	Pain in joint
V72.85	303	Other specified special examination
V65.40	284	Other specified housing or economic circumstance
348.3	275	Encephalopathy, unspecified
V53.7	271	Fitting and adjustment of Orthopedic devices
729.1	249	Myalgia and myositis, unspecified
622.1	233	Dysplasia of cervix (uteri)
V67.0	216	Follow-up examination following surgery
V52.1	215	Fitting and adjustment of artificial leg
845.00	208	Sprains and strains of Ankle, unspecified site
042	207	Human Immunodeficiency Virus
722.10	204	Lumbar intervertebral disc without myelopathy
V08	196	Asymptomatic human immunodeficiency virus (HIV) infection status
477.8	186	Allergic rhinitis due to other allergen

Table 10.

Top Fifteen Patient Evaluation and Management Codes from ADS

Code	Frequency	Evaluation and Management Description
99214	3442	Outpatient visit for the eval and management of an established patient, detailed, moderate complexity
99213	3373	Outpatient visit for the eval and management of an established patient, focused, low complexity
99215	3209	Outpatient visit for the eval and management of an established patient, comprehensive, high complexity
99242	1635	Office consultation for a new or established patient, expanded, straightforward
99203	1424	Outpatient visit for the eval and management of a new patient, detailed, low complexity
99241	1270	Office consultation for a new or established patient, focused, straightforward
99243	1162	Office consultation for a new or established patient, detailed, low complexity
99205	1090	Outpatient visit for the eval and management of a new patient, comprehensive, high complexity
99244	995	Office consultation for a new or established patient, comprehensive, moderate complexity
99202	965	Outpatient visit for the eval and management of a new patient, expanded, straightforward
99371	939	Telephone call
99212	742	Outpatient visit for the eval and management of an established patient, focused, straightforward
99372	704	Telephone call, intermediate, detailed
99354	585	Initial inpatient consultation for a new or established patient, comprehensive, moderate complexity
99499	567	Unlisted evaluation and management

Table 11.

Top Ten Clinic Referrals for Fort Carson Active Duty Patients Outpatients(Control & Study Period Combined)

Clinic	Period 1	Period 2
Disk Surgery (Lumbar)	24	17
Disk Surgery (Cervical)	18	3
Orthopedic Surgery	10	7
Ophthalmology	10	4
Neurosurgery	6	8
Pulmonary Disease	5	3
AIDS (Evaluation)	2	2
Cardiology	4	1
Urology	3	0
Plastic Surgery	0	3
Laser Ocular Trauma	0	2
Oncology	2	0

Tables 12 & 13 show a comparison of clinic appointment data drawn from ADS for Active Duty outpatients from Fort Carson during the control and test period. The top ten ranking includes Social Work, high on both lists. This also appears in the composite ADS appointment list in Table 7 above. When tallied by individuals, Table 14 summarizes the mean number of appointments per patient over the two time periods of this study.

Tables 12 & 13.

ADS Top Ten Clinic Appointments Apr-Sep 97 & Oct 97-Mar 98

Control Period		Study Period	
Clinic	Appts	Clinic	Appts
BFE-SOCIAL WORK	39	BBC-NEUROSURGERY	23
BBC-NEUROSURGERY	22	BEA-ORTHOPEDICS	14
BBD-OPHTHALMOLOGY	19	BFE-SOCIAL WORK	10
BEA-ORTHOPEDICS	18	BBG-PLASTIC SURGERY	6
BAQ-INFECTIOUS DIS	10	BLA-PHYSICAL THERAPY	6
BAC-CARDIOLOGY	6	BAM-ONCOLOGY	5
BAM-ONCOLOGY	6	BAN-PULMONARY DIS	4
DGE-AMB NURSING SVCS	6	BAQ-INFECTIOUS DIS	4
BEE-ORTHOTIC LAB	5	BAP-DERMATOLOGY	3
DDA-E/CARDIOGRAPHY	5	BBD-OPHTHALMOLOGY	3

Table 14.

Appointment Statistics Control Period & Study Period

<u>Control Period</u>		<u>Study Period</u>	
Mean	3.57	Mean	2.91
Standard Error	0.35	Standard Error	0.41
Median	3	Median	2
Mode	1	Mode	1
Standard Deviation	2.35	Standard Deviation	2.35
Sample Variance	5.51	Sample Variance	5.51
Kurtosis	-0.08	Kurtosis	6.13
Skewness	0.80	Skewness	2.12
Range	8	Range	11
Minimum	1	Minimum	1
Maximum	9	Maximum	12
Sum	157	Sum	93
Count	44	Count	32
Largest(1)	9	Largest(1)	12
Smallest(1)	1	Smallest(1)	1
Confidence Level(95.0%)	0.71	Confidence Level(95.0%)	0.85

ICD-9-CM and CPT E&M codes for the study population are provided in the following tables for the step-down focus of this study. Tables 15 & 16 rank order the top fifteen primary diagnosis according to DMRIS and ADS for the study population. It is noteworthy to mention the lopsided coding reflected in the DMRIS database ICD-9-CM total ranking of 57 instances of intervertebral disc diagnosis of some type. This accounts for nearly half of all Active Duty outpatient referrals from Fort Carson during the entire period of the study. Similar to the larger population, the ADS list of diagnosis is more varied and specific. I attribute this to the difference in data entry. The AE clerk at referring MTFs either look-up or transcribe primary diagnosis to fill the blanks of a movement request; while professional coders are responsible for ADS data entry that is part of the patients' permanent record. The difference is clearly evident.

Table 15.

Fort Carson Patients' ICD-9-CM Primary Diagnosis from DMRIS

ICD-9-CM	Patients	Diagnosis
722.2	48	Displacement of intervertebral disc, site unspecified, without myelopathy
722.0	8	Displacement of intervertebral disc, without myelopathy
737.2	4	Lordosis
371.9	4	Unspecified corneal disorder
371.60	4	Keratoconus, unspecified
805.4	3	Fracture of the vertebral column, lumbar, closed
745.0	3	Common truncus cardiac anomalies
733.40	3	Aseptic necrosis of bone, site unspecified
721.3	3	Lumbosacral spondylosis without myelopathy
786.6	2	Swelling, mass, or lump in chest
756.19	2	Other anomalies of spine
724.2	2	Lumbago
721.90	2	Spondylosis of unspecified site without mention of myelopathy
709.2	2	Scar conditions and fibrosis of skin
722.10	1	Lumbar intervertebral disc without myelopathy

Table 16.

Fort Carson Patients' ICD-9-CM Primary Diagnosis from ADS

ICD-9-CM	Patients	Primary Diagnosis
722.2	55	Displacement of intervertebral disc, site unspecified, without myelopathy
722.1	43	Displacement of thoracic or lumbar intervertebral disc without myelopathy
722.52	24	Lumbar or lumbosacral intervertebral disc
724.2	20	Lumbago
780.3	19	Convulsions
414	13	Other forms of chronic ischemic heart disease
389.14	13	Central hearing loss
V73.72	9	Screening for viral and chlamydial disease
722.0	9	Displacement of intervertebral disc, without myelopathy
174.9	9	Malignant neoplasm of female breast, unspecified
786.5	8	Chest pain
780.57	8	Other unspecified sleep apnea
719.43	8	Pain in joint, forearm
599.7	8	Hematuria
780.2	7	Syncope and collapse

For a direct macro to micro comparison of clinical activity, the CPT E&M codes for the study population is represented in Table 17. The rank order of the study population, for all

practical application, is virtually identical to the larger Active Duty population's list in Table 10. The list clearly shows that a majority of appointments were for established patients during the entire twelve months of this study.

Table 17.

Fort Carson Patients' CPT E&M Codes from ADS

Code	Frequency	Evaluation and Management Description
99213	45	Outpatient visit for the eval and management of an established patient, focused, low complexity
99214	44	Outpatient visit for the eval and management of an established patient, detailed, moderate complexity
99215	40	Outpatient visit for the eval and management of an established patient, comprehensive, high complexity
99203	29	Outpatient visit for the eval and management of a new patient, detailed, low complexity
99244	26	Office consultation for a new or established patient, comprehensive, moderate complexity
99205	22	Outpatient visit for the eval and management of a new patient, comprehensive, high complexity
99371	14	Telephone call
99242	12	Office consultation for a new or established patient, expanded, straightforward
99243	12	Office consultation for a new or established patient, detailed, low complexity
99354	11	Initial inpatient consultation for a new or established patient, comprehensive, moderate complexity
99201	6	Other outpatient visit for the eval and management of a new patient, focused, straightforward
99202	6	Other outpatient visit for the eval and management of a new patient, expanded, straightforward
99241	6	Office consultation for a new or established patient, focused, straightforward
99372	6	Telephone call, intermediate, detailed
99212	5	Outpatient visit for the eval and management of an established patient, focused, straightforward

Another metric key to this study was patient travel duration. Relying upon AE manifest logs and CHCS appointment data, The average length of time spent away from Fort Carson traveling to and from specialty appointments at BAMC was calculated. Table 18 shows the statistical analysis of travel days for the last six months of FY97 and first six months of FY 98. Although the number of visits decreased, as shown previously above, the mean duration of stay increased by one whole day. A z-test was performed to compare means and revealed no statistical difference. Table 19 contains the result of the z-test for means comparison.

Table 18.

Number of Days to Access Specialty Treatment

<u>Control Period</u>		<u>Study Period</u>	
Mean	8.03	Mean	9.11
Standard Error	0.56	Standard Error	0.84
Median	8	Median	8
Mode	8	Mode	8
Standard Deviation	4.38	Standard Deviation	4.98
Sample Variance	19.20	Sample Variance	24.81
Kurtosis	1.88	Kurtosis	10.43
Skewness	1.18	Skewness	2.51
Range	19	Range	28
Minimum	3	Minimum	3
Maximum	22	Maximum	31
Sum	490	Sum	319
Count	61	Count	35
Largest(1)	22	Largest(1)	31
Smallest(1)	3	Smallest(1)	3
Confidence Level(95.0%)	1.12	Confidence Level(95.0%)	1.71

Further break-out of the patient activity included the number of trips made by each patient and the corresponding appointments. Over the course of a treatment regimen, patients made multiple trips to the referral facility. The encounters were for: initial consultation/evaluation; treatment or surgical procedure; and follow-up visits. Table 20 shows the mean number of trips made by Active Duty outpatients from Fort Carson during the two consecutive six-month periods of the study. Another z-test was performed to compare means and Table 21 reveals there was no statistical difference between means.

Table 19.

z-test Two Sample for Means for Number of Days

z-Test: Two Sample for Means		
Travel Duration		
	Control	Study
Mean	8.03	9.11
Known Variance	19.2	24.81
Observations	61	35
Hypothesized Mean Difference	0	
z	-1.07	
P(Z<=z) one-tail	0.14	
z Critical one-tail	1.64	
P(Z<=z) two-tail	0.29	
z Critical two-tail	1.96	

Table 20.

Number of Trips to BAMC per Individual Active Duty Outpatient FY 97/98

Control Period		Study Period	
Mean	1.66	Mean	1.42
Standard Error	0.13	Standard Error	0.12
Median	1	Median	1
Mode	1	Mode	1
Standard Deviation	0.98	Standard Deviation	0.76
Sample Variance	0.96	Sample Variance	0.57
Kurtosis	1.64	Kurtosis	2.95
Skewness	1.47	Skewness	1.85
Range	4	Range	3
Minimum	1	Minimum	1
Maximum	5	Maximum	4
Sum	93	Sum	54
Count	56	Count	38
Largest(1)	5	Largest(1)	4
Smallest(1)	1	Smallest(1)	1
Confidence Level(95.0%)	0.26	Confidence Level(95.0%)	0.25

Table 21.

z-test Two Sample for Means for Number of Trips

z-Test: Two Sample for Means		
Appointments Per Patient Trip		
	<i>Control</i>	<i>Study</i>
Mean	1.66	1.42
Known Variance	0.96	0.57
Observations	56	38
Hypothesized Mean Difference		0
z	1.34	
P(Z<=z) one-tail	0.09	
z Critical one-tail	1.64	
P(Z<=z) two-tail	0.18	
z Critical two-tail	1.96	

When the number of trips and appointments are compared to the number of individual patients, the respective periods show a 1.69 and 1.72 average appointments kept at BAMC per individual patient trip. This statistic can help explain some of the disparity between the rank ordered DMRIS list of referral clinic and the inconsistencies found on the same type of list derived from ADS. Additional appointments, like Physical Therapy, are often generated as a result of an orthopedic consult or procedure.

Medical and Non-Medical Cost

Patient records and accounting in sufficient depth were not readily available for the study population that would enable total cost comparison. To simplify matters, MEPRS data for BAMC and Evans ACH was used for setting clinic visit cost. Table 22 summarizes the per-clinic-visit cost for the most referred clinics, as derived from DMRIS and ADS. Clinic cost is just part of the overall expense of specialty care delivery to Active duty Patients. The previously mentioned TDY and per diem expense are part of the overall expense. Table 23 contains the per diem and contract commercial air travel costs at and between the referring and referral facilities. Although cost saving measures, such as the use of no-charge remain-over-night facilities and

obtaining government meals, off set total TDY expenses, the figures in this table reflect the worst-case liability to the military.

Table 22.

MEPRS Cost Data by Specialty Clinic and Facility

CLINIC	BAMC Cost	EACH Cost
CARDIOLOGY CLINIC	\$84.40	\$48.28
NEUROLOGY CLINIC	\$73.10	\$78.73
ONCOLOGY CLINIC	\$161.00	No Svcs
PULMONARY DISEASE CLINIC	\$104.19	No Svcs
DERMATOLOGY CLINIC	\$47.30	\$47.26
INFECTIOUS DISEASE	\$139.68	No Svcs
HIV CLINIC	\$154.22	No Svcs
NEUROSURGERY CLINIC	\$126.82	No Svcs
OPHTHALMOLOGY CLINIC	\$56.98	\$52.76
PLASTIC SURGERY CLINIC	\$81.28	No Svcs
UROLOGY CLINIC	\$64.88	\$63.86
ORTHOPAEDIC CLINIC	\$76.31	\$68.68
SOCIAL WORK CLINIC	\$34.94	\$30.71
PHYSICAL THERAPY	\$24.52	\$11.20

Table 23.

TDY/Per Diem and Commercial Air Travel Contract Rates

Installation	Season	Max Lodging	No Govt Meals	Prop Meals	Max PD
Fort Carson	4/01-10/31	\$ 76	\$ 28	\$ 18	\$ 106
	11/01-3/31	\$ 63	\$ 28	\$ 18	\$ 93
Fort Sam Houston	1/01-12/31	\$ 91	\$ 32	\$ 20	\$ 125
Round Trip Contract Commercial Air Fare					\$ 308

Another non-medical cost variable is lost soldier productivity. Productivity simply defined is the result or outcome from the application or input of resources like labor and equipment. A simple example of productivity could be the completion of a preventive maintenance check or service on an aircraft by a repair technician. In this case the repairman's time spent performing the task is one of the resources applied to produce the result of completed

maintenance. Completed maintenance is one measure of productivity and the time applied to the task is a component of this metric. Accordingly, application of the repairman's time to some other task unrelated to completing maintenance can be considered counter-productive or lost productivity. Therefore, the time a soldier spends away from the workplace is, by this definition, clearly unproductive. I mention this because the test for lost productivity is more than merely being away from the workplace. It's more akin to being in an environment that does not allow the individual to provide the service or produce an item that is principal to his or her occupational specialty.

There are a great number of sophisticated models for measuring productivity. For the purpose of this study, a work-day valuation of an individual soldier was used to estimate lost productivity. The numerator in this ratio is an annual cost value derived from the Army Military-Civilian Cost System (AMCOS). This system was created by Systems Research and Applications Corporation (SRA) for the U.S. Army Cost and Economics Analysis Center. The software application program computes direct military pay and allowances along with proportional operations and maintenance expenses for a given pay grade and specialty skill. Table 24. summarizes the annual program default costs for all Military Occupational Skills (MOS) by pay grades from Private E-1 through Brigadier General O-7. Table 24 also lists annual aggregate default costs for three of the Army's clinical specialty prefixes, 60, 61, & 62 that includes all specialty pay and allowances.

The ratio denominator was derived from an estimated number of work days normally available in a year. Given that there are 52 weeks in a year, there are then 260 work/weekdays in a full year. Subtracting the ten (10) Federally recognized holidays, leaves 250 work days per year. Consideration was given to annual leave and sick days; however, this was balanced by the

irrefutable fact that soldiers can be ordered to work without days off for indefinite periods, regardless of weekends and holidays. This coupled with the mathematical challenge of calculating a realistic value for a soldier work day left the simple solution at 250 days. Referring again to Table 24, the work-day valuations can be found beneath the associated pay grade and annual cost. Using these cost tables, let us analyze an example of an Army Corporal spending an estimated three days accessing an orthopedics clinic appointment at BAMC. This representative example could cost the Army over \$1,200, after adding three days of per diem (\$125 max each day), prorated soldier cost (\$173 each day), round-trip commercial air travel (\$309), and the clinic visit cost (\$76).

Table 24.

Estimated Per-Work-Day Productivity Values

Category	Work Days	E1-E3	E-4	E-5	E-6	E-7	E-8	E-9
Default	250	\$34,042.50	\$43,274.05	\$51,246.19	\$60,466.54	\$70,927.67	\$76,537.44	\$86,532.76
		\$136.17	\$173.10	\$204.98	\$241.87	\$283.71	\$306.15	\$346.13
		W-1	W-2	W-3	W-4	W-5		
Default	250	\$57,937.38	\$68,114.15	\$78,928.25	\$89,958.67	\$100,598.37		
		\$231.75	\$272.46	\$315.71	\$359.83	\$402.39		
		O-1	O-2	O-3	O-4	O-5	O-6	O-7
Default	250	\$131,644.95	\$76,395.02	\$96,641.59	\$115,563.33	\$132,024.05	\$156,029.48	\$166,850.27
		\$526.58	\$305.58	\$386.57	\$462.25	\$528.10	\$624.12	\$667.40
60	250			\$140,265.84	\$158,568.36	\$175,844.90	\$193,981.38	\$222,787.61
				\$561.06	\$634.27	\$703.38	\$775.93	\$891.15
61	250			\$136,653.45	\$155,235.93	\$171,621.50	\$188,478.12	\$218,369.42
				\$546.61	\$620.94	\$686.49	\$753.91	\$873.48
62	250			\$142,706.75	\$164,729.60	\$181,719.67	\$195,245.00	
				\$570.83	\$658.92	\$726.88	\$780.98	

In order to establish a cost reference for TDY that would reflect the actual travel costs, data was collected for FY 98 medical referrals from the Finance and Accounting Office at Fort Carson. Obligation transactions were consolidated for 49 of the 54 known Active Duty

outpatient referrals in DMRIS. Table 25 contains a statistical summary showing a mean cost of \$560.43 per trip to BAMC. For the thirteen complete records that had both cost data and hard manifest dates, a per-day TDY/per diem cost average of \$94.57 was derived. Having no similar data for preceding periods, this estimate stood the test of common sense logic. At a max per day rate of \$125, the average seemed well within the ball park.

Table 25.

Per-Trip TDY Statistical Summary.

TDY Cost	
Mean	560.43
Standard Error	54.27
Median	473.59
Mode	#N/A
Standard Deviation	379.91
Sample Variance	144328.44
Kurtosis	1.85
Skewness	1.30
Range	1732.20
Minimum	74.80
Maximum	1807.00
Sum	27461.24
Count	49
Largest(3)	1360
Smallest(3)	102
Confidence Level(95.0%)	109.12

Alternative Modes and Cost Trends

The Supplemental Care Program at Evans ACH received more than the usual scrutiny during the six-month Pickler Project demonstration. Previous year's data was not as complete or comprehensive; therefore information tracking was a very intensive operation. Two noteworthy corrections to the Supplemental Care database were required to remove accounting biases. First, there were a number of inpatient procedures that were counted as outpatient Supplemental Care episodes. This was the accepted accounting practice until a hospital inpatient charge

corresponding with the episode was received. Calls were placed to provider's offices to ascertain the correct patient setting, whether in or out, then the working database was corrected. Another anomaly was an inordinately high number of CT scans showing up on the Supplemental Care record. Further investigation revealed that the CT device at the Air Force Academy had been out of service for upgrade and the entire military network had to rely on locally contracted services from a private hospital. At a bundled price of over \$500 each, the thirty some scans would consume a good portion of the demonstration's funding of \$50,000. CT scans are not one of the services normally referred out of the catchment area to BAMC, and therefore were held out of the Supplemental Care accounting database. Of the 141 patient billing records there were 326 documented encounters. However, billing delays can sometimes last over a year from the time the service is provided. The common element among all supplemental care episodes was the referral approval form 2161. Since this form either remains in a suspense file or is attached to the provider's bill and reimbursement record once received, the count of bill files and outstanding approval forms was a better potential estimate of patient encounters at a given time. Figure 5 is a graph that represents the cumulative number of specialty care episodes compared between Fiscal Years 97 and 98. The trend shows a fifteen percent increase over the preceding year.

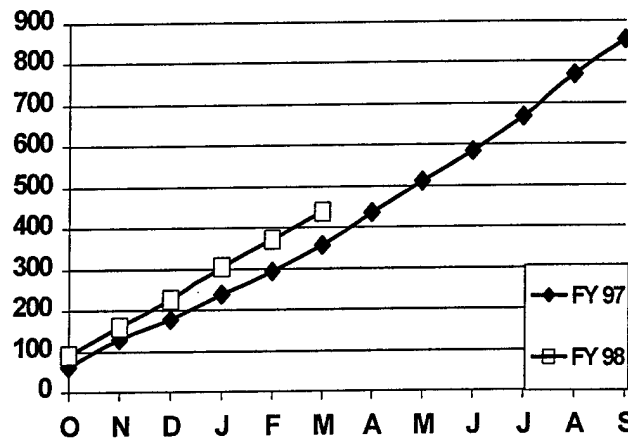


Figure 5. Supplemental Care Episodes

The variety of specialty care provided to the Active Duty outpatients roughly mirrors the referrals' top ten rankings, with orthopedic services coming out on top. Tables 26 & 27 list specialty services referred to and ICD-9-CM diagnosis codes for patients that were part of the study population. Table 27 also reflects Supplemental Care average cost according to diagnosis and a total average of \$220 per encounter. Table 28 numerates the type of service provided during the Supplemental Care encounter with evaluations and treatments topping the list.

Table 26.

Supplemental Care Clinics

Visits	Clinic	AVG Cost
55	ORTHOPEDIC SERVICE	\$ 244.91
37	INTERNAL MEDICINE	\$ 154.82
24	OB/GYN	\$ 448.85
23	GENERAL SURGERY	\$ 556.72
19	OTORHINOLARYNGOLOGY	\$ 429.41
18	CARDIOLOGY	\$ 248.46
16	UROLOGY	\$ 289.80
11	SOCIAL WORK SERVICE	\$ 451.82
7	PSYCHOLOGY CLINIC	\$ 411.43
6	NEUROLOGY SERVICE	\$ 125.67

Table 27.

Supplemental Care Patient Diagnosis and Average Cost

Encounters	ICD-9-CM	Primary Diagnosis	Avg Cost
16	780.2	Syncope and collapse	\$ 112.51
12	724.2	Lumbago	\$ 88.51
10	714	Rheumatoid arthritis	\$ 49.92
8	300.4	Neurotic depression	\$ 441.38
8	493.9	Asthma, unspecified	\$ 128.57
7	296.32	Major depressive disorder	\$ 311.75
6	147.9	Nasopharynx, unspec neoplasm	\$ 189.98
6	427	Cardiac dysrhythmias	\$ 119.85
6	724.4	Thoracic or lumbosacral neuritis	\$ 355.41
6	780.57	Unspecified sleep apnea	\$ 277.50

Table 28.

Supplemental Care Clinics

Total	Type of Care
149	EVALUATION/CIV
36	TREATMENT/CIV
20	GENETIC STUDY
19	PSYCHOTHERAPY
10	EVENT MONITOR
9	EPIDURAL BLOCK
8	PHYSICAL THERAPY
8	EQUIPMENT RENTAL
6	CHEMOTHERAPY
6	GROUP THERAPY

Additionally, consideration should be given to the cost avoidance aspect of not sending the patient to the referral center. Specifically, the difference in financial liability incurred for care from a local provider is technically offset by the MEPRS expense that didn't occur at BAMC.

As of 15 April 98, the FY 98 Supplemental Care expenditures (corrected for inpatient procedures and CT scans) was thirteen percent less than it was the same time in FY 97. Figure 6 documents this trend over time. Billing delays account for a lag in accounting for expenses which would tend to understate actual costs. Additionally, the TRICARE managed care contract

had been in effect since April 97. In a number of instances, the contractor was able to negotiate a ten percent contract discount on the CHAMPUS Maximum Allowable Charge rate for specialty services. The combination of these two factors can account for some or all of the \$14K difference.

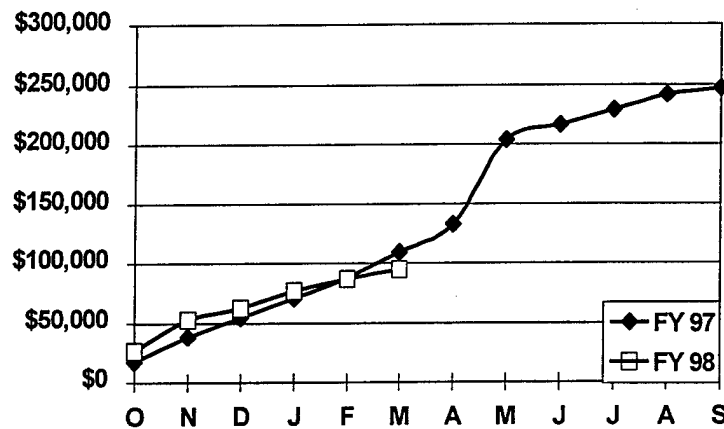


Figure 6. Supplemental Care Cost.

Soldier work days saved over the same time during the previous Fiscal Year were found to be 206 or a 32 percent reduction. Figure 7 graphically depicts this trend. This extrapolates into \$48,861 in work day savings. Using the proportions of pay grades sent to BAMC during FY 98 (See Figure 8) and the AMCOS per day estimates, equates to a weighted average of \$229 per day. Multiplying the number of days saved by this weighted value produces the estimated \$48,861 figure.

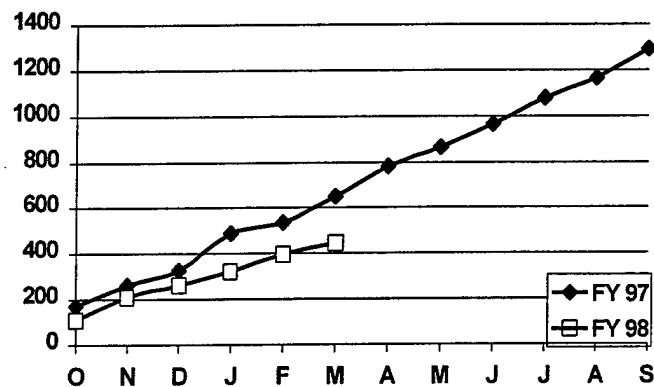


Figure 7. Estimated Work Day Savings

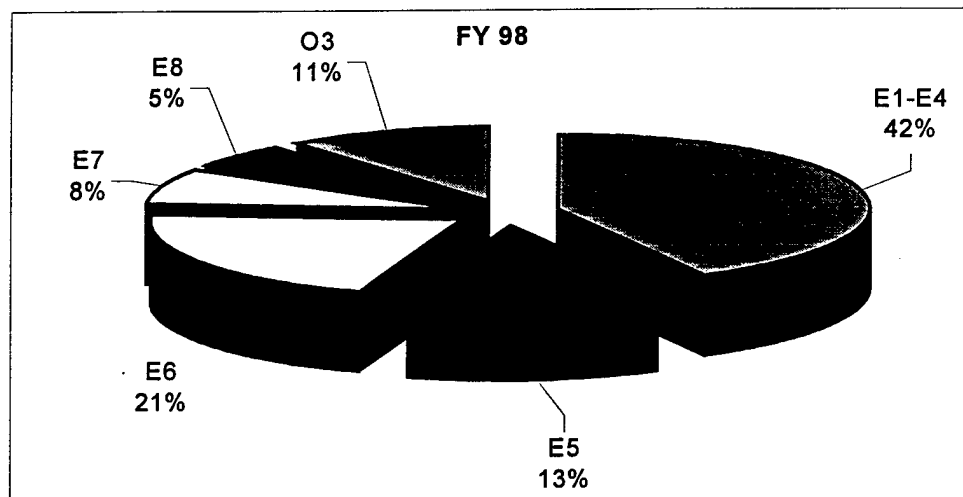


Figure 8. Patient Rank Demographics

There were also TDY cost savings over a comparable time in the preceding FY. Figure 9 highlights the aforementioned trend which reflects a twenty-four percent reduction or over \$17,000 in savings. Collectively, the saved resources amount to nearly \$80,000. A majority of the savings were realized in the soldiers' organizations that now have more human and financial

resources with which to perform their assigned mission. In time, lagging bills for Supplemental Care episodes will erode the MTF's comparative savings and likely result in increased expense over the test period. However, when combined with the savings in TDY and productivity, the slight increase in supplemental care expenditures will not offset the overall economic benefit to the Army.

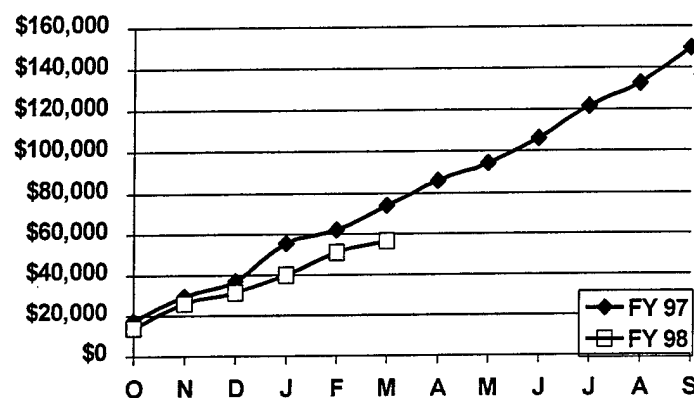


Figure 9. TDY Cost

Discussion

The research results clearly show that the control and study patient populations were a good representation of the larger Active Duty population. From clinics referred and associated diagnosis, the soldiers accessing care at one of BAMC's clinics or from a local provider in Colorado Springs were very similar. The summarized table data collected for this study points out that comprehensive orthopedic services are in high demand at Fort Carson and elsewhere in the Army. For the somewhat narrow variety of specialty services reviewed as part of this study,

the data supports the conclusion that the supplemental care alternative is an affordable mode. To further test the hypothesis that other modes are cost effective, a cost model for circuit rider was developed. In this instance, the specialty provider is an orthopedic surgeon from BAMC making a scheduled trip to Fort Carson for patients requiring both initial and follow-up appointments. The E&M numbers in Table 17 and the ICD-9-CM diagnosis data in Tables 15, 16 and 28 can be used to estimate a demand for approximately twelve orthopedic patients who need to be evaluated or managed. In this example the per visit cost from EACH orthopedics, found in Table 22, of \$68.68 will apply to cover fixed and marginal clinic expenses. Additionally there is the provider's non-medical cost of TDY, per diem, and lost productivity to consider as well. To get the provider to Colorado Springs, it will cost the Army \$308 for air fare and \$212 for the two days spent TDY. It is also reasonable to assume that there will be some lost productivity for the provider as he or she makes their way to and from Colorado Springs. If they take the last evening flight both ways, there is very little or no productivity time lost. However, a more realistic estimate would be at least one half of one work day lost. Using the scale for an O-4 specialty 61 found on Table 24 the half day productivity cost is roughly \$311 for an orthopedic surgeon. The first patient cost rolls up to \$900 and increases by a marginal cost of \$68.68 per patient seen thereafter.

The other alternative to supplemental care and referral to BAMC, tele-medicine, is not yet a viable mode for delivering care. When regional infrastructure and hardware improve, there will be opportunities to test the Video-Tele-Conferencing (VTC) medium. In many of the clinics around the GPRMC, there are existing facilities and appear to be used on less of an extent than the telephone is currently. As shown in Tables 10 & 17, the telephone does account for an appreciable number of provider to patient encounters. The \$38 Million Virtual Radiology

Environment (VRE) initiative envisioned by BAMC's chief of radiology will lead the way in this cutting edge field. Orthopedic care will no doubt be enhanced with this shared imaging resource; however, the reliance upon physical patient examination for the majority of joint and lumbar disorders will likely continue to require the live in-person presence of the provider and patient.

Returning to our orthopedic patient example, the table data allows a quick analysis of the visit in reverse sequence. In this example, the patient goes to BAMC for the visit and travels aboard USAF C-9 aircraft both ways. Relying upon the statistical data in Tables 18, 20, 22, & 25 the following cost data can be derived: 9.11 days away from work, 1.42 clinic visits at \$76.31, \$560.43 in TDY/per diem. Multiplying the days times the \$229 weighted average for soldier productivity derived from Figure 8 gives a total of \$2086 in lost work day expense. Added all together and the one trip total to BAMC costs the Army \$2,754. This cost would be even greater if the soldier were an E-6 or higher in pay grade or had to rely on commercial transportation. Compared to the costs of the circuit rider alternative, an additional 26 soldiers could be seen at Fort Carson before reaching the marginal cost curve break even point of sending a soldier to BAMC.

The test continues with the patient being seen by a local contract civilian orthopedic surgeon in Colorado Springs. The historical average cost for orthopedic services incurred by the supplemental care alternative was \$244.91 per visit (see Table 26). As an additional cost estimation, CMAC for a comprehensive and complex evaluation and management encounter is \$91.40 for the EACH catchment area (OCHAMPUS, 1998). The cost avoidance factor of not being seen in a military facility conceivably lowers the cost even more by the MEPRS cost at Evans of \$68.68. It may be unrealistic to subtract avoidance costs, since the majority represents sunk or fixed facility costs that cannot be easily realized into savings. Clearly, for the orthopedic

follow-up visit, contract supplemental care is the cost effective solution at Fort Carson. The supplemental care example is less than one third the estimated cost of one patient seen by a Circuit Rider and less than one tenth of the documented expense of going to BAMC for the same appointment. Given the comparison of average TDY cost alone and local contract provider costs, supplemental care is still the low cost alternative. This cost comparison can be replicated for other frequently accessed specialties, by using the data available in the tables.

The underlying issue of concern in this study is money. Specifically, whose valuation of money. Productivity is somewhat analogous to readiness or health, where you don't know how much you have until you reach a zero balance. It's a difficult concept to quantify, especially when you believe you are saving or enhancing this nebulous commodity of productivity. The dollar value assigned is not arbitrary but the utility is. Although the cost figures are drawn from recognized sources and statistical analysis of gathered data, it will be challenging to place a value on saved soldier work days that most decision makers will accept.

Military leaders do care about readiness and resources. The argument that the supplemental care alternative saves money and therefore enhances readiness is a logical one; however, it will be difficult to convince the Army's senior leadership that this is money well spent and worth reimbursing MTF's increased expenses. Increased use of supplemental care has a *cost-shifting* effect by lessening the expense on operational units while increasing expense within the military medical budget. From the Army perspective, supplemental care makes good sense. The military medical community may think otherwise, by not seeing any direct return on their investment. At least by keeping the patient in the military facility, there is some recognized value of training for the providers. Sending patients downtown reduces this training opportunity and costs the facility more to do less.

This brings up the related issue of Graduate Medical Education (GME). This program trains the people who provide the care while simultaneously administering to the health care entitlement guaranteed by the military service. The notion that increased use of supplemental care will have an adverse affect on patient mix for GME purposes is without merit. As an example of how insignificant the active duty outpatient referral volume is in comparison to the overall patient volume, refer to the ADS active duty outpatient statistics in Table 4. Recall that the in the entire twelve months of the study, 26,000 Active Duty Outpatient Appointments were kept at BAMC by soldiers stationed outside its catchment area. According to the Corporate Executive Information System that relies upon ADS to feed data, BAMC averaged well over 40,000 patient visits each month during the year preceding this study. The statistical truth is that Active Duty non- catchment appointments account for less than six percent of the total. Therefore, even a change in referral patterns of the magnitude studied at Fort Carson will likely go unnoticed at teaching facilities like BAMC.

A clear limitation in this study is the USAF Aeromedical Evacuation cost factors. Lacking the commercial air transportation standard of a passenger seat per-mile rate, US TRANSCOM instead costs its aircraft by flight hour. This figure does not break out well to any average based on usage. Therefore the service was free for the overall cost accounting purposes in this study. If the Air Force should someday choose to charge for this service, then supplemental care would become the primary alternative, unless patient's lived within reasonable driving distances of the referral facility. US TRANSCOM does charge for their service to passengers with third party health insurance. The rate charged is one dollar less than the average of ten or all (whichever is less) competing air fares for the route traveled. This is done to avoid government competition with the private sector. Oddly enough, private insurers are happy to pay

for a flight to a facility where the beneficiary receives less costly or even free health care. The alternative of having to pay full rate for the insured patient at a civilian institution becomes the high-cost option. This is worth mentioning because of its reverse relationship to this study, and as a noteworthy example of transportation cost considerations determining healthcare access.

Another limitation to this study was the quality aspects of care received in the alternative modes. Lacking a valid patient satisfaction measuring instrument, this study assumed a default of equal quality. However, given the added benefits and comfort of receiving care in the local community along with reduced travel stress, supplemental care may prove to be more satisfactory than regional referral options. This of course, is pure speculation on quality-of-life issues that are often difficult to quantify unless you live in a third world area like Sri Lanka. Access was an aspect outside the control of this study. With the implementation of TRICARE mandated travel limits for specialty care, the default alternative appears to be supplemental care. Of course, aspects of this study may vary among treatment facilities within the GPRMC. Some civilian localities in proximity to military installations do not have the robust array of specialty services found in Colorado Springs, Colorado. For example, Fort Hood's proximity to BAMC combined with the limited number of competing providers in its local community, make regional referral the option of choice for specialty care. Other facilities in the GPRMC have stopped sending active duty outpatients to BAMC altogether, relying instead on local arrangements. In the last three months of the study, there were no Active Duty outpatients from Fort Leavenworth and Fort Huachuca listed in ADS as having appointments at BAMC (see Table 5). From a pure cost savings perspective and whenever practical, all pre-operative and post-operative outpatient encounters should be performed in the supplemental care mode. With that said, there will always be military unique referrals that are inappropriate candidates for supplemental care.

Examples include Persian Gulf Syndrome, Medical Evaluation Boards, Clinical Investigations, etc. For cases like these, there are no other alternatives than to refer the patient to the appropriate military facility. Which mode to employ depends on the many independent variables mentioned in the Purpose section of this study. It safe to conclude that there is no singular option correct for all possible circumstances.

Conclusion and Recommendations

This study set out to determine the most cost-effective mode of delivering specialty care to Active Duty outpatients within the GPRMC area of responsibility. The short conclusion to this broad and all-encompassing quest is, it depends. In the focus study of this paper, supplemental care is in nearly all cases the most cost-effective mode for the soldiers needing outpatient specialty care who are stationed at Fort Carson. By treating soldiers locally, line commanders avoid lost productivity and save TDY/per diem funds. At the same time, supplemental care increases the referring facilities medical overall cost. Circuit Rider mode offers the next most cost effective alternative. This alternative requires accurate estimation of patient demand and exacting patient scheduling to maximize the benefit of sending the provider to outlying facilities. As manpower resources draw-down, this option will become increasingly difficult to schedule. Tele-medicine has yet to mature as a realistic alternative to the other three modes. Accordingly, its cost-effectiveness can not be determined. The default mode of referring patients to the regional military medical center (BAMC) remains the undisputed choice for most all Active Duty outpatient specialty care. As long as the patients' commanders' are willing to expend operational funds, lose uncounted soldier work day productivity, and the Air Force provides free air transport on an opened-end basis, this mode will remain predominate.

This study's findings provide empirical data and useful analysis of costs associated with DOD HA policy implementation, specifically, TRICARE Prime access standards and Enrollment Based Capitation (EBC) out of catchment area expenditures. DOD HA policy nearly mandates the use of supplemental care, in order to meet the one-hour travel access standard for specialty care. In the case of Fort Carson, quantifying non-medical costs after policy implementation appears retrospectively to justify imposed limits on an economic basis. The study's summary of specialty care cost also provides MTF resource managers an idea of the magnitude of *free care* currently received by referred patients, i.e. care rendered to patients enrolled in TRICARE Prime at the referring MTF and receiving care from another facility. If and when EBC is fully implemented as a resource methodology, referring facilities will have to reimburse referral centers for care given to patients enrolled at the referring MTF.

The findings and conclusions of this study do not support total elimination of regional military treatment facility referrals for Active Duty specialty care; however, it provides justification to transfer control and allocation of TDY funds to referring MTFs. Even though supplemental care mode was the least expensive for the soldiers at Fort Carson, the medical facilities are understandably reluctant to expend their resources when there are suitable alternatives that avoid these costs. By transferring control of all medical TDY funding and control to referring medical facilities, financial incentives come into play. When the decision makers have a financial stake in the process, they are likely to consider the non-medical costs associated with referring patients. As the system presently works, the soldiers' units underwrite the overwhelming majority of expenses, while the referring body incurs zero cost for its decision. With fiscal responsibility, resource managers could develop a build-or-buy scenario where program savings could be reallocated to possibly increase capacity or share providers amongst

facilities. Changing AR 40-3 would formally link TDY and travel costs to the referral decision making process, as well as, provide a financial incentive to evaluate alternative modes.

To the best of my personal knowledge, outside of the Pickler Project, there has not been any analysis of the non-medical costs associated with delivery of specialty care to Active Duty outpatients. By quantifying these costs, this study adds another metric to the specialty referral decision process. Changing Army Regulations to align non-medical fiscal responsibility with referring facility's will encourage decision-makers to take indirect costs into consideration when selecting modes for treating Active Duty outpatients.

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