REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
24-04-2009	FINAL REPORT	JULY 2008-JULY 2009

4. TITLE AND SUBTITLE

Development of Clinic Specific Physical Therapy Efficiency Targets Based on Clinic Specific Metrics

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

FISHER, DANIEL P.
MAJ, ARMY MEDICAL SPECIALISTS CORPS
U.S. ARMY

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Brooke Army Medical Center
3851 Roger Brooke Drive
Fort Sam Houston, TX 78234-6200

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

US Army Medical Department Center and School
BLDG 2841 MCCS-HE-HA (Army-Baylor Program in Health & Business Administration)
3151 Scott Road, Suite 1411
Fort Sam Houston, TX 78234-6135

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
03-09

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

20100329215

14. ABSTRACT

Objective: This study proposes an alternate model of developing physical therapy clinic efficiency targets within the Army healthcare system. Methods: The Military Health System Management and Analysis Reporting Tool (M2) and the Expense Assignment System (EAS IV) were queried to obtain fiscal year 2005 data from 28 military treatment facilities (MTFs). Ten variables entered a multiple regression modeling process to determine which variables, if any, best predicted total relative value units (RVU) for each parent MTF. Predicted total RVUs were entered into the Performance Based Adjustment Model (PBAM) to calculate the efficiency rating of each parent MTF. Results: Multiple regression modeling identified several useful models for RVU prediction. Both a monthly and an annual model identified four predictors of RVU production: 1) encounters performed by physical therapists, 2) encounters performed by technicians, 3) physical therapist clinically available FTEs and 4) is the MTF a Medical Center. The monthly prediction model for RVUs resulted in an adjusted R^2 = .943 (p<.001). The annual prediction model for RVUs resulted in an adjusted R^2 = .963 (p<.001). Conclusion: The current MEDCOM method of developing an efficiency target based on averaging is not appropriate. The distribution of the individual MTF's values is not normal and use of a measure of central tendency will always result in clinics above and below the target. Additionally, the current method results in several clinics with unrealistic efficiency ratings in the PBAM model which inflates the monetary budget adjustment for the MTF under the orthopedic product line. Developing individual clinic targets for each MTF with a regression model develops achievable targets for every MTF based on the characteristics of the clinic and reduces the wide variation in PBAM efficiency ratings and resulting monetary budget adjustments.

15. SUBJECT TERMS

Physical Therapy, Productivity, Efficiency, Medical Expense and Performance Reporting System, MEPRS, Performance Based Adjustment Model, PBAM, Relative Value Unit, RVU, Benchmarking, Prospective Payment System, PPS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Education Technician
U	U	U	UU	86	19b. TELEPHONE NUMBER *(include area code)* (210-221-6443

PHYSICAL THERAPY EFFICIENCY TARGET DEVELOPMENT

Development of Clinic Specific Physical Therapy Efficiency Targets Based on Clinic Specific Metrics

MAJ Daniel P. Fisher

U.S. Army-Baylor MHA/MBA Program

Abstract

Objective: This study proposes an alternate model of developing physical therapy clinic efficiency targets within the Army healthcare system. Methods: The Military Health System Management and Analysis Reporting Tool (M2) and the Expense Assignment System (EAS IV) were queried to obtain fiscal year 2005 data from 28 military treatment facilities (MTFs). Ten variables entered a multiple regression modeling process to determine which variables, if any, best predicted total relative value units (RVU) for each parent MTF. Predicted total RVUs were entered into the Performance Based Adjustment Model (PBAM) to calculate the efficiency rating of each parent MTF. Results: Multiple regression modeling identified several useful models for RVU prediction. Both a monthly and an annual model identified four predictors of RVU production: 1) encounters performed by physical therapists, 2) encounters performed by technicians, 3) physical therapist clinically available FTEs and 4) is the MTF a Medical Center. The monthly prediction model for RVUs resulted in an adjusted $R^2 = .943$ ($p<.001$). The annual prediction model for RVUs resulted in an adjusted $R^2 = .963$ ($p<.001$). Conclusion: The current MEDCOM method of developing an efficiency target based on averaging is not appropriate. The distribution of the individual MTF's values is not normal and use of a measure of central tendency will always result in clinics above and below the target. Additionally, the current method results in several clinics with unrealistic efficiency ratings in the PBAM model which inflates the monetary budget adjustment for the MTF under the orthopedic product line. Developing individual clinic targets for each MTF with a regression model develops achievable targets for every MTF based on the characteristics of the clinic and reduces the wide variation in PBAM efficiency ratings and resulting monetary budget adjustments.

DISCLOSURE AS CALLED FOR BY ARMY REGULATION 360-1, THE ARMY PUBLIC AFFAIRS PROGRAM, EFFECTIVE DATE: 15 OCTOBER 2000.

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For clarification on any issues, interested parties may contact the author via e-mail at daniel.fisher2@us.army.mil.

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Introduction

Conditions that Prompted the Study

The evaluation of provider productivity by a medical facility is an important aspect of any clinical business model. An employer may evaluate provider productivity based on the volume of patients treated, the number of procedures performed, time spent performing patient care, relative value units earned or combinations of these metrics. It is important for medical providers to possess a basic awareness of how their employer assesses provider productivity to assure accurate accountability and early identification of errors or deviations from a standard or target. If providers are not efficiently producing or properly documenting reimbursable workload, both the business and the provider are at risk for failure. Poor documentation can make a clinically productive provider appear unproductive and result in actual low financial productivity. Gregg (2008) stated "physical therapy clinics will never be optimally efficient until they comprehensively understand the drivers of productivity" (p. 73). Commonly, the remedy for this situation occurs through simple provider education and increased awareness of the local accountability process.

Although the purpose of military healthcare is generally not to produce revenue, productivity analysis is no less important in military facilities than it is in a civilian facility. Military healthcare administrators use productivity measures to assist in justifying budgets, reducing leakage of patient care out of the military health system onto the civilian network and for developing staffing models rather than for earning revenue. Productivity awareness is equally important at the clinic level as it is at the facility level. Clinic managers and providers need to be aware of productivity metrics as poor accountability can result in lost funding and staff if

productivity goals are not met. Likewise, improved capturing and reporting of productivity can result in additional funding and staff to assist in providing better healthcare outcomes.

The Army has an enterprise wide process of assessing efficiency and productivity in outpatient physical therapy clinics. Outpatient therapy clinics report efficiency and productivity through a combination of relative value units (RVU) and full time equivalents (FTE). The Department of Defense (DOD) defines an FTE as "a work force equivalent of one individual working full-time for a specific period, which may be made up of several part-time individuals or one full-time" (Glossary of Healthcare Terminology, 1999, p. 72) and a relative value unit as:

> Non-monetary, relative units of measure that indicate the value of healthcare services and relative difference in resources consumed when providing different procedures and services. RVUs assign relative values or weights to medical procedures primarily for the purpose of reimbursement of services performed. They are used as a standardized method of analyzing resources involved in the provision of services or procedures (MEPRS for Fixed Military Medical and Dental Treatment Facilities Manual, 2008, p. 14).

Each procedure performed and recorded in the medical record for an outpatient encounter has an RVU weight assigned to it (see Appendix A). If a provider performs a procedure but does not code the procedure in the medical record, the provider earns no workload credit for that procedure.

The Army Medical Command (MEDCOM) developed the physical therapy efficiency target of 17.32 RVUs per FTE per day in 2006 by averaging the actual RVUs per clinically available FTE in fiscal year 2005 for each physical therapy clinic across the Army. MEDCOM adjusted the efficiency target in 2007 as a result of changes in the RVU weights for many

procedures. The physical therapy efficiency target for fiscal year 2008 is 17.10 RVUs per FTE per day. This means that one physical therapist and his associated support staff should produce 17.10 RVUs during an 8-hour day devoted entirely towards patient care. MEDCOM calculates the RVUs per FTE per day metric at the military treatment facility (MTF) level and compares the MTF to the global target. Gregg (2008) found that in fiscal year 2007, 62% of the efficiency ratings for physical therapy clinics fell above or below the control limits indicating special cause variation and not random variation.

There are multiple problems with the method MEDCOM utilized to determine the physical therapy efficiency target. First, MEDCOM assumes all clinics are similar in their ability to meet this target. The target is a global application of a standard target to all clinics and does not account for the many differences that exist among the individual physical therapy clinics. "Each MTF, regardless of size, enrollee demographics, and post mission, holds their respective clinics to the same externally developed PBAM [Performance Based Adjustment Model] benchmarks" (Gregg, 2008, p. 8). Second, the target is an average figure or a measure of central tendency. As a measure of central tendency, the target is not achievable by all clinics. Assuming the distribution of the averages follows a normal distribution, only half of the clinics would be able to meet or exceed the target. In actuality, the distribution is not normal as more than half of the clinics are able to meet the target. Additionally, the current benchmarking process makes the false assumption that all clinics in the MEDCOM are homogenous. Third, as clinics below the target strive to reach the target by increasing their production, the average will move upward and away from them whenever MEDCOM recalculates the target.

The purpose of this study is to develop an alternate model of predicting expected physical therapy clinic productivity within the Army healthcare system. A need exists to develop an

enterprise method of calculating productivity targets for individual physical therapy clinics in the Army by accounting for the unique characteristics of each clinic. As clinic characteristics change, the new model needs to be flexible and adjust the target appropriately rather than applying a fixed target over time. A production target that is flexible also accounts for seasonal or cyclic changes through the fiscal year.

Problem Statement

Total RVU production is a function of how much available time is spent performing patient care, the number of patients treated in that time and what procedures are performed for each patient. Clinics that have more staff spend more total time performing patient care activities. These clinics also spread non patient care activities across more staff. Clinics that have a higher patient turnover rate with lower complexity of care, such as in high volume sick call and Initial Entry Training (IET) settings, have a greater total patient count per hour of patient care. Characteristics such as the number of therapists, the number of support staff, the employment status of the staff (military, contractor or civilian), the complexity of the patients and the patient types (inpatient, outpatient) should affect the volume of RVUs produced by each clinic. Although these characteristics vary across clinics and MTFs, MEDCOM does not generate MTF specific clinic productivity targets. Application of a global target across the heterogeneous population of physical therapy clinics can result in clinics possessing less favorable characteristics to fail in meeting the global target. MEDCOM ties MTF funding directly to productivity through PBAM. PBAM is a "pay-for-performance" model that provides revenue to an MTF based on actual production rather than funding completely on a cost-plus model. PBAM uses the MEDCOM efficiency target to determine a RVU productivity target. The PBAM efficiency rating for clinics is based on the ratio of actual RVU production compared

to the expected RVU production derived from the MEDCOM efficiency target. If a clinic's actual RVU production is greater than the expected RVU production, the PBAM efficiency rating is positive. If actual RVU production is less than the expected RVU production, the PBAM efficiency rating is negative. If a clinic's performance was equal to its target, the efficiency rating would be zero. If a clinic is operating efficiently, the PBAM model proportionally awards additional revenue to the MTF for that clinic. Likewise, if a clinic is not operating efficiently, the PBAM model decrements earnings awarded to the MTF for that clinic.

The global efficiency target of 17.10 RVUs per FTE per day is one of two key components to calculating earnings targets and efficiency ratings. If the global target is high for a specific clinic, that clinic will not be able to meet the RVU production or earnings target and will be identified as inefficient by the PBAM model. The PBAM model utilizes a rolling twelve month data set to calculate metrics. Table 1 displays the efficiency scores for all Army physical therapy clinics for data spanning July 2007 through June 2008. Note the wide variation among the regions as well as the individual clinics. Large medical centers tend to have lower efficiency ratings than community hospitals and health clinics. Additionally, MTFs that support Basic Combat Training (BCT) tend to have higher efficiency ratings. The current PBAM model does not account for the wide variation in the efficiency ratings or attempt to control for them.

The research questions for this study include: 1) Through multiple regression model analysis, can clinic characteristics be identified that predict expected RVU production for each Army physical therapy clinic? 2) How will clinic specific RVU production targets based on this regression model affect the Performance Based Adjustment Model (PBAM) performance target, earnings target, adjusted earnings and efficiency scores?

Table 1

Twelve Month Efficiency Scores for Army PT Clinics: July 2007-June2008

Location	Efficiency	Region	MTF Type	BCT
MEDCOM	8.3%			N/A
Great Plains RMC	-4.4%		N/A	N/A
North Atlantic RMC	0.8%		N/A	N/A
Pacific RMC	16.9%		N/A	N/A
South East RMC	56.7%		N/A	N/A
Western RMC	8.3%		N/A	N/A
European RMC	2.7%		N/A	N/A
Bayne Jones ACH-Ft. Polk	142.2%	GPRMC	ACH	No
Brooke AMC-Ft. Sam Houston	-42.1%	GPRMC	MEDCEN	No
Darnall AMC-Ft. Hood	-10.6%	GPRMC	MEDCEN	No
Evans ACH-Ft. Carson	73.2%	GPRMC	ACH	No
Irwin ACH-Ft. Riley	58.4%	GPRMC	ACH	No
FLW ACH-Ft. Leonard Wood	31.8%	GPRMC	ACH	Yes
Munson AHC – Ft. Leavenworth	4.7%	GPRMC	AHC	No
WilliamBeaumont AMC-Ft. Bliss	45.9%	GPRMC	MEDCEN	No
Reynolds ACH-Ft. Sill	17.0%	GPRMC	ACH	Yes
RW Bliss AHC-Ft. Huachuca	2.0%	GPRMC	AHC	No
Dewitt ACH-Ft. Belvoir	25.9%	NARMC	ACH	No
Guthrie AHC-Ft. Drum	36.8%	NARMC	AHC	No
Ireland ACH-Ft. Knox	32.4%	NARMC	ACH	Yes
Keller AHC-West Point	-21.2%	NARMC	AHC	No
Kenner AHC-Ft. Lee	65.6%	NARMC	AHC	No
Kimbrough AHC-Ft. Meade	-6.6%	NARMC	AHC	No
McDonald AHC-Ft. Eustis	54.6%	NARMC	AHC	No
Womack AMC-Ft. Bragg	14.2%	NARMC	MEDCEN	No
Walter Reed AMC	-34.3%	NARMC	MEDCEN	No
Patterson AHC-Ft. Monmouth	N/A	NARMC	AHC	No
121st GH-South Korea	28.8%	PRMC	ACH	No
Crawford F. Sams AHC-Japan	-7.5%	PRMC	AHC	No
Tripler AMC-Hawaii	16.1%	PRMC	MEDCEN	No
Blanchfield ACH-Ft. Campbell	49.8%	SERMC	ACH	No
Eisenhower AMC-Ft. Gordon	4.6%	SERMC	MEDCEN	No
Fox AHC-Redstone Arsenal	19.6%	SERMC	AHC	No
Lyster AHC-Ft. Rucker	97.9%	SERMC	AHC	No
Martin ACH-Ft. Benning	109.2%	SERMC	ACH	Yes
Moncrief ACH-Ft. Jackson	121.6%	SERMC	ACH	Yes
Winn ACH-Ft. Stewart	30.8%	SERMC	ACH	No
Bassett ACH-Ft. Wainwright	24.8%	WRMC	ACH	No
Madigan AMC-Ft. Lewis	5.7%	WRMC	MEDCEN	No
Weed ACH-Ft. Irwin	20.5%	WRMC	ACH	No
Heidelberg ACH-Germany	54.7%	ERMC	ACH	No
Landstuhl AMC-Germany	-11.6%	ERMC	MEDCEN	No
Wuerzburg ACH-Germany	-2.2%	ERMC	ACH	No

Literature Review and Background

Productivity

Shortell & Kaluzny (2005) define productivity as the ratio of outputs to inputs. Ozcan (2005) defines productivity similarly as the number of output units per unit of input. Each individual industry can define unique outputs and inputs that are relevant to that respective industry. The primary inputs in healthcare include personnel in the form of medical providers and support staff, equipment, supplies, technology and facilities. The number of daily, weekly or monthly work-hours is the common method of measuring the input of personnel. Common outputs in healthcare include number of procedures performed, RVUs produced and number of patient visits completed. These components are common to both civilian and military healthcare providers.

Jette & Davis (1991) discuss utilization related to outpatient physical therapy as patients seen per week per provider. Britt (2005) defines productivity in outpatient physical therapy as "adjusted procedures per clinical full time equivalent per working day" (p. 87) but there is no explanation of what an adjusted procedure is or how a full time equivalent per working day is calculated. Harp (2004) further defines productivity in physical therapy as "the amount of time billed or allotted to patient care, divided by the total time available" (p. 110). This method of productivity assessment described by Harp is similar to the calculation of the clinically available FTEs within the Army health system. The methods described by Jette & Davis and Harp used in isolation disregard the capture of relative value units for performed procedures.

In a survey of 155 hospital-based outpatient physical therapy clinics, Jette & Davis (1991) report providers completed an average of 45.8 encounters per week and work an average of 41.2 hours per week. Ladyshewsky, Barrie, & Drake (1998) indicate 47 minutes or 78.3% of every

hour is spent on direct patient care. Although the findings of these studies provide some indications of productivity in physical therapy, they are limited by scope, enviornment of care and sample size and as such should not be considered as industry benchmarks.

A recent unpublished study by Gregg (2008) evaluated the variation of productivity specific to Army physical therapy clinics. Gregg described two factors that may contribute to variation in productivity between Army physical therapy clinics, fixed characteristics and modifiable characteristics. Fixed characteristics include facility mission or mission-driven staffing ratios. Modifiable characteristics could include general business operations or inconsistencies in workload coding and work-hours reporting. Gregg analyzed the contribution of four variables on productivity in an Army physical therapy clinic: 1) the proportion of total clinic workload performed by technicians, 2) the proportion of available work hours recorded outside of patient care or the proportion of time spent at work not involved in patient care, 3) the number of RVUs coded per encounter and 4) the proportion of RVUs related to outpatient care compared to inpatient care. All variables were significant positive contributors to productivity in multiple regression analysis. Gregg (2008) noted that significant special cause variation may indicate that MEDCOM's one size fits all benchmark may be inappropriate.

Benchmarking

Benchmarking is the "process of establishing operating targets based on the leading performance standards for the industry" (Shortell & Kaluzny, 2005, p. 440). Tepper (2002) defines benchmarking in physical therapy as "providing an objective comparison and quantifiable data in order to define current rehabilitation performance" (p. 48). Harp (2004) discussed benchmarking as comparing results of a program with an acceptable standard in the industry.

Although they provide some discussion of benchmarking, none of these authors provide benchmarks in the rehabilitation industry. Britt (2005) indicates a benchmark of 24-28 adjusted procedures per clinical FTE per provider but does not define adjusted procedures or clinical FTE. Ransom, Maulik, and Nash (2005) state benchmarking should be goal directed and promote performance improvement by seeking industry leading practices, create objective performance measures, provide a customer focus, substantiate the need for improvement, and establish data-driven processes.

The two best sources for extrapolating an industry benchmark are the American Physical Therapy Association (APTA), the governing body of physical therapy in the United States, and the Medical Group Management Association (MGMA). The APTA does not produce guidelines for determining appropriate productivity benchmarks for physical therapists (Frequently Asked Questions, 2007). The APTA position is that each individual facility is the judge of appropriate productivity standards for that specific facility. However, the APTA completed a Practice Profile Survey of its members in 2005 which inquired about employer developed benchmarks. Respondents reported that employers in hospital based outpatient facilities expected 31.5 hours of direct patient care (n=409) and 41.8 completed visits (n=323) in a typical workweek (Waller, 2006). The survey further indicates that therapists spend 72.7% of their time in a hospital based outpatient facility in patient care related activity, including documentation time (Miller, 2005). Unfortunately, the APTA Practice Profile survey did not provide results with enough granularity for application to all business practices in the industry.

The Medical Group Management Association (MGMA) is a professional organization with a mission to "continually improve the performance of medical group practice professionals and the organizations they represent". MGMA conducts surveys of healthcare fields to produce

information medical executives can use for making practice management decisions. Gregg (2008) cites the MGMA benchmark for outpatient physical therapists as 11.52 RVUs per work day for 2007. For reasons discussed later, the Army does not utilize the MGMA physical therapy standard.

MEDCOM Health Policy and Services

The MEDCOM office of Health Policy and Services develops product line benchmarks for the Army Medical Department (AMEDD). When applicable, MEDCOM utilizes MGMA developed standards and reduces them by 15% for inefficiencies in the Army healthcare system compared to the civilian healthcare system. The four identified inefficiencies are 1) increased time for completing patient documentation into the Department of Defense electronic health record, 2) the military mission to project a healthy force, 3) mission to perform education of medical support staff in training programs and 4) disruption of provider and support staff resulting from frequent permanent changes of station (PCS) or relocations (Michael O'Brien, Senior Operational Data Analyst, AMEDD Health Policy and Services, personal communication, September 11, 2008).

Due to differing business practices in provision of physical therapy within the Army compared to civilian counterparts, MEDCOM does not utilize the MGMA standard for physical therapy (Michael O'Brien, Senior Operational Data Analyst, AMEDD Health Policy and Services, personal communication, September 11, 2008). In the civilian physical therapy setting, only licensed physical therapists or physical therapy assistants can perform procedures that earn workload or RVUs. However, in the Army setting, unlicensed physical therapy technicians perform procedures under the supervision of a physical therapist. The technicians not only

perform the workload, they earn credit for the patient encounter by completing the documentation in the medical record to include coding of the procedure. Although both the physical therapist and the supporting technician earn RVUs, the Army only tracks the clinically available FTEs for skill type one and skill type two employees. A physical therapist is a skill type two, Direct Care Professional, and a technician is a skill type four, Direct Care Paraprofessional (see Table 2). This stacking effect of the technician's RVUs onto the physical therapists results in the productivity rating for a facility far exceeding the MGMA standard even before the MEDCOM 15% reduction utilized for other services.

Table 2

Skill Types

Skill Type	Description	Suffix	Suffix Description
1	Clinician	1P	Physician
		1D	Dentist
	Physicians, Dentists,	1N	Intern-Medical
	and Veterinarians	1F	Fellow-Medical
		1R	Resident-Medical
		1S	Intern-Dental
		1T	Fellow-Dental
		1U	Resident-Dental
		1V	Veterinarian
2	Direct Care Professional	2P	Physician Assistant
		2N	Nurse Practitioner
	Physical and Occupational	2M	Nurse Midwives
	therapists, podiatrists,	2A	Nurse Anesthetist
	psychologists, social	2C	Community Health Nurse
	workers, physician assistants,	2H	Occupational Health Nurse
	and advanced practice nurses	2S	Clinical Nurse Specialist
		2W	Student-Non GME
		2Z	All other skill type 2
3	Registered Nurse	3R	Registered Nurse
		3W	Student-Non GME
		3Z	All other skill type 3
4	Direct Care Professionals	4L	LPV or LVN
		4A	Nursing Assistant
	LPN, LVN, medical specialists,	4W	Student-Non GME
	medical technicians, x-ray specialist,	4Z	All other skill type 4
	dental lab specialists, dental hygienist		
5	Administrative, Logistics or Clerical	5A	Administrators
		5L	Logisticians
		5C	Clerical
		5W	Student-Non GME
		5Z	All other skill type 5

Note: Adapted from Table C3.T1. Skill Types, Department of Defense Medical Expense and Performance Reporting System for Fixed Military Medical and Dental Treatment Facilities Manual, DOD 6010.13-M, April 07, 2008.

MEDCOM does not calculate efficiency ratings for individual providers or support staff. Calculation of a productivity rating only for physical therapists neglects the RVUs generated by the supporting technician. MEDCOM cannot calculate an efficiency rating for technicians without knowing their clinically available FTEs which are not recorded. Consequently, a robust technician staff inflates the perceived productivity of an individual clinic (Gregg, 2008).

MEDCOM Health Policy and Services initially generated the military physical therapy benchmark for fiscal year 2006 based on fiscal year 2005 aggregate historical productivity. Health Policy and Services calculated the initial target by dividing the aggregate RVUs (produced across all Army PT clinics) by the aggregate physical therapist clinically available FTEs (across all Army PT clinics) to arrive at the initial target of 17.32 RVUs per clinically available FTE per day. Again, it is important to note that the productivity calculation includes the RVU workload of technicians but does not include the clinically available FTEs of technicians. The productivity target is an efficiency measure compared to utilizing raw targets such as RVUs produced or number of encounters completed.

Reweighting of the RVU values for procedures by the Center for Medicare and Medicaid Services (CMS) in 2007 required an adjustment of the physical therapy efficiency target. MEDCOM Health Policy and Services calculated the adjustment by totaling RVU values for all procedures performed in fiscal year 2006 with both old and new RVU weights. The lower values of the reweighted procedures resulted in difference of 1.26%. MEDCOM Health Policy and Services lowered the original target of 17.32 by 1.26% to arrive at the current target of 17.10 RVUs per FTE per day (Michael O'Brien, Senior Operational Data Analyst, AMEDD Health Policy and Services, personal communication, September 11, 2008).

Medical Expense and Performance Reporting System (MEPRS)

"The purpose of the MEPRS is to provide a uniform system of healthcare managerial accounting for the MHS" (MEPRS for Fixed Military Medical and Dental Treatment Facilities Manual, 2008, p. 20). As a DOD program, Navy, Air Force and Army medical facilities utilize MEPRS as a standardized and uniform reporting and tracking tool. It is important for individual healthcare providers to be familiar with MEPRS because they are responsible for ensuring accurate reporting of data reflective of their actual performance (MEPRS Basic Course, n.d.). MEPRS is not a single database or data warehouse, rather it is a program or process for allocating cost (Mona Bacon, Chief, MEDCOM MEPRS Branch, personal communication, September 11, 2008). MEPRS is an extensive system for cost allocation of numerous categories of expenses. This study is only concerned with accounting for the performance aspect of MEPRS, specifically reportable time of employees who provide medical care.

Reportable time is the total of available and non-available hours. Staff members in an MTF report time into the Defense Medical Human Resource Data System internet (DMHRSi) for use by the MEPRS cost accounting process. Within the MEPRS model, there are 168 reportable hours per month, or 21 eight hour work days, for each employee. The calculation uses 21 work days in a month instead of 30 or 31 to account for weekends and holidays that occur throughout the year and not just in any one month. Available time includes those hours worked in support of the healthcare and readiness missions. Non-Available time includes hours not in direct support of the healthcare or readiness mission. Non-available hours generally entail any time spent away from work including authorized leave (annual, sick, other), passes, medical appointments and unauthorized absences. All personnel (military, civilians, contractors, and volunteers) report

available hours where only military and civilian staff report non-available hours (MEPRS for Fixed Military Medical and Dental Treatment Facilities Manual, 2008).

Knowing the distribution of an employee's available and non-available time allows for the calculation of three important metrics, available FTEs, non-available FTEs and clinically available FTEs. MEDCOM determines an available FTE by dividing the total number of reported available hours by 168. Since it is possible for a provider to work more than eight hours per day or more than 21 days in a month, the available FTE calculation can be greater than one. For an employee that reports working 11 eight hour days, the available FTE would be the number of work hours available (8 hours x 11 days = 88 hours) divided by 168 hours for an available FTE of .524. MEDCOM calculates a non-available FTE in the same manner as the available FTE, only using non-available hours in place of available hours. If a staff member was on leave, pass or ill for 10 working days in one month, the individual's non-available FTE would be the number of work-hours missed (8 hours x 10 days = 80) divided by 168 hours for a non-available FTE of .476.

The clinically available FTE is a subcategory of the available FTE and includes only the available time spent performing activity directly related to patient care. MEDCOM calculates the clinically available FTE in the same manner as the available FTE but only uses hours reported by the provider as clinically available. The clinically available FTE is important as this is the portion of available time utilized by MEDCOM in determining the performance target under the PBAM model (Performance Based Adjustment Model Handbook, 2008). Available and non-available time reported erroneously as clinically available falsely increases the performance target for the clinic. MEDCOM will expect more workload or RVUs from that clinic since the clinic reported more clinically available time. It is important at this point to recall that as skill

type 4 staff members, physical therapy technicians earn RVUs but do not report any clinically available time. Table AP3.T1 of the MEPRS for Fixed Military provides a list of specific rules for reporting available and non-available time.

In order to capture clinically available time, the clinic or department must first be identifiable. MEPRS accomplishes this by using functional cost codes (FCC). A FCC is a four digit code that identifies a work center within an MTF. The first position of the FCC is the functional category, the second position is the summary account, and the third and fourth positions identify the subaccounts. Use of this classification system assigns each clinic and department within an MTF a unique three or four digit alphanumeric FCC.

Functional accounts are the highest level of MEPRS accounts. There are seven functional accounts designated by a letter A through G (see table 3). All FCCs must start with one of these letters. As an ambulatory care service, the functional category for a physical therapy clinic is B. Summary accounts are the second level of FCCs. These are major subdivisions of the functional accounts. Two capital letters identify summary accounts. These accounts usually coincide with medical divisions in the medical facility, such as the department of Medicine (BA), Surgical Care (BB), Pediatrics (BD) and Rehabilitative Ambulatory Services (BL). Physical therapy falls under the Rehabilitative Ambulatory Services summary account of BL. The subaccount level of the FCC system is the third and fourth level positions of the FCC. Three or four capital letters identify subaccounts and reflects the actual work centers. Table AP1.T1 of the MEPRS for Fixed Military Medical and Dental Treatment Facilities Manual (2008) displays a comprehensive table of standard FCC accounts. The third level MEPRS code for outpatient ambulatory physical therapy is BLA (see table 4). Fourth level MEPRS codes for physical therapy clinics vary,

however BLAA commonly indicates the main MTF physical therapy clinic (MEPRS for Fixed Military Medical and Dental Treatment Facilities Manual, 2008).

Table 3

MEPRS Functional Account Codes

Functional Account	Description
Inpatient (A)	Examination, diagnosis, treatment and prompt disposition of inpatients
Ambulatory Care (B)	Comprehensive primary medical care; diagnostic services, care and treatment; ambulatory surgical procedures; medical examinations; mental health consultation
Dental Care (C)	Provides comprehensive dental care
Ancillary Services (D)	Functions that participate in the care of patients principally by assisting and augmenting the attending physicians, dentists and non-physicians, dentists and non-physician privileged providers in diagnosing and treating human ills
Support Services (E)	Collects expenses necessary to direct and support the missions assigned to the MTF
Special Programs (F)	Summarizes the expenses incurred by an MTF resulting from performing those portions of its military mission other than direct patient care
Readiness (G)	Summarizes the expenses incurred by an MTF as a result of performing the readiness portion of its military mission rather than direct patient care

Note: Adapted from Section C1.2.3, Department of Defense Medical Expense and Performance Reporting System for Fixed Military Medical and Dental Treatment Facilities Manual, DOD 6010.13-M, April 07, 2008.

Table 4

Physical Therapy Functional Cost Codes

Functional Category	B	Ambulatory Care
Summary Account	BL	Rehabilitative Ambulatory Services
Sub Account	BLA	Parent Physical Therapy Clinic
Sub Account	BLAA	Physical Therapy Clinic

Although the MEDCOM PBAM model does not utilize the metric of an assigned FTE, it is relevant to have an understanding of how to determine an assigned FTE and how it differs from an available FTE. MEDCOM calculates an assigned FTE for military personnel by dividing the number of assigned days for a month by the number of days in the month for those individuals counted as part of the MTF assigned strength. For example, for a soldier assigned to an MTF for all 30 days of a month, the assigned FTE would be one (30/30). If the soldier reported to the MTF after the first of the month, the assigned FTE for that month would be less than one. The assigned FTE calculation for civilians is slightly different. To calculate the assigned FTE for a civilian worker, divide the number of assigned work-days by the number of work-days in the month. Since an employee cannot be present for work for more days than there are in a month, the assigned FTE for an individual cannot exceed one.

Prospective Payment System (PPS)

Congress appropriates money to the Defense Health Program (DHP) for the TRICARE Management Authority (TMA) to accomplish the healthcare mission. The amount of funds appropriated to DHP is based on historical plus budgeting or last year's cost plus inflation. TMA

also passes funds to the service level (Army, Navy or Air Force) based on historical plus budgeting. MEDCOM distributes the Army's portion of the funds out to the individual MTF (Jo Anne Cyr, MEDCOM Program Analysis and Evaluation Division, personal communication, September 9, 2008)

The Prospective Payment System (PPS) is the process used by TMA to allocate funds down to the service level (Army, Navy or Air Force). PPS is a fee-for-service reimbursement method based on historical performance. MEDCOM receives funds from TMA on two occasions. TMA distributes the initial funds on a historically based cost plus model with a second distribution at mid year to adjust based on actual performance. TMA compares a current 12 month rolling average of actual performance to fiscal year 2007 as the baseline (Vera Hanna, MEDCOM Management Division, personal communication, September 10, 2008).

As a DOD system, all MTF level PPS calculations roll up to the service level. Historically, the Army does well in performing above the historical cost plus budget where the Navy and Air Force do not. When the Air Force and Navy are unable to justify their initial budget disbursement through documentation of workload TMA moves funds away from the Navy and Air Force at the mid year adjustment period and shifts it to the Army. The Army uses the PBAM model to fairly cascade the additional midyear funds to the MTF level (Vera Hanna, MEDCOM Management Division, personal communication, September 10, 2008).

Performance Based Adjustment Model (PBAM)

The Performance Based Adjustment Model (PBAM) is an Army specific budget adjustment method used to "translate strategy into action, to promote quality clinical outcomes, productivity and improvements in data quality…" (Richard Meyer, MEDCOM Management

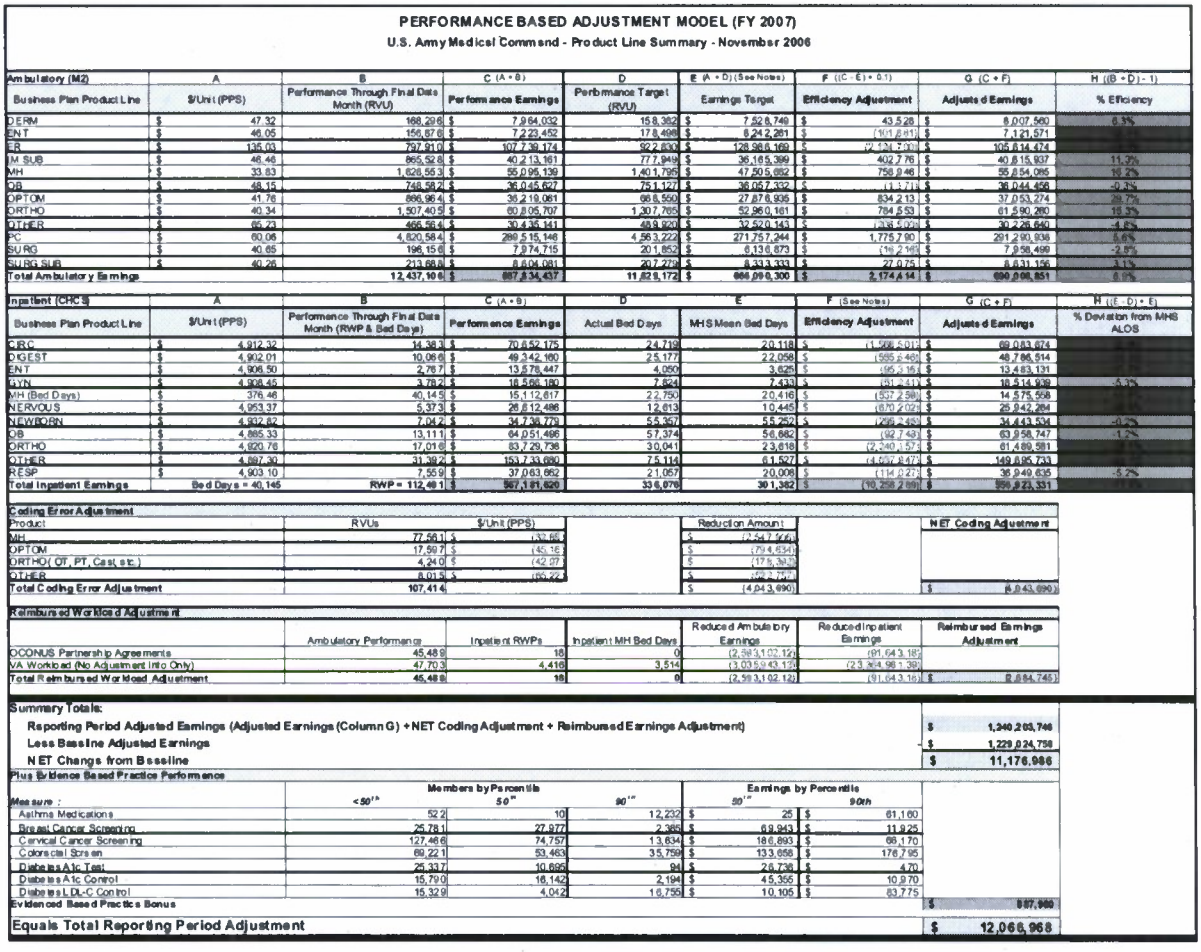
Division, personal communication, September 8, 2008). PBAM is not a tool utilized to develop a budget, it is a budget adjustment tool designed to modify MTF funding based on actual workload/performance when compared to performance goals. PBAM only adjusts the healthcare portion of an MTF budget based on efficiency, preventive medicine success and accurate procedural coding practices. The adjustment process of PBAM incorporates ambulatory care, inpatient care, mental heath bed days and MEDCOM selected Healthcare Effectiveness Data and Information Set (HEDIS) measures.

The PBAM model utilizes data from Expense Assignment System (EASIV), MHS Data Mart (M2) and the MHS health portal. EASIV is the source for FTE data, M2 is the source for the RVU workload data. The FTE data from EASIV derives from the DMHRSi manpower reporting system. Although FTE data is available in M2, the quality of FTE data in EASIV is considered superior and more current with greater granularity (Jeanie McCleary, MEDCOM MEPRS Analyst, personal communication, September 11, 2008). The RVU data from M2 derives from the Armed Forces Health Longitudinal Technology Application (AHLTA), the DOD outpatient electronic health record (EHR). The ownership for the data used in the PBAM model is at the facility level. The staff at the MTF level enter the data used by MEDCOM in the PBAM model. Since the data quality is fully dependent on the internal MTF practices for quality control, responsibility for data quality resides with the MTF and not with MEDCOM (Richard Meyer, MEDCOM Management Division, personal communication, September 8, 2008).

The primary report produced by the PBAM model is the Product Line Summary Report (see Figure 1). The Product Line Summary Report displays ambulatory data, inpatient data, coding error adjustments, reimbursed workload adjustments and evidenced based practice performance information. The ambulatory section tracks performance of twelve products lines

(see Business Plan Product Line column in Figure 1). Each primary product line compiles productivity information for several related clinics into a primary product line. This study is only concerned with the Physical Therapy clinic under the Orthopedic (ORTHO) primary product line within the ambulatory section of the Product Line Summary.

The ambulatory section of the Product Line Summary Report compares a facility's actual performance against its performance targets and provides an efficiency score for each product line. TMA sets the Prospective Payment System (PPS) rate for each product line (Vera Hanna, MEDCOM Management Division, personal communication, September 10, 2008). The PPS rate, (see Column A, figure 1), is the dollar value for each RVU produced. Every clinic under the primary product line has the same PPS rate but each MTF has a unique PPS rate for each product line based on 66% of the cost of care for that product line in the geographical region of the MTF (Richard Meyer, MEDCOM Management Division, personal communication, September 8, 2008). The values in the Performance Through Final Data Month (see Column B, figure 1), are the actual RVUs produced for that product line for the most current 12 months of available data in the M2 repository. The Performance Earnings in Column C of figure 1 derive from multiplication of columns A and B.



PERFORMANCE BASED ADJUSTMENT MODEL (FY 2007)
U.S. Army Medical Command - Product Line Summary - November 2006

Ambulatory (M2)	A	B	C (A * B)	D	E (A * D) (See Notes)	F ((C - E) * 0.1)	G (C + F)	H ((B * D) - 1)
Business Plan Product Line	$/Unit (PPS)	Performance Through Final Date Month (RVU)	Performance Earnings	Performance Target (RVU)	Earnings Target	Efficiency Adjustment	Adjusted Earnings	% Efficiency
DERM	$ 47.32	168,296	$ 7,964,032	158,362	$ 7,528,746	$ 43,528	$ 8,007,560	6.3%
ENT	$ 46.05	156,876	$ 7,223,452	178,498	$ 8,242,261	$ (101,881)	$ 7,121,571	
ER	$ 135.03	797,910	$ 107,739,174	922,830	$ 128,986,169	$ (2,124,700)	$ 105,614,474	
IM SUB	$ 46.46	865,528	$ 40,213,161	777,949	$ 36,165,399	$ 402,776	$ 40,615,937	11.3%
MH	$ 33.83	1,626,553	$ 55,095,139	1,401,795	$ 47,505,882	$ 758,946	$ 55,854,085	16.2%
OB	$ 48.15	748,582	$ 36,045,627	751,127	$ 36,057,332	$ (11,718)	$ 36,044,456	-0.3%
OPTOM	$ 41.76	866,964	$ 36,219,061	666,550	$ 27,876,935	$ 834,213	$ 37,053,274	29.7%
ORTHO	$ 40.34	1,507,405	$ 60,805,707	1,307,765	$ 52,960,161	$ 784,553	$ 61,590,260	15.3%
OTHER	$ 65.23	466,564	$ 30,435,141	489,920	$ 32,520,143	$ (338,009)	$ 30,226,640	-4.8%
PC	$ 60.06	4,820,584	$ 289,515,146	4,563,222	$ 271,757,244	$ 1,775,790	$ 291,290,936	5.6%
SURG	$ 40.65	196,156	$ 7,974,715	201,852	$ 8,136,873	$ (16,216)	$ 7,958,499	-2.8%
SURG SUB	$ 40.26	213,668	$ 8,604,081	207,279	$ 8,343,333	$ 27,075	$ 8,631,156	3.1%
Total Ambulatory Earnings		12,437,106	$ 687,834,437	11,629,172	$ 666,070,300	$ 2,174,414	$ 690,008,851	6.9%

Inpatient (CRCS)	A	B	C (A * B)	D	E	F (See Notes)	G (C + F)	H ((E - D) * E)
Business Plan Product Line	$/Unit (PPS)	Performance Through Final Date Month (RWP & Bed Days)	Performance Earnings	Actual Bed Days	MHS Mean Bed Days	Efficiency Adjustment	Adjusted Earnings	% Deviation from MHS ALOS
CRC	$ 4,912.32	14,383	$ 70,652,175	24,719	20,118	$ (1,506,501)	$ 69,083,674	
DIGEST	$ 4,902.01	10,066	$ 49,342,160	25,177	22,058	$ (595,646)	$ 48,746,514	
ENT	$ 4,906.50	2,767	$ 13,578,447	4,050	3,625	$ (95,316)	$ 13,483,131	
GYN	$ 4,906.45	3,782	$ 18,556,189	7,824	7,433	$ (51,241)	$ 18,514,938	-5.3%
MH (Bed Days)	$ 376.46	40,145	$ 15,112,617	22,750	20,416	$ (537,298)	$ 14,575,558	
NERVOUS	$ 4,953.37	5,373	$ 26,612,486	12,613	10,445	$ (670,202)	$ 25,942,284	
NEWBORN	$ 4,932.82	7,042	$ 34,736,779	55,357	55,252	$ (296,248)	$ 34,443,534	-0.2%
OB	$ 4,885.33	13,111	$ 64,051,496	57,374	56,682	$ (92,748)	$ 63,958,747	-1.2%
ORTHO	$ 4,920.76	17,016	$ 83,729,736	30,041	23,618	$ (2,240,575)	$ 61,489,591	
OTHER	$ 4,897.30	31,382	$ 153,733,690	75,114	61,527	$ (4,037,947)	$ 149,695,743	
RESP	$ 4,903.10	7,559	$ 37,063,662	21,057	20,008	$ (114,027)	$ 36,949,635	-5.2%
Total Inpatient Earnings	Bed Days = 40,145	RWP = 112,481	$ 567,181,626	336,076	301,382	$ (10,288,286)	$ 556,923,331	-11.6%

Coding Error Adjustment

Product	RVUs	$/Unit (PPS)	Reduction Amount	NET Coding Adjustment
MH	77,561	$ (32.66)	$ (2,547,900)	
OPTOM	17,597	$ (45.15)	$ (794,634)	
ORTHO(OT, PT, Cast, etc.)	4,240	$ (42.27)	$ (179,303)	
OTHER	8,015	$ (55.22)	$ (442,753)	
Total Coding Error Adjustment	107,414		$ (4,043,690)	$ (4,043,690)

Reimbursed Workload Adjustment

	Ambulatory Performance	Inpatient RWPs	Inpatient MH Bed Days	Reduced Ambulatory Earnings	Reduced Inpatient Earnings	Reimbursed Earnings Adjustment
OCONUS Partnership Agreements	45,489	18	0	(2,593,102.12)	(91,643.16)	
VA Workload (No Adjustment Into Only)	47,703	4,419	3,514	(3,035,943.12)	(23,364,981.39)	
Total Reimbursed Workload Adjustment	45,489	18	0	(2,593,102.12)	(91,643.16)	$ (2,684,745)

Summary Totals:

Reporting Period Adjusted Earnings (Adjusted Earnings (Column G) + NET Coding Adjustment + Reimbursed Earnings Adjustment)	$ 1,340,203,746
Less Baseline Adjusted Earnings	$ 1,229,024,758
NET Change from Baseline	$ 11,176,986

Plus Evidence Based Practice Performance

	Members by Percentile			Earnings by Percentile	
Measure :	<50th	50th	90th	50th	90th
Asthma Medications	52	10	12,232	$ 25	$ 61,160
Breast Cancer Screening	25,781	27,977	2,365	$ 69,943	$ 11,825
Cervical Cancer Screening	127,466	74,757	13,634	$ 186,893	$ 68,170
Colorectal Scren	69,221	53,463	35,759	$ 133,658	$ 178,795
Diabetes A1c Test	25,337	10,695	94	$ 26,738	$ 470
Diabetes A1c Control	15,790	16,142	2,194	$ 45,356	$ 10,970
Diabetes LDL-C Control	15,329	4,042	16,759	$ 10,105	$ 83,775
Evidenced Based Practice Bonus					$ 887,989

Equals Total Reporting Period Adjustment	$ 12,066,968

Figure 1. PBAM – Product Line Summary Report

The Performance Target (see Column D, figure 1), is the most important section of the Product Line Summary in to this study. The Performance Target is the total number of RVUs MEDCOM expects a product line or clinic to produce for the most recent 12 months of data. MEDCOM calculates the Performance Target by multiplying the provider target, 17.10 RVUs per FTE per day for physical therapy, by the average number of workdays in a month (always set at 21) to determine the monthly RVU performance target for a full FTE. The RVU/month metric for a fully clinically available FTE by a physical therapist is 21 x 17.10 or 359.1 RVUs per month. It is uncommon for a provider to work a full available FTE as clinically available

requiring an adjustment of the 359.1 RVU/month metric by multiplying 359.1 RVU/month by the clinically available FTE for that provider. Multiplying the clinically available FTE by the product line RVU/month provides the Performance Target for column D (Richard Meyer, MEDCOM Management Division, personal communication, September 8, 2008). This example demonstrates how to calculate the performance target for one provider. Column D in the Product Line Summary Report will display the cumulative target for all providers in that product line.

If providers over allocate their reportable time as clinically available, MEDCOM will expect more RVU production from that provider's product line. Similarly, if the 17.10 RVUs per FTE per day target is unreasonably high for a clinic based on the clinic characteristics, the clinic will not be able to meet the Performance Target. The Earnings Target in Column E of figure 1 derives from multiplication of columns A and D (Performance Based Adjustment Model Handbook, 2008). If the Performance Target in erroneously elevated, the Earnings Target will be erroneously elevated as well. Although the term target implies a prospective approach with the Performance Target and Earnings Target known in advance, calculation of the these values is not possible until calculation of the available FTE at the end of the working period. This makes the determination of the Performance and Earnings Targets a retrospective process.

Obtaining the remainder of the information to populate the Product Line Summary Report requires only the ability to perform simple mathematics. Calculate the Efficiency Adjustment (see column F, figure 1) by subtracting the Earnings Target from the Performance Earnings and multiplying by .10 (10%). A positive figure indicates the product line produced more earnings than expected. Calculate Adjusted Earnings (see column G, figure 1) by adding Performance Earnings (column C) and Efficiency Adjustment (column F). If the product line was inefficient, the PBAM model reduces the Performance Earnings. The Efficiency Rating in column H (see

figure 1) represents how actual performance in column B compares to the Performance Target (column D) by dividing the actual total RVUs produced by the target RVUs and subtracting one ((B/D)-1) (Performance Based Adjustment Model Handbook, 2008).

MEDCOM does not individualize product line adjusted earnings. Rather, adjusted earnings for the twelve ambulatory product lines sum to a total ambulatory adjusted earnings. MEDCOM determines the difference in the adjusted earnings for the current year to the previous year. The PBAM model year runs August through July (Richard Meyer, MEDCOM Management Division, personal communication, September 8, 2008). This same process occurs for inpatient care product lines and mental health bed days. The differences between current year adjusted earnings and baseline year adjusted earnings for each area are summed. A positive value results in the MTF receiving additional funds. PBAM is not a punitive tool. If the final total of the adjusted values from the three areas is negative, MEDCOM does not remove money from the MTF (Richard Meyer, MEDCOM Management Division, personal communication, September 8, 2008).

Methods and Procedures

Experimental Design

The unit of analysis for this study was Army MTF physical therapy clinics. Of the 36 parent clinics Army-wide, 28 were studied. Selection of the 28 MTFs is discussed later. The design of this study was formal with formulated research questions and defined data specifications and analysis procedures. The purpose of the study was to explain the relationship between defined clinic variables and RVU production. The investigator has no control or intent

to manipulate the variables resulting in ex post facto design. The study was cross sectional in nature as a result of taking a cross section of longitudinal data (Cooper and Schindler, 2006).

Multiple Regression Statistical Analysis

Multiple regression produces a coefficient of multiple determination (r^2) to measure the variation in the dependent variable (Y) that can be explained by the independent variables (X). The closer the coefficient of determination (r^2) gets to the value of one (1.00), the more variation that is explained in the dependent variable (Y) by the independent variables (X). The best multiple regression model will be determined through multiple regression model building.

Tests for Appropriate Use of Regression

Normality of error, homoscedasticity (constant or homogenous variance), independence of errors and residuals will be assessed in order to satisfy the necessary assumptions for regression. Residual analysis and assessment for homoscedasticity occurs by plotting the residuals on a vertical axis against the corresponding independent variable. Any evidence of a pattern indicates the regression model is not appropriate and that variance is not constant. Normality of errors is assessed by observing the normal probability plot of the residuals for a pattern of normal distribution (Berenson, Levine and Krehbiel, 2004).

Since the data utilized for analysis is collected over time, an assessment of the independence of errors is required to assess for autocorrelation. The assumption of independence of errors can be evaluated by plotting the residuals in order of sequence in which the data were obtained. Any observed relationship between consecutive residuals violates the assumption of independence of errors. Autocorrelation can be measured by the Durbin-Watson statistic (Berenson, Levine and Krehbiel, 2004).

Variables

Table 5 displays the variables utilized for multiple regression modeling building. The variables selected to explain total RVU production relate to how much available time is spent performing patient care, the number of patients treated in that time and what procedures are performed for each patient. The explanatory variables in Table 5 are suspected to best represent these functions. Each of these potential variables will be assessed for their individual contribution to explaining the variance in total RVU production. Those variables that contribute significant explanation of variance in RVU production will be carried into the second phase for multiple regression analysis.

Table 5

Model Building Code Sheet

Equation Coefficient	SPSS Variable Code	Label	Description	Type	Source
Y	Y_Total_RVUs	Total RVUs	Total RVUs	Continuous	M2
X1	X1_Total_Enc	Total encounters	Total completed clinic encounters	Continuous	M2
X2	X2_ST2_Enc	PT Encounters	Encounters by a licensed PT	Continuous	M2
X3	X3_ST4_Enc	Tech Encounters	Encounters by a technician	Continuous	M2
X4	X4_Prop_PT_Enc	Proportion of encounters by a PT	The proportion of total encounters performed by a PT	Continuous	
X5	X5_Prop_IP_Enc	Proportion of inpatient encounters	The proportion of total encounters that are inpatient	Continuous	
X6	X6_Prop_B_FTE	Proportion of B FTEs	The proportion of Skill type 2 B FTEs that are Non military	Continuous	
X7	X7_Tot_ST2_ B_FTE	Total ST2 B available FTEs	Total clinically available FTEs from all PTs	Continuous	EASIV
X8	X8_Mil_ST2_ B_FTE	Military ST2 B available FTEs	Total clinically available FTEs military PTs	Continuous	EASIV
X9	X9_Nonmil_ST2_ B_FTE	Non Military ST2 B available FTEs	Total clinically available FTEs civilian PTs	Continuous	EASIV
X10	X10_MEDCEN	MEDCEN Y or N	MEDDAC or MEDCEN	Nominal	

Sampling

The population for this study includes all Army physical therapy clinics. The sample of physical therapy clinics for this study includes all clinics in the continental United States (CONUS) and two clinics from outside the continental United States, Tripler Army Medical Center in Hawaii and Bassett Army Community Hospital in Alaska. All other OCONUS clinics were not used in the sample.

2005 data were selected for analysis for multiple reasons. First, fiscal year 2005 was the data used to establish the first physical therapy efficiency target. The use of historical RVUs from the M2 database corrects for the change in RVU weights in 2007. Second, at this time fiscal year 2005 data is the last fiscal year of data expected to be complete in the M2 database (Richard Holmes, Tricare Management Activity, personal communication, July 14, 2008). Many MTFs are significantly delinquent in their transmission of data to higher levels (Richard Meyer, MEDCOM Management Division, personal communication, September 8, 2008). Third, data in EASIV and M2 databases are under continual correction. More mature data has a higher likelihood to have had errors identified and corrected. Lastly, fiscal year 2005 FTE data was transferred into EASIV prior to the DOD transition from the Uniform Chart of Accounts and Personnel Utilization System (UCAPERS) to DMHRSi. Transition into the new reporting system has resulted in significant reporting delays and a possible decline in reporting accuracy related to employees and supervisors learning the new system.

Missing and Excluded Data

All European and overseas clinics were not included in the original study sample. From that sample, several exclusions resulted. Walter Reed Army Medical Center (WRAMC) was

excluded as they rolled up all workload to skill type 2 physical therapists and reported no RVUs from skill type 4 physical therapy technicians in fiscal year 2005. The WRAMC clinic was contacted and it was verified that technicians saw patients during this period. It was the business practice of the clinic at the time to have the physical therapists signs all encounters thus giving the therapists credit for all technician workload. Kimbrough Army Health Clinic from Ft. Meade was excluded for a similar reason. Although Kimbrough did report some encounters by technicians, very few technician encounters were reported for the year (n=781). Since "encounters by technicians" is a variable in this study, inclusion of clinics without any technician encounters would lessen the validity of the study's outcomes.

Some child or 4th level MEPRS clinics were additionally chosen for exclusion. These included the Institute of Surgical Research (ISR) sub clinic from the BAMC parent clinic, the Dilorenzo Tricare Health Clinic at the Pentagon from the Walter Reed parent clinic, and the Dunham Health Clinic at Carlisle Barracks from the Ft. Meade Kimbrough Ambulatory Care Center parent clinic. The ISR, a burn specialty rehabilitation clinic, was excluded due to its unique mission. The patient load at the ISR is unknown and highly dependent on current combat operations. If the patient volume at the ISR is low, the staff of the clinic is not able to shift time towards another mission. Although the clinic is physically located in Brooke Army Medical Center (BAMC), the staff is assigned to the Institute of Surgical Research under the U.S. Army Medical Research and Materiel Command (MRMC). Dilorenzo was excluded as it is staffed with providers from multiple services. Although the clinic falls under Walter Reed and is responsible for meeting Army production and efficiency standards, the multiservice nature of the staff may make it difficult to enforce compliance to the host service standards. Finally, Dunham Health Clinic from Carlisle Army Barracks was excluded because there was no full time physical

therapy staff assigned to that clinic. The encounters at the clinic were by a physical therapist working at the local War College and treating patients irregularly as needed.

Data for fiscal year 2005 was organized by clinic and by month. Although the above clinics were excluded in their entirety, some clinics had partial exclusions. Reynolds Army Hospital from Ft. Sill and Moncrief Army Hospital reported no technician encounters for multiple consecutive months. It is hypothesized that this change in consecutive months of the year indicated a change in local business practices similar to those previously mentioned at Walter Reed and Kimbrough clinics. Patterson AHC from Ft. Monmouth was excluded because MEDCOM does not generate PBAM metrics for this clinic. Additionally, Patterson AHC documented encounters performed by a technician but reported no technician FTEs into EASIV.

The final exclusions from the original sample were encounters and RVUs reported to the BLA MEPRS codes by providers other than physical therapists and physical therapy technicians. Two of the query dimensions in the M2 data query were provider specialty and provider ID. Any provider ID that was not matched with a provider specialty of physical therapist (706) or physical therapy technician (900) was investigated further. During this investigation process, it was found that many physical therapists and technicians were miscoded under other specialties. Each individual therapist or technician was verified as a therapist or a technician. If no verification could be made or it was verified that the provider was not a therapist or technician, the encounters and RVUs from those providers were excluded. Table 6 displays a summary of the data exclusions.

Table 6

Data Excluded from the Original Sample

	RVUs	%	Encounters	%
Walter Reed AMC	41,107.17	7.12	50,631	6.83
Kimbrough AHC-Ft. Meade	19,323.28	3.35	23,004	3.10
Reynolds ACH-Ft. Sill	2,016.22	0.35	3,021	0.41
Moncrief ACH-Ft. Jackson	7,736.39	1.34	7,147	0.96
Patterson AHC-Ft. Monmouth	3,367	0.58	3,361	0.45
Dilorenzo Tricare Clinic-Pentagon	13,795	2.39	14,094	1.90
Dunham AHC-Carlisle Barracks	180.46	0.03	341	0.05
Institute of Surgical Research-BAMC	2849.54	0.49	4,724	0.64
Provider Specialty Exclusions	777.86	0.13	975	0.13
Total Excluded	91,153.93	15.79	107,298	14.47
Total Included	486,169.72	84.21	634,281	85.53
Total	577,323.65		741,579	

Note: Dilorenzo is a child clinic of Walter Reed and Dunham AHC is a child clinic of Kimbrough ACH. The data from these two excluded child clinics are separated from the parent clinics.

Multiple Regression Model Building

The goal of model building is to develop a parsimonious regression model with the least number of explanatory variables that still permits acceptable interpretation of the dependent variable. Model building is a method used when there are several possible explanatory variables. The desire is to develop a model that uses the least number of explanatory variables to achieve acceptable explanation of the dependent variable. A potential issue of model building with numerous explanatory variables is that there may not be a single best model but rather several equally appropriate models. Table 7 displays the steps involved in model building according to Berenson, Levine and Krehbiel (2004).

Table 7

Steps Involved In Model Building

Step	Description
1	Choose a set of independent variables (IDV) to be considered for inclusion in the regression model.
2	Fit a full regression model that includes all IDV to be considered so that the variance inflationary factor (VIF) for each IDV can be determined.
3	Determine whether any IDV have a VIF > 10
4	If no IDV has a VIF > 10, go to step 5. If an IDV has a VIF > 10, eliminate that variable and repeat step 2. Repeat step 2-4 until all remaining IDV have a VIF < 10.
5	Perform best-subsets, all subsets or a stepwise regression with the remaining IDV to determine which of the remaining IDV significantly contribute to the variance in the DV.
6	Perform a entry model linear regression with the remaining IDV. Perform a complete analysis of the model, including residual analysis and influence analysis.
7	Use the selected model for prediction if appropriate.

Note: A VIF of 10 or less is considered acceptable; a VIF of 5 or less is preferred. Adapted from Exhibit 15.1, page 615 of Berenson, Levine and Krehbiel (2004).

The stepwise model was utilized to develop a multiple regression model for this study. Utilizing the method in table 7 resulted in a regression model with four IDV (see table 8).

Table 8

Regression Model 1

Equation Coefficient	SPSS Variable Code	Label	Description	Type	Source
Y	Y_Total_RVUs	Total RVUs	Total RVUs	Continuous	M2
X2	X2_ST2_Enc	PT Encounters	Encounters by a licensed PT	Continuous	M2
X3	X3_ST4_Enc	Tech Encounters	Encounters by a technician	Continuous	M2
X4	X4_Prop_PT_Enc	Proportion of encounters by a PT	The proportion of total encounters performed by a PT	Continuous	
X10	X10_MEDCEN	MEDCEN Y or N	MEDDAC or MEDCEN	Nominal	

Note. $R^2 = .941$; Adjusted $R^2 = .940$; $F = 1285.89$; Regression Equation: $y = b_0 + b_2x_2 + b_3x_3 + b_4x_4 + b_{10}x_{10} + \epsilon$; $y = 220.626 + 1.088x_2 + .515x_3 - 444.266x_4 - 277.105x_{10} +$ Error.

Although this model was significant at an alpha level of 0.05 ($p < 0.000$) and captured 94% of the variance in the dependent variable, the proportion variable was thought inappropriate as it is a derivation of the X2 and X3 variables also in the model. The proportion variable was thus removed from the equation since the equation also contained the raw data variables used to calculate the proportions. The linear regression model was performed again with the variables listed in table 9.

Table 9

Regression Model 2

Equation Coefficient	SPSS Variable Code	Label	Description	Type	Source
Y	Y_Total_RVUs	Total RVUs	Total RVUs	Continuous	M2
X2	X2_ST2_Enc	PT Encounters	Encounters by a licensed PT	Continuous	M2
X3	X3_ST4_Enc	Tech Encounters	Encounters by a technician	Continuous	M2
X10	X10_MEDCEN	MEDCEN Y or N	MEDDAC or MEDCEN	Nominal	

Note. $R^2 = .939$; Adjusted $R^2 = .938$; $F = 1673.73$; Regression Equation: $y = b_0 + b_2x_2 + b_3x_3 + b_{10}x_{10} + \epsilon$; $y = 11.634 + 1.008x_2 + .589x_3 - 280.491x_{10} +$ Error.

This second regression model was also significant at an alpha level of 0.05 ($p < 0.000$), with a minimal decrease (.002) in the adjusted R^2. Additionally, the second model was more parsimonious with three variables compared to four in the initial model. Although this model was an improvement over the first model, the model does not include a variable from the FTE category. To incorporate an FTE variable, a third regression model was performed with the variables listed in table 10. The third regression model continued to be significant at an alpha level of 0.05 ($p < 0.000$) with an adjusted R^2 of 0.940 and is the model of choice for implementation to calculate clinic specific efficiency targets.

Table 10

Regression Model 3

Equation Coefficient	SPSS Variable Code	Label	Description	Type	Source
Y	Y_Total_RVUs	Total RVUs	Total RVUs	Continuous	M2
X2	X2_ST2_Enc	PT Encounters	Encounters by a licensed PT	Continuous	M2
X3	X3_ST4_Enc	Tech Encounters	Encounters by a technician	Continuous	M2
X7	X7_Tot_ST2_B_FTE	Total ST2 B available FTEs	Total clinically available FTEs from all PTs	Continuous	EASIV
X10	X10_MEDCEN	MEDCEN Y or N	MEDDAC or MEDCEN	Nominal	

Note. $R^2 = .941$; Adjusted $R^2 = .940$; $F = 1291.296$; Regression Equation: $y = b_0 + b_2x_2 + b_3x_3 + b_7x_7 + b_{10}x_{10} + \epsilon$; $y = 7.445 + .920x_2 + .566x_3 + 30.992x_7 - 326.757x_{10}$ + Error.

Hypothesis Statements

The multiple regression phase of this study tests the third model developed in the modeling phase to explain the variance in total RVU production at the clinic level. The dependent variable is Total RVU production. The four independent variables are displayed in table 10. There are four pairs of null and alternate hypotheses related to the regression equation: $\hat{Y} = b_0 + b_2X_2 + b_3X_3 + b_7X_7 + b_{10}X_{10} + \epsilon$ (error).

H_0: $b_2 = 0$ 'PT Encounters' *is not* a predictor of Total RVU production.
H_a: $b_2 \neq 0$ 'PT Encounters' *is* a predictor of Total RVU production.

H_0: $b_3 = 0$ 'Tech Encounters' *is not* a predictor of Total RVU production.
H_a: $b_3 \neq 0$ 'Tech Encounters' *is* a predictor of Total RVU production.

H_0: $b_7 = 0$ 'Total PT B FTEs' *is not* a predictor of Total RVU production.
H_a: $b_7 \neq 0$ 'Total PT B FTEs' *is* a predictor of Total RVU production.

H_0: $b_{10} = 0$ 'MEDCEN' *is not* a predictor of Total RVU production.
H_a: $b_{10} \neq 0$ 'MEDCEN' *is* a predictor of Total RVU production.

In more general terms, the null and alternate hypotheses are:

H_0: No independent variables are predictors of Total RVU production.
H_a: At least one independent variable is a predictor of Total RVU production.

Application of Regression Model

The multiple regression model developed in the model building phase will be used to develop clinic specific RVU performance targets (column D of the PBAM Product Line Summary) and complete the PBAM Product Line Summary efficiency rating (column H of the PBAM Product Line Summary). The monetary values in the PBAM model will be calculated using the clinic specific RVU performance target, actual RVU production and the individual MTF prospective payment rates.

The current efficiency target (17.10 RVUs per FTE) and the clinically available FTEs are utilized to calculate the performance target (column D of the Product Line Summary) through the formula:

$$\frac{17.10 \text{ RVUs}}{\text{FTE}} \times 21 \times \text{Clinically available FTEs} = \text{Performance target (RVUs)}$$

The developed multiple regression model provides an alternate method of deriving a clinic specific performance target. Instead of using a global efficiency rating to project RVUs, the regression model is used to project RVUs. The projected RVUs from the regression formula are entered into the equation and the equation is solved for the efficiency target.

$$\frac{\text{Projected Performance Target (RVUs)}}{(21 \times \text{Clinically Available FTEs})} = \text{Clinic Specific Efficiency Target (RVUs/FTE)}$$

The same formula can be used to calculate a clinic's actual efficiency.

$$\frac{\text{Actual RVUs}}{(21 \times \text{Clinically Available FTEs})} = \text{Actual Efficiency (RVUs/FTE)}$$

Data

Data Quality and Sources

Data quality issues arise in this study because the data utilized, RVUs and FTEs, are self reported at the provider level. Physical therapists and technicians independently complete encounter documentation and CPT coding to generate RVUs. There is minimal oversight in the MHS on CPT coding and documentation as billing of a third party for reimbursement rarely occurs. There are few, if any, barriers other than personal integrity to prevent a provider from coding excessive CPT codes to earn additional RVUs during an individual encounter. Additionally, since third party reimbursement is not a focus there is little provider education on proper coding rules. This lack of education and absence of coding for reimbursement purposes may result in coding too few CPT codes and earning insufficient RVUs for work performed. Computerized audits commonly occur of completed encounters but the software programs can only determine if a CPT code utilized is inappropriate for a service line. The software programs cannot match documentation in the medical encounter of services performed and CPT codes to determine appropriate use of an allowed set of CPT codes.

Providers self report how they spend each hour of the day into a workload database. In fiscal year 2005, the database for workload capture was UCAPERS. Under the UCAPERS system, providers are asked to submit the distribution of their time at the end of each month.

Commonly, this workload is submitted to an internal third party administrator to enter into the UCAPERS system. The DOD uses this information to ealeulate available and non-available FTEs. The rules for manpower reporting eome from the MEPRS for Fixed Military Medieal and Dental Treatment Faeilities Manual (2008) and ean be eonfusing even to an experieneed analyst. Monthly submission of this information eommonly results in the provider waiting until the end of the month and estimating time spent aeross numerous eategories from memory. The frequeney and eomplexity of manpower reporting results in the potential for redueed data quality in this area.

There are no known studies of the aeeuraey or reliability of military medieal doeumenation or manpower reporting. The high pereentage of exeluded data from the sample utilized in this study indicates more oversight, education and study may be needed in this area. The Model Building Code Sheet (Table 5) displays the souree of eaeh varable.

Instrumentation

All statistieal ealeulations were performed using the Statistieal Paekage for the Soeial Seienees (SPSS), Version 16.0.

Findings

Regression Findings

Tables 11-19 display the model summaries, ANOVA tables and eoeffieient tables for the three potential regression models. Model three (tables 17-19) is the model of ehoiee for implementation for developing monthly elinie speeifie effieieney targets. Model one (tables 11-13) is not preferred as it eontains a variable that is not direetly obtainable from a data query and

the constant in the equation is a significant contributor to the model (p = .004). Model two (tables 14-16) is an improvement over model one as it has the fewest number of variables and all variables can be directly obtained from a data query but it lacks a variable for FTEs. Model three (table 17-19) is preferred over model one and two because all variables are easily obtained with a direct data query and it contains a variable related to available FTEs of skill type two providers (physical therapists). Neither the constant in model two nor three are significant contributors to the respective models (p =.458 and p = .767). The null hypothesis is rejected for each individual variable in model three as each variable significantly contributes to the model.

Table 11

Regression Model 1 Summary

R	R2	ADJ R2	SEE	Durbin-Watson
.970	.941	.940	216.325	.519

Table 12

Regression Model 1 ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.407E8	4	6.018E7	1285.889	.000
Residual	1.521E7	325	46769.496		
Total	2.559E8	329			

Significant at an alpha level of 0.05

Table 13

Regression Model 1 Coefficients

Variable	B	SE B	β	Sig.	VIF
Constant	220.626	76.366		.004	
PT Encounters	1.088	.034	.886	.000	4.214
Tech Encounters	.515	.034	.369	.000	3.156
Proportion of Enc by a PT	-444.266	153.293	-.078	.004	3.971
MEDCEN	-277.105	35.388	-.137	.000	1.676

Note. $R^2 = .941$; Adjusted $R^2 = .940$; $F = 1285.89$; Regression Equation: $y = b_0 + b_2x_2 + b_3x_3 + b_4x_4 + b_{10}x_{10} + \epsilon$; $y = 220.626 + 1.088x_2 + .515x_3 - 444.266x_4 - 277.105x_{10} + \text{Error}$.

Table 14

Regression Model 2 Summary

R	R2	ADJ R2	SEE	Durbin-Watson
.969	.939	.938	218.766	.477

Table 15

Regression Model 2 ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.403E8	3	8.010E7	1673.730	.000
Residual	1.560E7	326	47858.647		
Total	2.559E8	329			

Significant at an alpha level of 0.05

Table 16

Regression Model 2 Coefficients

Variable	B	SE B	β	Sig.	VIF
Constant	11.634	25.414		.647	
PT Encounters	1.008	.020	.822	.000	1.486
Tech Encounters	.589	.022	.422	.000	1.318
MEDCEN	-280.491	35.768	-.139	.000	1.674

Note. $R^2 = .939$; Adjusted $R^2 = .938$; $F = 1673.73$; Regression Equation: $y = b_0 + b_2x_2 + b_3x_3 + b_{10}x_{10} + \epsilon$; $y = 11.634 + 1.008x_2 + .589x_3 - 280.491x_{10}$ + Error.

Table 17

Regression Model 3 Summary

R	R2	ADJ R2	SEE	Durbin-Watson
.970	.941	.940	215.898	.494

Table 18

Regression Model 3 ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.408E8	4	6.019E7	1291.296	.000
Residual	1.515E7	325	46612.139		
Total	2.559E8	329			

Significant at an alpha level of 0.05

Table 19

Regression Model 3 Coefficients

Variable	B	SE B	β	Sig.	VIF
Constant	7.445	25.117		.767	
PT Encounters	.920	.035	.750	.000	4.378
Tech Encounters	.566	.023	.405	.000	1.473
Total PT B Available FTEs	30.992	9.942	.104	.002	6.072
MEDCEN	-326.757	38.292	-.162	.000	1.970

Note. $R^2 = .941$; Adjusted $R^2 = .940$; F = 1291.296; Regression Equation: $y = b_0 + b_2x_2 + b_3x_3 + b_7x_7 + b_{10}x_{10} + \epsilon$; $y = 7.445 + .920x_2 + .566x_3 + 30.992x_7 - 326.757x_{10}$ + Error.

The assumptions of a linear regression model are assessed both quantitatively and subjectively. Autocorrelation is objectively assessed with the Durbin-Watson statistic and collinearity is objectively assessed with the VIF statistic. Homoscedasticity, independence of error and normality of error are subjectively assessed with scatter plots and histograms. Figure 2 subjectively assesses the third regression model for normality of error. The VIF statistic in table X objectively assesses the model for an absence of collinearity. Figure 3 is a scatter plot of actual RVUs and the residuals (Actual RVUs – Predicted RVUS) to subjectively assess for homoscedasticity. Figures 4 –7 are scatter plots of the independent variables with the residuals to subjectively assess for independence of errors. The Durbin-Watson statistic in table 17 objectively assesses for autocorrelation.

The third regression model objectively meets the assumption of an absence of collinearity and subjectively meets the assumption of normality of error. The residuals scatter plots in figures 3-7 adequately demonstrate the subjective assessment of the assumptions of homoscedasticity

and independence of errors for the purpose of this model. The Durbin-Watson statistic objectively demonstrates the failure of the third model to meet the assumption of an absence in autocorrelation.

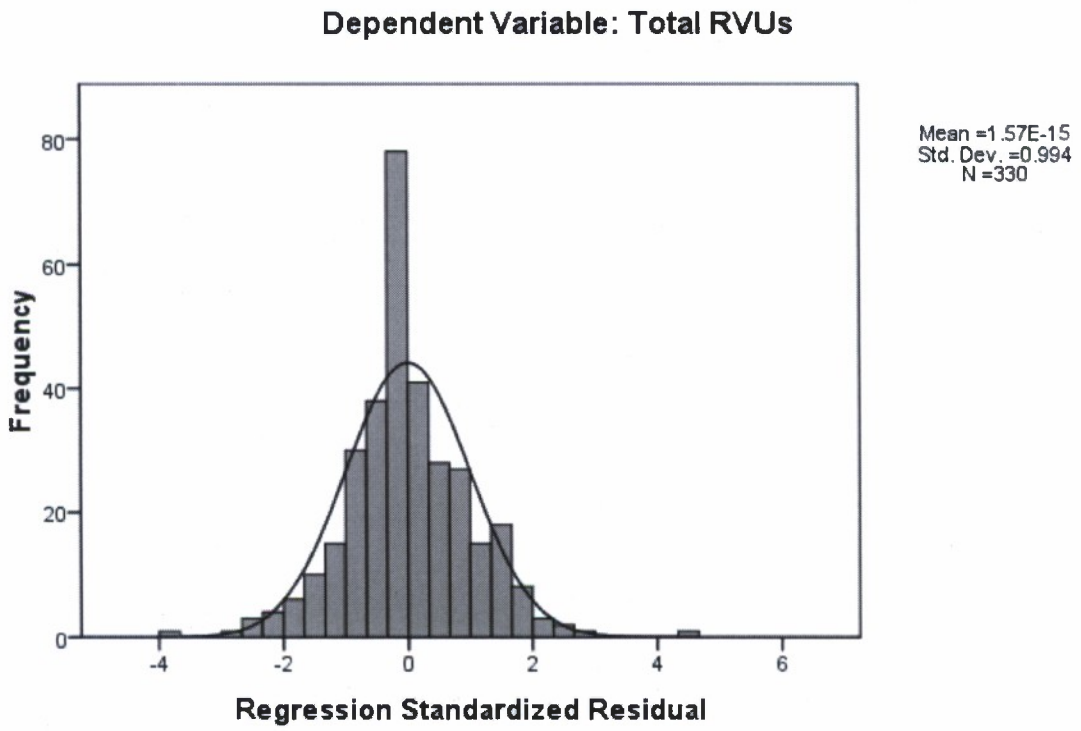


Figure 2. Residual Plot Assessing Normality of Error

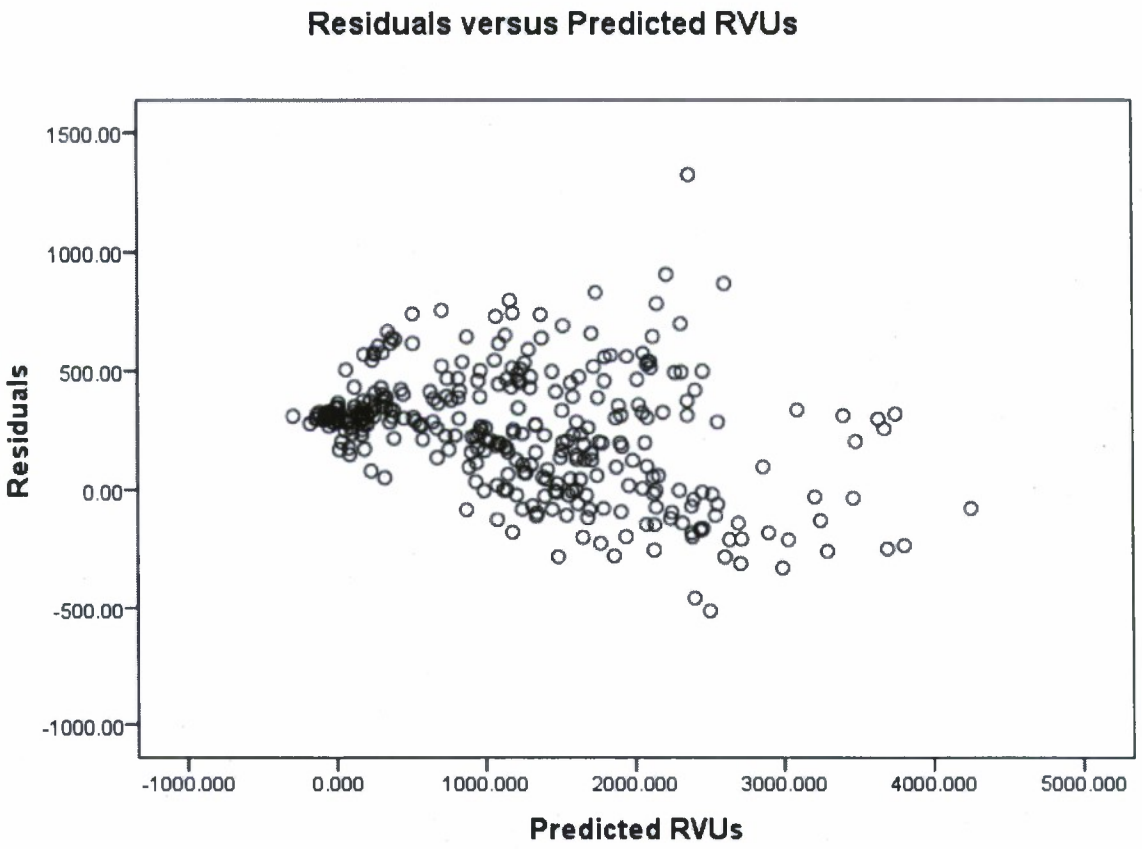


Figure 3. Scatter Plot Assessing for Homoschedasticity

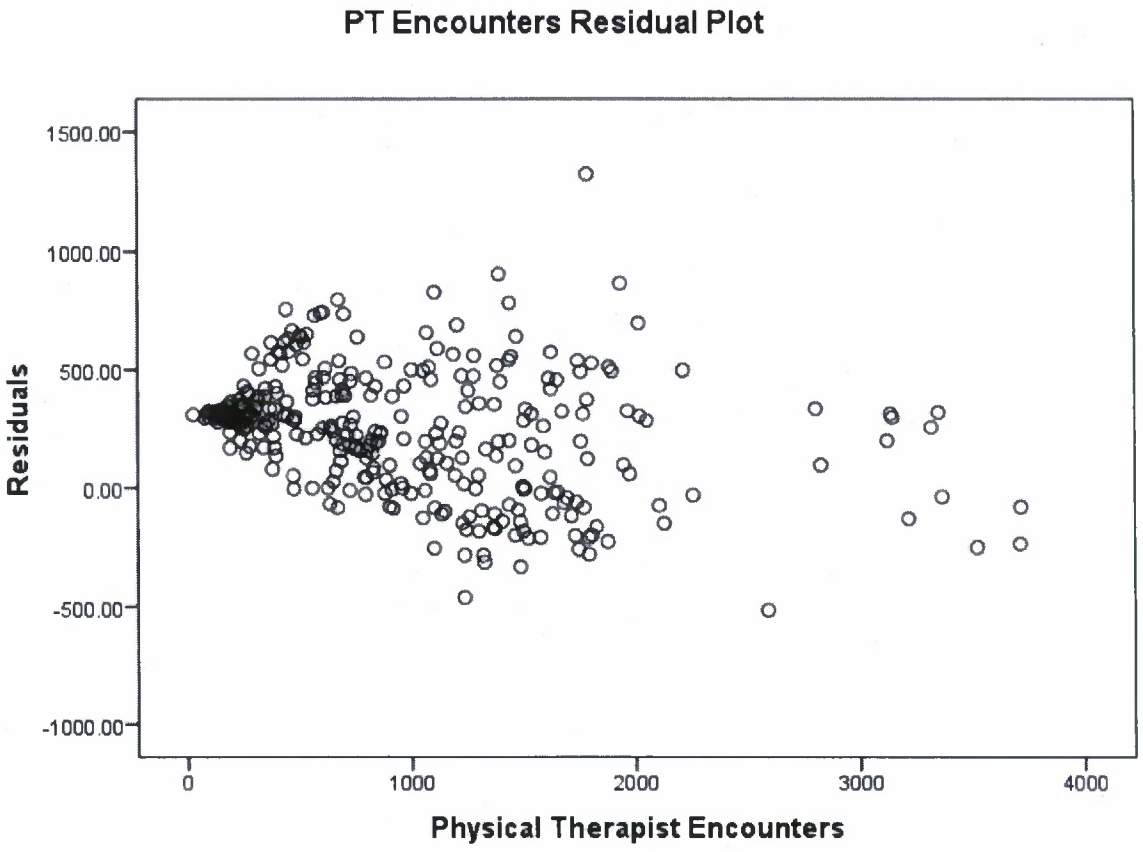


Figure 4. PT Encounters Residual Plot

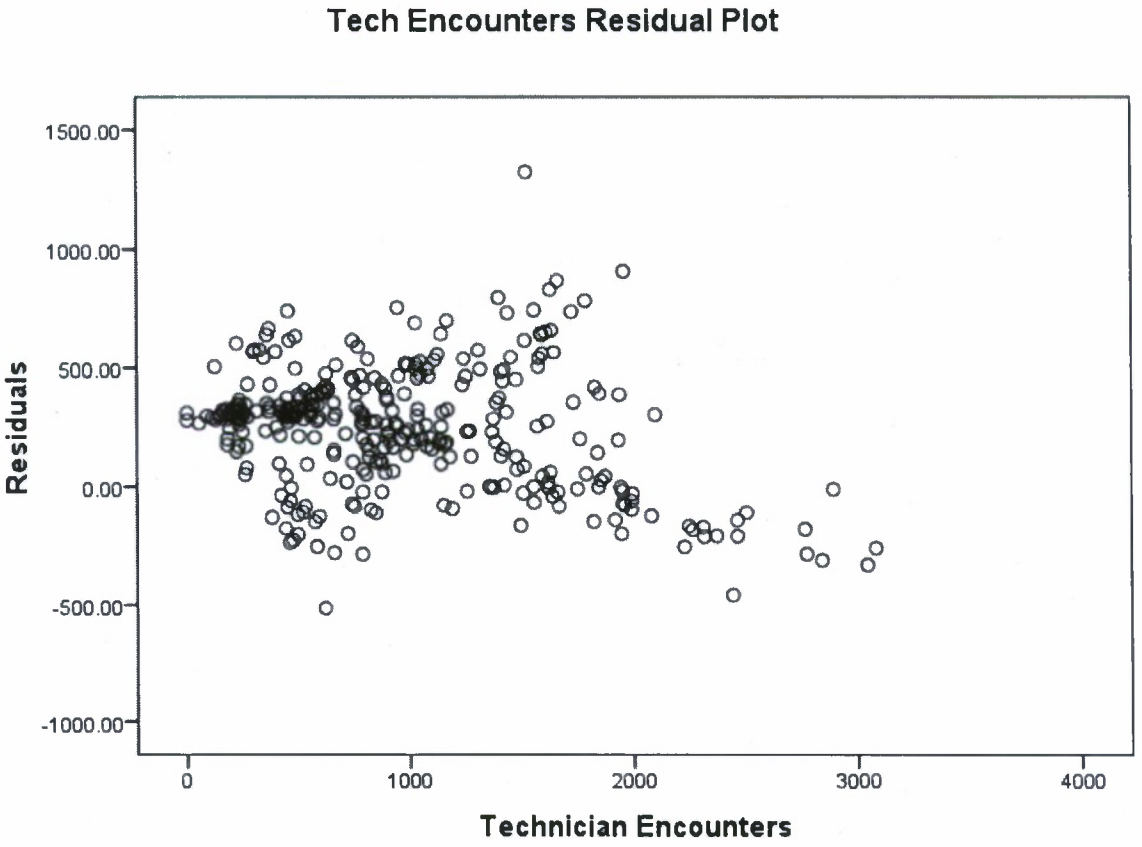


Figure 5. Tech Encounters Residual Plot

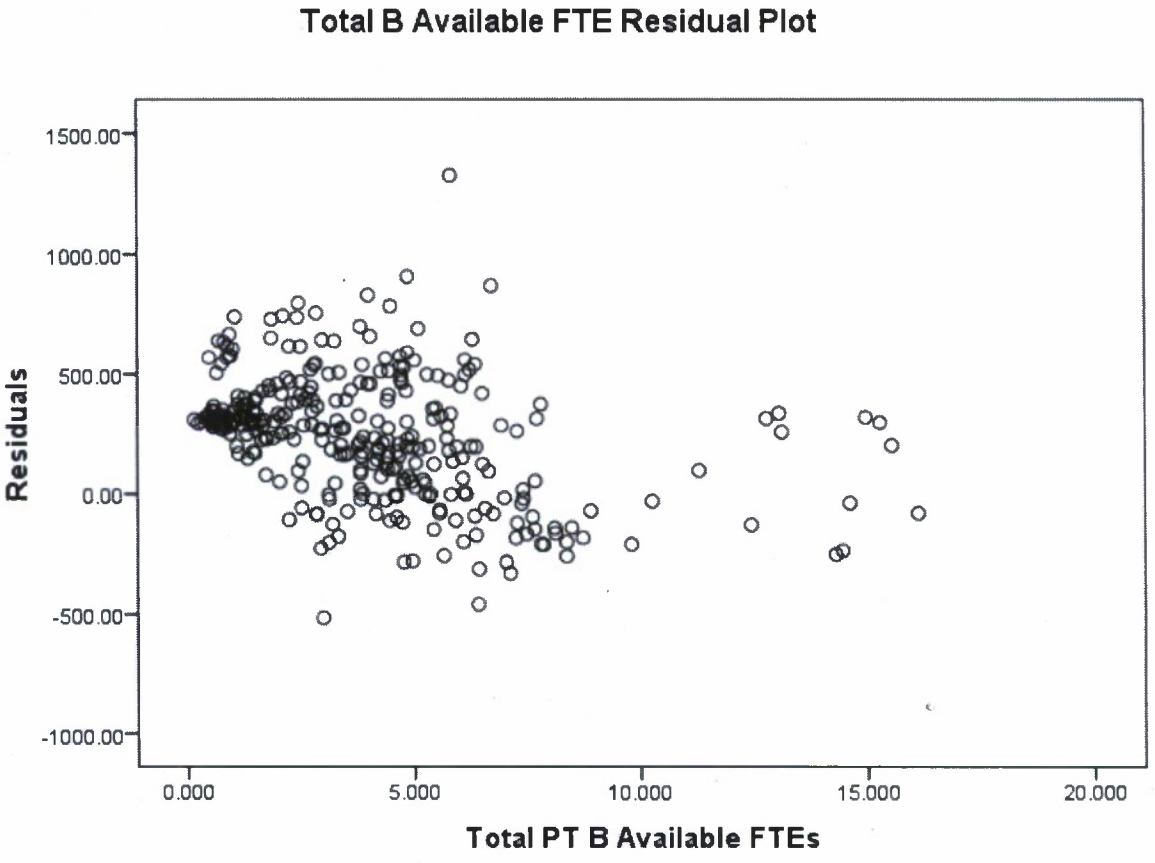


Figure 6. Total B Available FTE Residual Plot

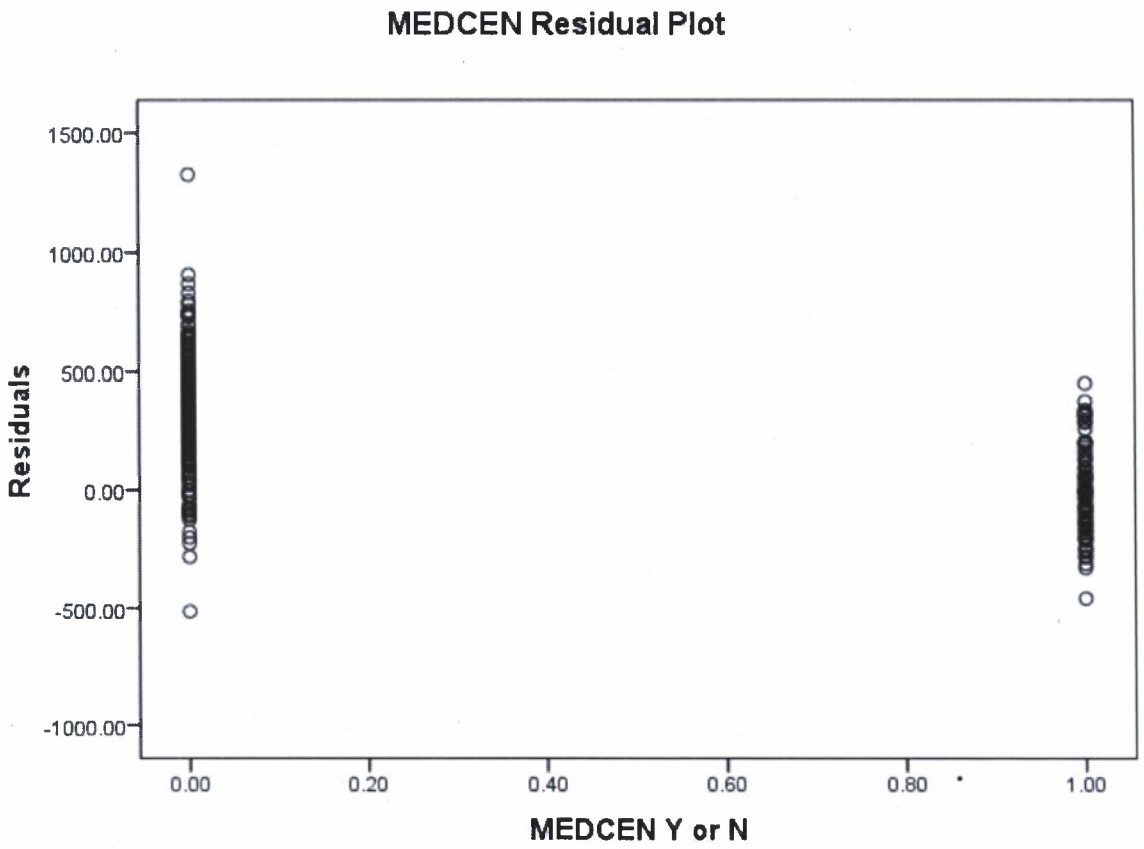


Figure 7. MEDCEN Residual Plot

Regression Implementation

A clinic specific efficiency target was calculated as described in the methods section using the regression equation $y = 7.445 + .920x_2 + .566x_3 + 30.992x_7 - 326.757x_{10}$ + error from model three in tables 17-19. Table 20 displays the actual RVUs and projected RVUs using the third regression model. Table 21 displays the clinic specific efficiency targets for each individual facility as well as a projected efficiency target for each region and MEDCOM for the included data. The third regression model indicates an overall MEDCOM inefficiency with a difference of -0.29 between the actual MEDCOM efficiency and the projected MEDCOM efficiency. The

difference between the actual MEDCOM efficiency and the current efficiency target (0.51) notes an overall positive MEDCOM efficiency. Three of the five regions (GPRMC, NARMC and SERMC) exceeded the current MEDCOM efficiency target where none of the five regions met the projected efficiency target based on the third regression model calculations.

Seventeen of 31 MTFs (55%) exceeded the current MEDCOM efficiency target with 14 of 31 MTFs (45%) failing to meet the current target compared to 11 MTFs (39%) meeting the proposed clinic specific target developed through the third regression model and 17 MTFs (61%) failing to meet proposed clinic specific targets. Of particular note are the efficiency ratings of Ft. Leavenworth. Ft. Leavenworth far exceeded both the current and projected efficiency ratings, exceeding the current rating by more than three times. This clinic is an obvious outlier for both the current target and the projected target.

Table 20

Projected RVUs

	Actual RVUs	Model 3 Projected RVUs	Model 4 Projected RVUs[a]	Model 5 Projected RVUs[a]
Bayne Jones ACH-Ft. Polk	12,442.60	11,562.38	11,798.17	11,567.10
Brooke AMC-Ft. Sam Houston	43,448.25	45,870.24	46,550.07	43,375.62
Darnall AMC-Ft. Hood	26,274.10	27,454.12	27,794.41	23,749.30
Evans ACH-Ft. Carson	21,251.25	18,391.59	18,662.73	18,200.05
Irwin ACH-Ft. Riley	14,457.51	14,335.78	14,544.06	14,302.96
FLW ACH-Ft. Leonard Wood	20,797.74	22,482.42	22,856.39	22,537.26
Munson AHC-Ft. Leavenworth	10,858.69	7,445.27	7,460.76	7,100.59
WilliamBeaumont AMC-Ft. Bliss	16,535.07	20,022.82	20,439.65	16,211.93
Reynolds ACH-Ft. Sill	14,533.36	14,846.30	15,009.01	14,595.58
RW Bliss AHC-Ft. Huachuca	5,450.52	5,769.89	5,836.40	5,495.73
Great Plains RMC	**186,049.09**	**188,180.82**	**190,951.66**	**177,136.12**
Dewitt ACH-Ft. Belvoir	31,696.06	29,384.96	29,600.56	29,317.12
Guthrie AHC-Ft. Drum	21,413.40	25,536.28	25,571.83	25,212.40
Ireland ACH-Ft. Knox	13,490.17	17,993.27	18,189.27	18,035.95
Keller AHC-West Point	14,129.23	15,660.79	15,941.42	15,856.31
Kenner AHC-Ft. Lee	7,940.11	7,739.94	7,839.80	7,544.13
McDonald AHC-Ft. Eustis	7,313.86	6,805.18	6,890.53	6,569.59
North Atlantic RMC	**95,982.83**	**103,120.42**	**104,033.41**	**102,535.51**
Womack AMC-Ft. Bragg	28,844.16	35,059.64	35,680.74	31,384.55
Blanchfield ACH-Ft. Campbell	27,517.81	25,931.16	26,312.95	26,069.40
Eisenhower AMC-Ft. Gordon	21,134.97	23,628.08	23,854.92	19,807.45
Fox AHC-Redstone Arsenal	2,340.63	2,537.02	2,545.02	2,245.62
Lyster AHC-Ft. Rucker	3,550.85	3,508.13	3,518.90	3,186.96
Martin ACH-Ft. Benning	19,506.13	18,647.03	18,896.10	18,795.45
Moncrief ACH-Ft. Jackson	32,093.99	28,683.32	29,068.12	28,929.36
Winn ACH-Ft. Stewart	17,344.46	17,387.26	17,739.02	17,669.14
Southeast RMC	**152,333.00**	**155,381.63**	**157,615.77**	**148,087.92**
Bassett ACH-Ft. Wainwright	3,332.68	4744.85	4,798.03	4,549.09
Madigan AMC-Ft. Lewis	26,854.26	30,605.30	31,062.44	26,957.25
Weed ACH-Ft. Irwin	4,306.53	4,452.40	4,517.47	4,286.17
Western RMC	**34,493.47**	**39,802.55**	**40,377.93**	**35,792.51**
Tripler AMC-Hawaii	27,063.94	32,082.80	32,712.75	28,707.96
Pacific RMC	**27,063.94**	**32,082.80**	**32,712.75**	**28,707.96**
MEDCOM[c]	**495,922.33**	**518,568.23**	**528,730.05**	**492,260.02**

Note: All models estimate two months of poor Ft. Sill data and three months of poor Ft. Jackson data by averaging the remaining FY months to correct for a lack of consistent reporting of technician encounters. Projected RVUs for the RMCs is the sum of all parent MTFs in the region and not derived from the regression equation. MEDCOM totals are independent of the MTF and clinic exclusions.

[a]Models four and five exclude Ft. Leavenworth data in the development of the regression equation.

Table 21

Efficiency Targets (RVU/FTE)

	Actual Efficiency[a]	Model 3 Target[b]	Model 4 Target[c]	Model 5 Target[d]
Bayne Jones ACH-Ft. Polk	17.55	16.31	16.64	16.32
Brooke AMC-Ft. Sam Houston	12.32	13.01	13.20	12.30
Darnell AMC-Ft. Hood	16.88	17.64	17.85	15.26
Evans ACH-Ft. Carson	32.54	28.16	28.58	27.87
Irwin ACH-Ft. Riley	19.25	19.08	19.36	19.04
FLW ACH-Ft. Leonard Wood	19.72	21.32	21.67	21.37
Munson AHC-Ft. Leavenworth	51.66	35.42	35.49	33.78
RW Bliss AHC-Ft. Huachuca	23.17	24.53	24.81	23.37
Reynolds ACH-Ft. Sill	28.79	29.41	29.73	28.91
WilliamBeaumont AMC-Ft. Bliss	13.98	16.93	17.28	13.71
Great Plains RMC	**17.92**	**18.12**	**18.39**	**17.06**
Dewitt ACH-Ft. Belvoir	27.60	25.59	25.78	25.53
Guthrie AHC-Ft. Drum	28.04	33.44	33.49	33.02
Ireland ACH-Ft. Knox	14.09	18.79	19.00	18.84
Keller AHC-West Point	13.37	14.81	15.08	15.00
Kenner AHC-Ft. Lee	20.76	20.24	20.50	19.73
McDonald AHC-Ft. Eustis	23.68	22.03	22.31	21.27
Patterson AHC-Ft. Monmouth	13.09	N/A	N/A	N/A
Kimbrough ACC-Ft. Meade	20.54	N/A	N/A	N/A
Walter Reed AMC	14.27	N/A	N/A	N/A
North Atlantic RMC	**18.37**	**22.33**	**22.53**	**22.20**
Womack AMC-Ft. Bragg	16.59	20.16	20.52	18.05
Blanchfield ACH-Ft. Campbell	21.86	20.60	20.90	20.71
Eisenhower AMC-Ft. Gordon	15.89	17.76	17.93	14.89
Fox AHC-Redstone Arsenal	17.36	18.82	18.88	16.66
Lyster AHC-Ft. Rucker	28.37	28.03	28.12	25.46
Martin ACH-Ft. Benning	17.82	17.03	17.26	17.17
Moncrief ACH-Ft. Jackson	21.76	19.45	19.71	19.62
Winn ACH-Ft. Stewart	14.50	14.53	14.82	14.77
Southeast RMC	**18.23**	**18.60**	**18.87**	**17.73**
Bassett ACH-Ft. Wainwright	10.84	15.43	15.61	14.80
Madigan AMC-Ft. Lewis	15.91	18.13	18.40	15.97
Weed ACH-Ft. Irwin	12.95	13.39	13.58	12.89
Western RMC	**14.82**	**17.10**	**17.34**	**15.37**
Tripler AMC-Hawaii	13.36	15.83	16.14	14.17
Pacific RMC	**13.36**	**15.83**	**16.14**	**14.17**
MEDCOM	**17.61**	**17.90**	**17.89**	**17.89**

Note: Efficiency Ratings are calculated by the following formula: RVUs/(21&FTEs). a Efficiency rating in the MEDCOM model is calculated with target RVUs off the 17.10 RVU/FTE/day target. b Model 3 Efficiency rating is calculated with target RVUs from the third regression formula.
c Model 4 Efficiency rating is calculated with target RVUs from the fourth regression formula. Model 4 does not include data from Ft. Leavenworth.
d Model 5 Efficiency rating is calculated with target RVUs from the fifth regression formula. Model 5 does not include data from Ft. Leavenworth.

Given the outlying data from the Ft. Leavenworth MTF, a fourth regression model was developed with the same variables as model three and the exclusion of the Ft. Leavenworth MTF. The results of the fourth regression model are displayed in tables 22-24. The residual plots and histograms investigating the assumption of multiple regression are not displayed as they are near identical to the figures in model three with the same conclusions.

Table 22

Regression Model 4 Summary

R	R2	ADJ R2	SEE	Durbin-Watson
.972	.944	.943	212.149	.536

Table 23

Regression Model 4 ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.375E8	4	5.937E7	1319.057	.000
Residual	1.409E7	313	45007.169		
Total	2.516E8	317			

Significant at an alpha level of 0.05

Table 24

Regression Model 4 Coefficients

Variable	B	SE B	β	Sig.	VIF
Constant	-24.932	25.641		.332	
PT Encounters	.909	.034	.740	.000	4.311
Tech Encounters	.576	.023	.408	.000	1.434
Total PT B Available FTEs	37.355	9.858	.123	.000	5.922
MEDCEN	-337.909	37.706	-.168	.000	1.953

Note. $R^2 = .944$; Adjusted $R^2 = .943$; $F = 1319.057$; Regression Equation: $y = b_0 + b_2x_2 + b_3x_3 + b_7x_7 + b_{10}x_{10} + \epsilon$; $y = -24.932 + .909x_2 + .576x_3 + 37.355x_7 - 337.909x_{10}$ + Error.

A clinic specific efficiency target was calculated as described in the methods section using the fourth model regression equation $y = -24.932 + .909x_2 + .576x_3 + 37.355x_7 - 337.909x_{10}$ + error. Table 20 displays the actual RVUs and the projected RVUs from the fourth model regression formula for each MTF, region and MEDCOM as a whole. Table 21 displays the clinic specific efficiency targets for each individual facility as well as a projected efficiency target for each region and MEDCOM for the included data. All efficiency targets increases in the fourth model compared to the third model after the exclusion of the outlying Ft. Leavenworth data. Again, note the difference (-0.28) between the actual MEDCOM efficiency and the projected MEDCOM efficiency indicating a slightly inefficient physical therapy system in the Army. Again in the fourth model, none of the five regions met the projected efficiency.

Given the inability of the third and fourth regression models to firmly meet all assumptions of linear regression analysis, a fifth regression model was performed using a collapsed data set. Each MTF had observations for each fiscal month in the original data set

utilized in the third and fourth models. The data were collapsed into one observation per MTF for the 2005 fiscal year for the fifth regression model. Results for the fifth regression model are displayed in tables 26-27. The fifth regression model met the assumptions of linear regression better than the third or fourth model. Histograms and residual plots assessing normality of error, homoscedasticity and independence of errors for model five are displayed in figures 8-13. This final method improved the Durbin-Watson statistic to 1.442 which is between the lower (1.08) and upper (1.76) limits on the Durbin-Watson table resulting in an uncertain determination of autocorrelation.

A clinic specific efficiency target was calculated as described in the methods section using the fifth model regression equation $y = -340.943 + .896x_2 + .555x_3 + 48.381x_7 - 4356.315x_{10}$ + error. Table 20 displays the actual RVUs and the projected RVUs from the fifth model regression formula for each MTF, region and MEDCOM as a whole. Table 21 displays the clinic specific efficiency targets for each individual facility as well as a projected efficiency target for each region and MEDCOM for the included data. In the fifth model, two regions met the projected target (GPRMC and SERMC). Again, the actual MEDCOM efficiency (17.61 RVU/FTE/Day) fails to exceed the projected efficiency (17.89 RVU/FTE/Day) in the MEDCOM model.

Sixteen of 28 MTFs (57%) exceeded the current MEDCOM efficiency target in the fifth model with 12 MTFs (43%) failing to meet the current target. This is a slight improvement over the current MEDCOM method. The correction for MEDCENs in the fifth model is large and results in four (57%) of the MEDCENs being rated as efficient compared to zero in the original MEDCOM model. The three (43%) MEDCENs that are not efficient in the fifth model are within 10% of being efficient.

Table 25

Regression Model 5 Summary

R	R2	ADJ R2	SEE	Durbin-Watson
.984	.968	.963	2015.163	1.442

Table 26

Regression Model 5 ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.747E9	4	6.867E8	169.094	.000
Residual	8.934E7	22	4060882.468		
Total	2.836E9	26			

Significant at an alpha level of 0.05

Table 27

Regression Model 5 Coefficients

Variable	B	SE B	β	Sig.	VIF
Constant	-340.943	868.528		.698	
PT Encounters	.896	.108	.737	.000	5.517
Tech Encounters	.555	.066	.391	.000	1.504
Total PT B Available FTEs	48.381	32.183	.160	.147	7.935
MEDCEN	-4356.315	1282.831	-.186	.003	2.101

Note. $R^2 = .968$; Adjusted $R^2 = .963$; $F = 169.094$; Regression Equation: $y = b_0 + b_2x_2 + b_3x_3 + b_7x_7 + b_{10}x_{10} + \epsilon$; $y = -340.943 + .896x_2 + .555x_3 + 48.381x_7 - 4356.315x_{10} + \text{Error}$.

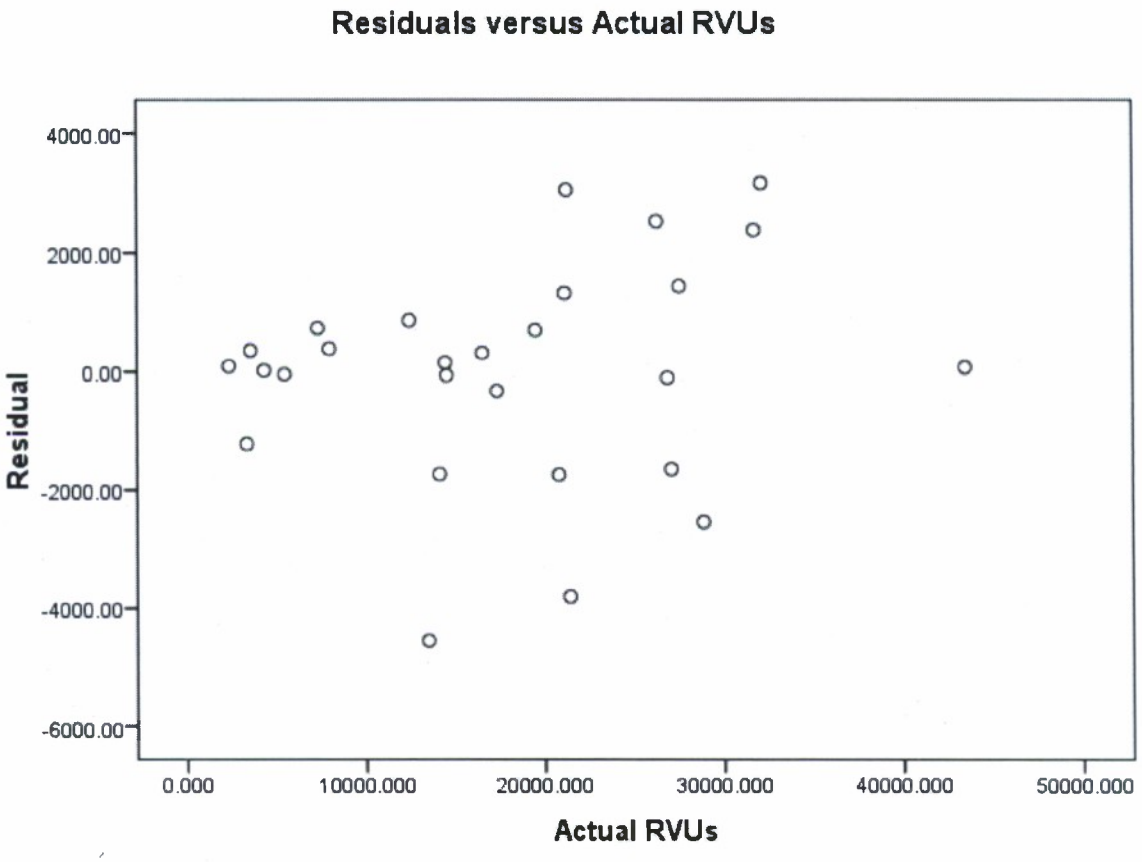


Figure 8. Scatter Plot Assessing for Homoschedasticity – Compressed Data Model

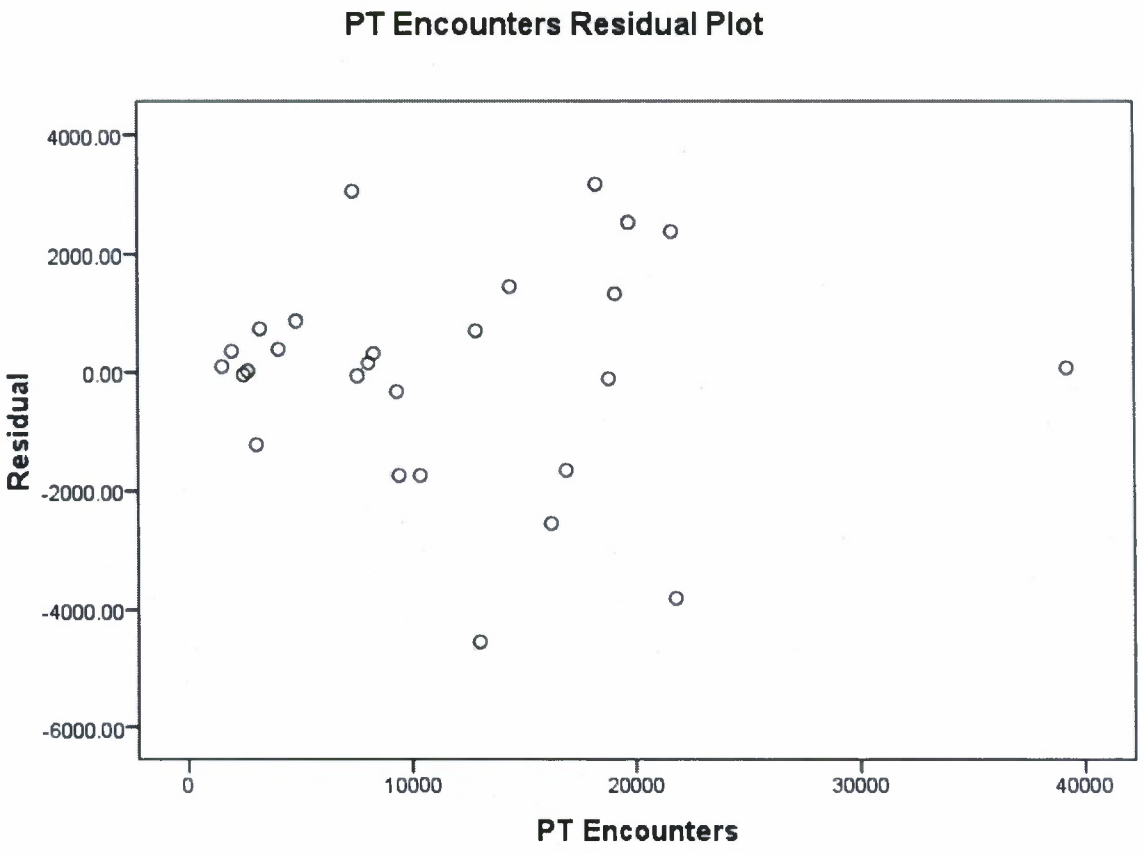


Figure 9. PT Encounters Residual Plot - Compressed Data Model

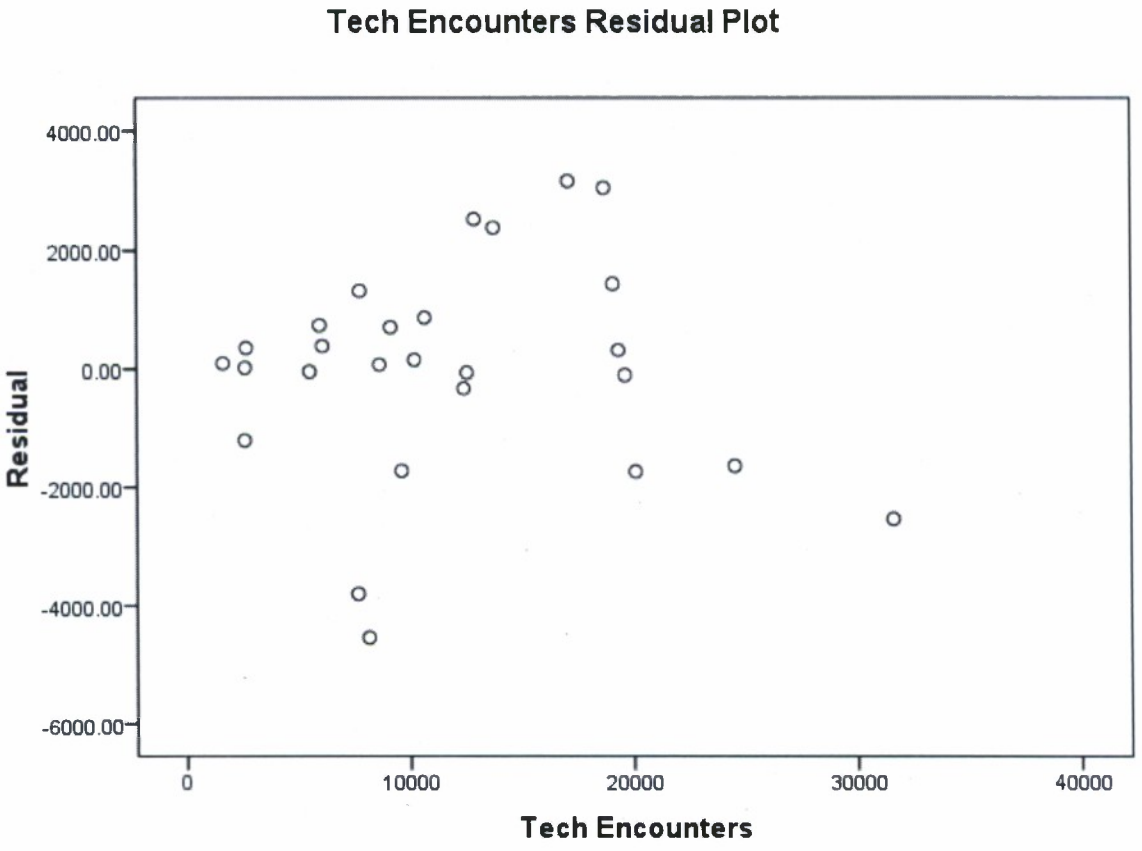


Figure 10. Tech Encounters Residual Plot – Compressed Data Model

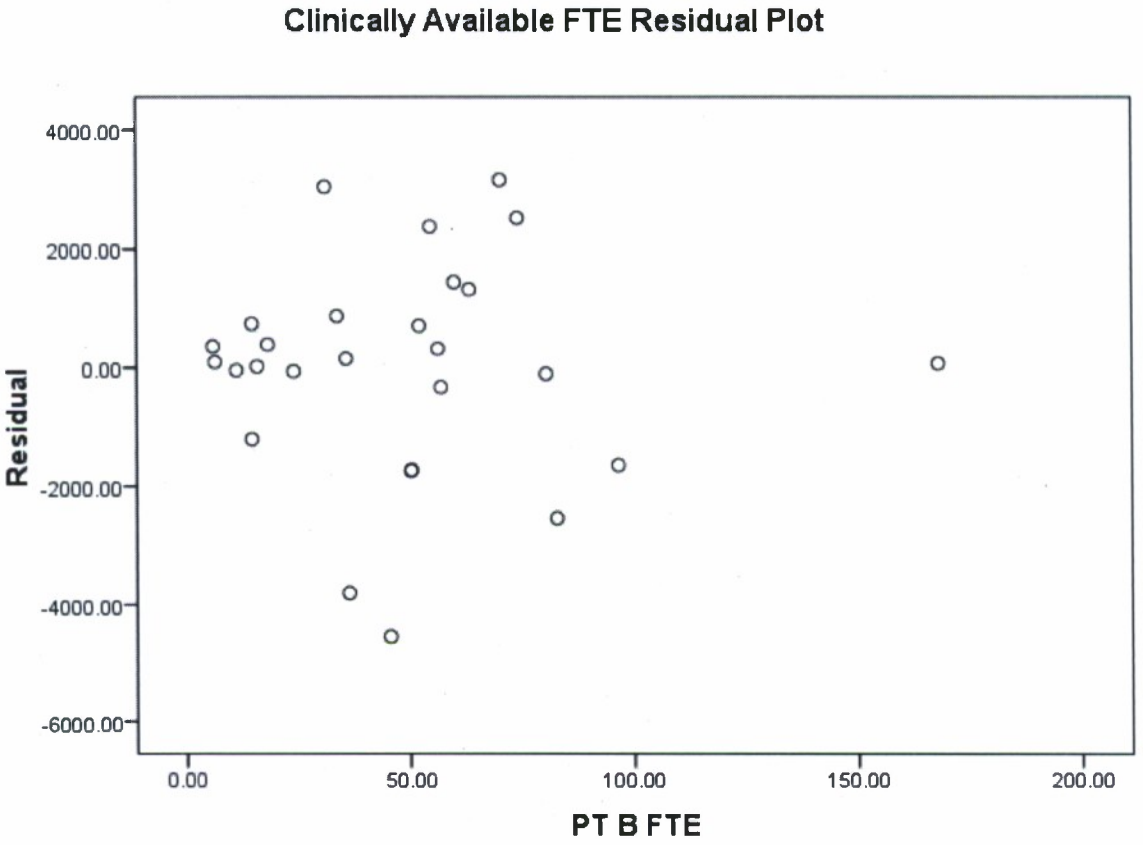


Figure 11. Total B Available FTE Residual Plot – Compressed Data Model

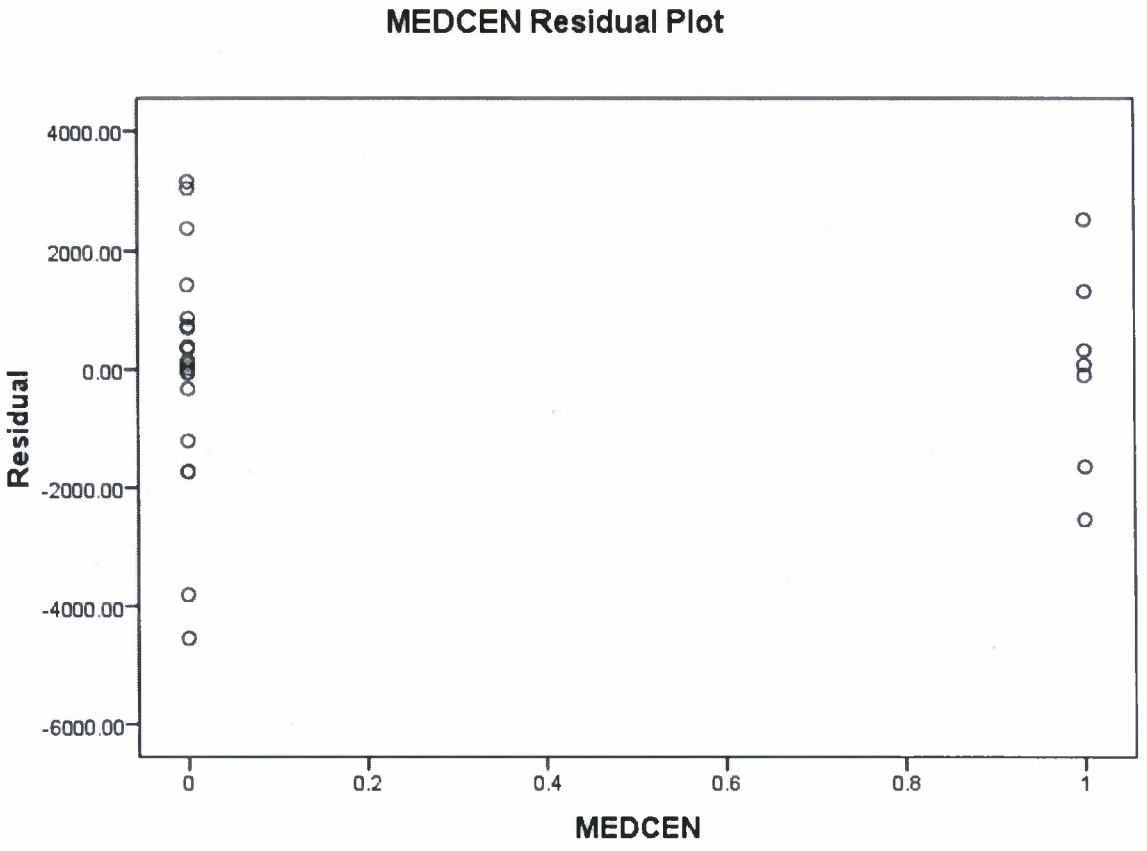


Figure 12. MEDCEN Residual Plot – Compressed Data Model

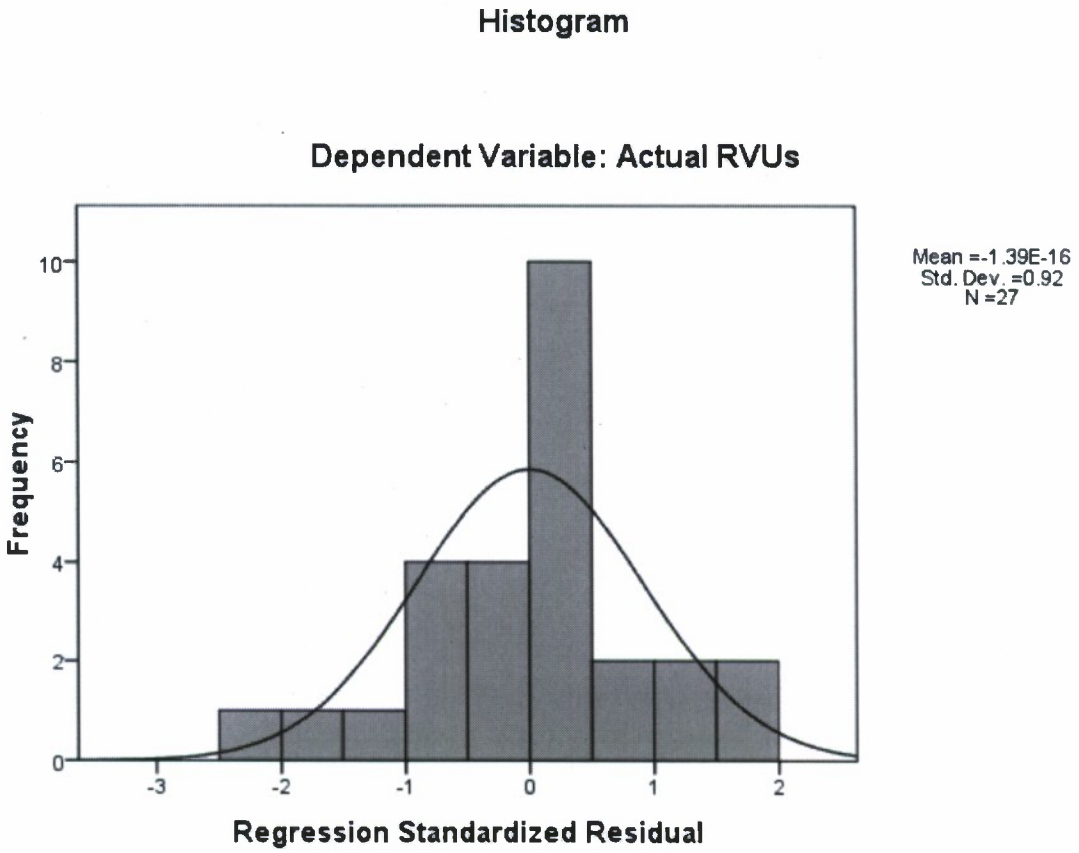


Figure 13. Residual Plot Assessing Normality of Error – Compressed Data Model

Table 28 displays differences between the actual performance (RVU/FTE/day) and the targets in the current MEDCOM method and each of the proposed models. When a clinic is operating at optimal efficiency, the difference between actual and expected should be zero. If a clinic performs more efficiently the difference becomes positive and when a clinic performs less efficiently the difference becomes negative.

Under the current MEDCOM method the range of differences is -6.26 to 34.56 (AVG = 3.28, SD = 8.41). Under the third regression model the range of differences is -5.40 to 16.24 (AVG = -0.19, SD = 3.93). Ft. Leavenworth continues to exceed the MEDCOM target of 17.10 RVU/FTE/day by nearly 100%. The removal of Ft. Leavenworth from the data set in the fourth and fifth models resulted in ranges of -5.45 to 3.96 (AVG = -1.05, SD = 2.27) and -4.98 to 4.67 (AVG = 0.08, SD = 2.19) respectively. Although the Ft. Leavenworth data was excluded in developing the regression equations in the fourth and fifth model, the models were utilized to develop targets for the MTF. Since the data for the MTF was not included in developing the equation, the Ft. Leavenworth targets from the fourth and fifth model were not included in calculating the average or standard deviation of the range.

Table 28

Actual Target versus Expected Target Differences

	Actual-MEDCOM Target	Actual-Model 3 Target	Actual-Model 4 Target	Actual-Model 5 Target
Bayne Jones ACH-Ft. Polk	0.45	1.24	0.91	1.23
Brooke AMC-Ft. Sam Houston	-4.78	-0.69	-0.88	0.02
Darnell AMC-Ft. Hood	-0.22	-0.76	-0.98	1.62
Evans ACH-Ft. Carson	15.44	4.38	3.96	4.67
Irwin ACH-Ft. Rilcy	2.15	0.16	-0.12	0.21
FLW ACH-Ft. Leonard Wood	2.62	-1.60	-1.95	-1.65
Munson AHC-Ft. Leavenworth	34.56	16.24	16.16	17.88
RW Bliss AHC-Ft. Huachuca	6.07	-1.36	-1.64	-0.19
Reynolds ACH-Ft. Sill	11.69	-0.62	-0.94	-0.12
WilliamBeaumont AMC-Ft. Bliss	-3.12	-2.95	-3.30	0.27
Great Plains RMC	**0.82**	**-0.21**	**-0.47**	**0.86**
Dewitt ACH-Ft. Belvoir	10.50	2.01	1.82	2.07
Guthrie AHC-Ft. Drum	10.94	-5.40	-5.45	-4.98
Ireland ACH-Ft. Knox	-3.01	-4.70	-4.91	-4.75
Keller AHC-West Point	-3.73	-1.45	-1.71	-1.63
Kenner AHC-Ft. Lee	3.66	0.52	0.26	1.04
McDonald AHC-Ft. Eustis	6.58	1.65	1.37	2.41
Patterson AHC-Ft. Monmouth	-4.01	N/A	N/A	N/A
Kimbrough ACC-Ft. Meade	3.44	N/A	N/A	N/A
Walter Reed AMC	-2.83	N/A	N/A	N/A
North Atlantic RMC	**1.27**	**-1.55**	**-1.74**	**-1.42**
Womack AMC-Ft. Bragg	-0.51	-3.57	-3.93	-1.46
Blanchfield ACH-Ft. Campbell	4.76	1.26	0.96	1.15
Eisenhower AMC-Ft. Gordon	-1.21	-1.87	-2.04	1.00
Fox AHC-Redstone Arsenal	0.26	-1.46	-1.54	0.70
Lyster AHC-Ft. Rucker	11.27	0.34	0.26	2.91
Martin ACH-Ft. Benning	0.72	0.78	0.56	0.65
Moncrief ACH-Ft. Jackson	4.66	2.31	2.05	2.15
Winn ACH-Ft. Stewart	-2.60	-0.04	-0.33	-0.27
Southeast RMC	**1.13**	**-0.36**	**-0.63**	**0.51**
Bassett ACH-Ft. Wainwright	-6.26	-4.59	-4.77	-3.96
Madigan AMC-Ft. Lewis	-1.19	-2.22	-2.49	-0.06
Weed ACH-Ft. Irwin	-4.15	-0.44	-0.63	0.06
Western RMC	**-2.28**	**-2.28**	**-2.53**	**-0.56**
Tripler AMC-Hawaii	-3.74	-2.48	-2.79	-0.81
Pacific RMC	**-3.74**	**-2.48**	**-2.79**	**-0.81**
MEDCOM	**0.51**	**0.01**	**0.01**	**0.01**

Note: Zero indicates a clinic that is producing exactly the number of RVUs expected given the reported clinical FTEs. A positive number indicates a clinic with that produces more RVUs than expected and a negative number indicates a clinic that produces fewer RVUs than expected given the number of reported clinical FTEs.

PBAM Recalculation

Multiple regression model building and analysis identified factors that significantly explain the variation in total RVU production among the 27 physical therapy clinics studied. The regression formula was implemented to predict RVU production for each clinic and subsequently a clinic specific efficiency target. The current PBAM model uses the same efficiency target for every clinic. Implementation of any of the three proposed regression models would affect the end results of the PBAM calculations. In order to determine how the regression models would affect the PBAM outcome, the RVUs in column D (performance target) of the original PBAM model (calculated using the global 17.10 RVUs/FTE efficiency target) were replaced with the RVU predictions from the regression models. The remainder of the PBAM metrics were determined in the same manner without modification.

Table 29 displays the %Efficiency calculations in the PBAM model for each MTF with the current MEDCOM method and with each of the regression models. Since the current PBAM model does not use encounters as a factor, Walter Reed AMC, Kimbrough AHC and Patterson AHC calculations are included. With the current PBAM method, 17 of 31 (55%) MTFs were efficient with 14 of 31 (45%) being inefficient. Note the wide range of efficiency ratings (-27.9% to 202.1%). If the assumption is made that the overall business practices and patient types are similar across the enterprise, the efficiency ratings should not have such a wide variance.

In the third regression model, 11 of 28 (39%) MTFs were efficient with 17 of 28 (61%) being inefficient. The range with the third regression model narrows (-29.8% to 45.8%) compared to the current MEDCOM model. In the fourth regression model, 10 of 28 (36%) MTFs were efficient with 18 of 26 (64%) being inefficient. Note the slightly wider range of efficiency ratings (-30.5% to 45.5%). In the fifth regression model, 17 of 27 (55%) MTFs were

efficient with 14 of 27 (45%) being inefficient. Note the efficiency range in the fifth regression model was similar to that in the third and fourth models (-26.7% to 52.9%). The efficiency ratings generated using any of the regression models are considered more realistic than the current MEDCOM method.

Table 29

PBAM % Efficiency Ratings

	MEDCOM Model[a]	Model 3[b]	Model 4[c]	Model 5[d]
Bayne Jones ACH-Ft. Polk	2.6	7.6	5.5	7.6
Brooke AMC-Ft. Sam Houston	-27.9	-5.2	-6.6	0.3
Darnell AMC-Ft. Hood	-1.3	-4.3	-5.5	10.6
Evans ACH-Ft. Carson	90.3	15.5	13.9	16.8
Irwin ACH-Ft. Riley	12.6	0.8	-0.6	1.1
FLW ACH-Ft. Leonard Wood	15.3	-7.5	-9.0	-7.7
Munson AHC-Ft. Leavenworth	202.1	45.8	45.5	52.9
RW Bliss AHC-Ft. Huachuca	35.5	-5.5	-6.6	-0.8
Reynolds ACH-Ft. Sill[a]	68.4	-2.1	-3.2	-0.4
WilliamBeaumont AMC-Ft. Bliss	-18.2	-17.4	-19.1	2.0
Dewitt ACH-Ft. Belvoir	61.4	7.9	7.1	8.1
Guthrie AHC-Ft. Drum	64.0	-16.1	-16.3	-15.1
Ireland ACH-Ft. Knox	-17.6	-25.0	-25.8	-25.2
Keller AHC-West Point	-21.8	-9.8	-11.4	-10.9
Kenner AHC-Ft. Lee	21.4	2.6	1.3	5.2
McDonald AHC-Ft. Eustis	38.5	7.5	6.1	11.3
Patterson AHC-Ft. Monmouth	-23.4	N/A	N/A	N/A
Kimbrough ACC-Ft. Meade	20.1	N/A	N/A	N/A
Walter Reed AMC	-16.5	N/A	N/A	N/A
Womack AMC-Ft. Bragg	-3.0	-17.7	-19.2	-8.1
Blanchfield ACH-Ft. Campbell	27.8	6.1	4.6	5.6
Eisenhower AMC-Ft. Gordon	-7.1	-10.6	-11.4	6.7
Fox AHC-Redstone Arsenal	1.5	-7.7	-8.0	4.2
Lyster AHC-Ft. Rucker	65.9	1.2	0.9	11.4
Martin ACH-Ft. Benning	4.2	4.6	3.2	3.8
Moncrief ACH-Ft. Jackson[a]	27.3	11.9	10.4	10.9
Winn ACH-Ft. Stewart	-15.2	-0.2	-2.2	-1.8
Bassett ACH-Ft. Wainwright	-36.6	-29.8	-30.5	-26.7
Madigan AMC-Ft. Lewis	-7.0	-12.3	-13.5	-0.4
Weed ACH-Ft. Irwin	-24.3	-3.3	-4.7	0.5
Tripler AMC-Hawaii	-21.9	-15.6	-17.3	-5.7

[a]% Efficiency rating in the MEDCOM model is calculated with target RVUs off the 17.10 RVU/FTE/day target.

[b]Model 3 % efficiency ratings calculated with target RVUs from the third regression model

[c]Model 4 % efficiency ratings calculated with target RVUs from the fourth regression model

[d]Model 5 % efficiency ratings calculated with target RVUs from the fifth regression model

Limitations

The third and fourth regression models fail to meet the assumption of an absence in autocorrelation. In the presences of autocorrelation the residual variance may underestimate the true variance. As a result, the adjusted R^2 may be overestimated in the regression model with autocorrelation (Gujarati, 2003). Additionally, the third and fourth models may slightly violate assumptions of homoscedasticity and independence of errors based on subjective assessment of residuals plots. Several attempts were made to improve the proposed model. Transformation of the dependent variable with many methods failed to improve the model as did first order autoregression (AR1) by creating a lagged independent variable from the dependent variable. The final attempt to improve the model by collapsing the data set from having multiple observations for each MTF by fiscal month to one observation for each MTF for the fiscal year improved the model in relation to meeting all the regression assumptions with a near identical R^2 which may indicate that the third and fourth models do not overestimate the R^2.

Although the fifth regression model appears to be the most statistically sound model, it has limitations of its own. The FTE variable (b_3) is not significant in the fifth model. Despite its lack of statistical significance the term remains in the model as clinically available FTEs do affect RVU production. The intercept or constant term ($b_0 = -340.943$) and the MEDCEN correction term ($b_4 = -4356.315$) are large. The large MEDCEN correction factor (b_4) is so large the model can only be used for a 12 month period of data where the third and fourth regression models can be used for monthly data. Since PBAM uses a 12 month rolling data set, the fifth model may be the best model for use in predicting an RVU performance target for use in PBAM.

Greater than 10% (14.47%) of the original sample was excluded from the analysis. The exclusion of Walter Reed resulted in the loss of over 41,000 (7.12%) RVUs and over 50,000

(6.83%) of encounters. Additionally, the Walter Reed AMC clinic had the greatest number of inpatient encounters. The proportion of encounters that were inpatient was an original variable. The addition of the Walter Reed AMC clinic could have made this variable a significant contributor to the final model. The proposed model may be able to be generalized to all other excluded clinics as there are similar clinics that remained in the dataset. There are no similar clinics in the dataset which makes generalizing the regression model to Walter Reed AMC questionable.

The constant or intercept term in either the third or fourth regression equation is equal to zero. The constant term in the third model is 7.445 and the constant in the fourth model is -24.932. Neither model would be appropriate to use for a clinic that registered no RVUs, encounters, or clinically available FTEs. In this instance the third regression equation would result in a 7.445 RVU projection and the fourth model would result in a -24.932 RVU projection for a non MEDCEN. Model five is only useful for a 12 month period and it is highly unlikely for a clinic to have no encounters, RVUs or FTEs over a twelve month period.

With the exclusion of Walter Reed AMC, the NARMC regional data has no MEDCEN in the dataset. Similarly, Tripler AMC is the only MTF included in the PRMC data.

Discussion

Physical therapy productivity assessment in the Army indicates an excessive range with large variance. It is difficult to explain why this variance exists. It is thought that this variance is due less to the actual performance among the clinics but more due to the accuracy of reporting and documentation of key metrics. The reports obtained from MEPRS are only as accurate as the information entered into MEPRS. Individual providers are one of the core sources of data input into the system. Inaccurate input of information at the provider level will result in inaccurate reports, analysis and ultimately uninformed decisions at upper management levels.

Performance improvement will only occur if productivity targets or benchmarks are set at appropriate levels. Employees are less likely to implement process improvement measures and strive for benchmarks perceived as unreachable. Commonly in the Military Health System (MHS), hospital leadership highlights performance in regular Review and Analysis meetings. If leadership publically brings attention to an underperforming clinic related to an unreachable goal employee morale my suffer resulting in a deterioration of performance and productivity. Additionally, unreachable targets may lead to employees manipulating the system inputs in order to achieve favorable outcomes.

Unreasonably low benchmarks can have a similar effect as the unreasonably high benchmarks. Productivity targets that are too low may hamper performance improvement efforts in a slightly different manner. A clinic that easily meets the benchmark under the current model has little incentive to reach for higher production and efficiency. The production and efficiency in clinics with low or easily reachable targets may result in poor utilization of resources and perhaps a lower quality of patient care. Leaders within the MHS need to be aware of these

potential effects of low productivity targets as the actual physical therapy performance for fiscal year 2007 was 19.34 relative value units per elinically available FTE per day (Miehael O'Brien, Senior Operational Data Analyst, AMEDD Health Policy and Services, personal communication, September 11, 2008), yet the target remained at the fiscal year 2006 level of 17.10 and will remain through fiscal ycar 2011.

Presently, physical therapy productivity is negatively affected by limitations of the currcnt Standard Ambulatory Data Reeord (SADR) in the Ambulatory Data Modulc (ADM) (Gregg, 2008). The SADR is unable to recognizc more than four proeedures per encounter or multiple units of the same proeedure during an encounter. For example, documenting and coding for three units of individual exercise will only credit thc provider with one unit. Implementation of the Comprehensive Ambulatory/Professional Encounter Record (CAPER) will correet this limitation as the CAPER will eapture multiple units of treatment and up to ten diffcrent procedures per eneounter. Onee CAPER implementation occurs, recaleulation of a produetivity target will have to occur as the providers will receive more RVUs under the CAPER model than the SADR ADM model.

There are no MEDCOM targets for RVUs, eneounters, available FTEs or elinieally available FTEs although individual facilities may have site-speeifie targets. MEDCOM does develop the RVU/FTE/day effieieney target whieh assesses the effieient production of RVUs for eaeh hour spent performing patient eare. However, the MEDCOM assessment ineludes the RVUs produeed by a teehnieian whieh prevents direet eomparison to the 11.52 RVU per day MGMA target. Utilizing only the RVUs and FTEs of physieal therapists for thc 2005 data set indieates that physieal therapists in the Army would have diffieulty meeting the MGMA target. As an enterprise, physieal therapists in MEDCOM produeed 12.74 RVUs/FTE/day in 2005

exeeeding the MGMA target of 11.52. However, only 46% (13 of 28) of the surveyed MTFs exeeeded the MGMA target. Five other MTF's physieal therapists produeed greater than 10 RVUs/FTE/day but less than 11.52 with 10 MTF's physical therapists produeing less than 10 RVUs/FTE/day (low of 7.43). Only 29% (2 of 7) of MEDCEN's physieal therapists exeeeded the MGMA target.

A provider can be efficient for the time spent in a clinie performing patient care but could actually be spending very little time performing patient eare. An investigation comparing available and non-available FTEs, the distribution of available time and total RVUs ean provide an indication of a staff member's presence for work, what type of work they are aetually pcrforming and how much workload they arc producing.

The MEPRS model uses 21 days to ealeulate available FTEs and the PBAM model uses 21 days to calculate the performance target (column D of the Produet Line Summary). The value of 21 derives from subtraeting the total number of federal holidays (10) and the total number of weekend days (104) in a 365 day year to arrivc at 251 available work days. Dividing 251 by 12 arrives at 20.91 work days per month. Commonly in a MTF, training holidays are awarded by leadership in addition to federal holidays. Thc MEPRS and PBAM models do not account for thesc lost work days by reducing the 21 day figurc. Failing to make this correetion can result in an additional 17.10 RVUs expeeted for each provider not working on a training holiday. Whcn a clinic does not produce the extra 17.10 RVUs for each provider, the elinie is at risk for failing to meet the PBAM productivity target.

In the current PBAM model there is ineentive to rcport low clinically available FTEs as this lowers the performance target (column D). Whcn actual RVU production exceeds this target, the MTF is considered excessively efficicnt and the MTF is rewarded with additional

funds. Whether intentional or not, erroneously low reporting of clinically available FTEs may explain the unrealistically high efficiency ratings of many MTFs. Similarly to the current MEDCOM method, low reporting of clinically available FTEs in the regression model also results in a lower performance target (column D).

Recommendations

Both the multiple regression models proposed here and the original MEDCOM model using the global efficiency target are easily manipulated through the clinically available FTE. Providers self report their clinically available time into the DMHRSi system. Providers can short the reported clinically available time lowering the performance target in both models and thus appear more efficient than they really are. MEDCOM does not have a target for clinically available FTEs for providers. To reduce the likelihood of providers short reporting clinical time either MEDCOM or local leadership should develop targets for clinically available FTEs. A clinically available FTE target would incentivize leaders to track and justify provider's time spent not performing patient care activity. Since MEDCOM discounts the MGMA productivity standard by 15% for inefficiencies in the Army healthcare system compared to the civilian healthcare system, this is also a reasonable target for available FTEs. MEDCOM should use this same reasoning to set the target of 85% of total available time should be clinically available time. An alternate target as reported by Waller (2006) in the previously mentioned APTA survey is the average 72.7% of time reported by physical therapists spent performing patient care activities. The survey was directed at physical therapists working in hospital based outpatient physical therapy clinics.

Although MEDCOM rolls up or includes technician RVU production and therapist RVU production to obtain a total for the clinic it is possible to easily calculate production by the physical therapists in isolation without the RVUs of the technicians. The isolated physical therapist production can be compared to the current MGMA benchmark for an indication of efficiency for the physical therapists.

Despite the importance of clinically available FTEs and RVUs in calculating productivity and efficiency, there is minimal to no formal education to physical therapy providers in business management practices. A therapist needs an opportunity to learn the administrative aspects of clinic management before assignment as a clinic chief. The material is not complex or extensive and there are multiple opportunities to incorporate this material into existing educational programs. Army physical therapy students obtain an initial introduction to some of this material in an Executive Skills course during the Army Baylor Doctoral Program in Physical Therapy. Physical therapists that attend the Kersey Neuromusculoskeletal Evaluation (NMSE) course receive a one hour class on administrative skills as well. Reinforcement and expansion of the introductory knowledge can be obtained during the track week of the Captains Career Course (CCC). The CCC is perhaps the best opportunity as the students in this program are the most likely to currently be or shortly become clinic chiefs. Early investment in junior officers prior to their assignment as clinic leaders can have a long term positive outcome on productivity measurement and assessment and avoid multiple pitfalls in the future. Prior to implementation of an educational program, a needs assessment to identify the current knowledge of the field would help to focus the training.

There is a need for improved accuracy of coding and accountability in the MHS databases and systems. For this study 12.87% of RVUs and 11.89% of all encounters needed to be

excluded from the study based on local business practices differing from the global enterprise business practices. Additionally, without intense investigation of miscoded provider specialties thousands of other RVUs and encounters could have been excluded. A positive note is that only 0.13% of the data were excluded due to non physical therapy staff reporting encounters into a therapy clinic. It is unknown if FTEs by these non physical therapy providers are erroneously reported into a BLA account. It is unlikely that MEDCOM data analysts have the time to assure data sets are cleaned at the level done for this study given the monthly data extractions. It is the responsibility of the individual clinics to assure that their providers are coded properly and that any non physical therapy providers that report time or encounters into a BLA are doing it appropriately.

Although there is no known possible range of efficiencies, there is a likely realistic maximum efficiency a clinic could possibly obtain. Ft. Leavenworth exceeded the MEDCOM target of 17.10 RVU/FTE/day by more than 200% which is can be considered an unrealistically obtainable efficiency rating. This unrealistic efficiency rating resulted in the development of the fourth model after the exclusion of the MTF. Given the averages and standard deviations of the data in models four and five, an efficiency rating not in excess of 5% may be a more realistically obtainable. Any efficiency rating deviating greater than 5% from zero in either direction should be explored further for validity to prevent an MTF from receiving excessive funds for enhanced efficiency based on intentional manipulation or unintentional erroneous reporting of inputs.

It is important for leaders and supervisors at the clinic level to possess an understanding of the interaction and relationship between FTEs and RVUs and the source of these data fields. Many physical therapy clinics are managed by a clinician who is occupied with providing quality patient care over managing the clinic. Some larger clinics may have administrative support but

many smaller clinics complete administrative processes internally. Tracking FTEs and RVUs from a higher level is difficult as there is a significant delay in transmission of the data from the MTF into the DOD data repositories. By the time MEDCOM identifies abnormalities at the local level the problem may be chronic with larger consequences. Additionally, analysts remote to an MTF may lose the ability to look at data with the granularity needed to identify the source of a problem. Local clinic chiefs are in the best position to obtain the information needed to track FTEs and RVUs regularly. Once end of month reports are complete in the clinic, the chief can obtain encounter and RVU reports at the provider level. The clinic chief can also obtain the available FTE data from the local DMHRSi system. If the local clinic management understands the efficiency target calculation they can calculate and track production efficiency on a monthly basis without delay. A required monthly report to the physical therapy branch chief or Army Medical Specialists Corps office would allow higher leadership to track production with minimal delay as well.

Future Research

Once the Comprehensive Ambulatory/Professional Encounter Record (CAPER) is implemented, the MEDCOM efficiency targets and this model will no longer be valid. It may be possible to modify this model by using the same independent variables along with the new RVU totals which will be higher with CAPER utilization.

This study can be adapted in multiple ways by further limiting the data set and/or use of later fiscal year data. The study can also be adapted to other product lines or clinics other than physical therapy. The differences among the MTFs across MEDCOM are unlikely to only affect RVU production in physical therapy clinics. Other product lines are likely affected as well by

differences within the MTF. Expansion of this method to other product lines may additionally improve the PBAM method of redistributing funds based on performance.

The variable of most concern for use in the current MEDCOM method or any of the proposed regression models is the clinically available FTE. Currently, MEDCOM accounts for FTEs through DMHRSi, a web based manpower accounting system. Each staff member inputs his or her own time into this system which eventually feeds the EASIV data repository. No reliability studies of the current DMHRSi process or the previous UCAPERS process of accounting for manpower were discovered during literature review for this study. A MEDCOM wide reliability study would be very difficult, however local MTF studies of manpower accounting accuracy are recommended. A similar potential study is evaluating the actual proportions of available time to determine what proportion of total available time is actually spent in clinical care and how close the actual time spent as clinically available comes to the proposed target of 85%.

Appendix A: Commonly used physical therapy CPT codes and associated work RVU value

CPT Code	Short Description	Work RVUs
90901	Biofeedback	.41
95851	ROM evaluation	.16
95831	Strength evaluation	.28
97001	PT evaluation	1.20
97002	PT re-evaluation	.60
97006	Hot pack / ice pack	.06
97012	Mechanical traction therapy	.25
97014	Electrical stimulation, unattended	.18
97016	Vasopneumatic device therapy	.18
97018	Paraffin bath therapy	.06
97022	Whirlpool therapy	.17
97032	Electric stimulation, attended	.25
97033	Iontophoresis	.26
97034	Contrast bath therapy	.21
97035	Ultrasound therapy	.21
97036	Hydrotherapy	.28
97110	Therapeutic exercises	.45
97112	Neuromuscular reeducation	.45
97113	Aquatic therapy / exercises	.44
97116	Gait training therapy	.40
97124	Massage therapy	.35
97140	Manual therapy	.43
97150	Group therapeutic procedures	.27
97530	Therapeutic activities	.44
97535	Self care management training	.45
97542	Wheelchair management training	.45
97597	Active wound care / 20cm or <	.58
97598	Active wound care > 20cm	.80
97750	Physical performance test	.45
97760	Orthotic management and training	.45
97761	Prosthetic training	.45
97762	Prosthetic check out	.25
98925	Osteopathic technique 1-2 segments	.45
98926	Osteopathic technique 3-4 segments	.65

Note: Adapted from Centers for Medicare & Medicaid Services Retrieved January 15, 2008 from http://www.cms.hhs.gov/pfslookup/

Appendix B. MTF name and associated fort, city and state / country by hospital size

Facility	Fort Name	Nearest City	State / Country
AMCs:			
Landstuhl RMC	Landstuhl	Landstuhl	Germany
Brooke AMC	Fort Sam Houston	San Antonio	Texas
Darnall AMC	Fort Hood	Killeen	Texas
William Beaumont AMC	Fort Bliss	El Paso	Texas
Walter Reed AMC	NA	Washington, DC	District of Columbia
Womack AMC	Fort Bragg	Fayetteville	North Carolina
Tripler AMC	Fort Shafter	Honolulu	Hawaii
Eisenhower AMC	Fort Gordon	Augusta	Georgia
Madigan AMC	Fort Lewis	Tacoma	Washington
ACHs:			
121st General Hospital	Camp Kasey	Seoul	Korea
Heidelberg MEDDAC	Heidelberg	Heidelberg	Germany
Wuerzburg MEDDAC	Wuerzburg	Wuerzburg	Germany
Baynes-Jones ACH	Fort Polk	Leesville	Louisiana
Evans ACH	Fort Carson	Colorado Springs	Colorado
Irwin ACH	Fort Riley	Manhattan	Kansas
Leonard Wood ACH	Fort Leonard Wood	Waynesville	Missouri
Reynolds ACH	Fort Sill	Lawton	Oklahoma
Dewitt ACH	Fort Belvoir	Fort Belvoir	Virginia
Ireland ACH	Fort Knox	Radcliff	Kentucky
Keller ACH	US Military Academy	West Point	New York
Blanchfield ACH	Fort Campbell	Clarksville	Tennessee
Martin ACH	Fort Benning	Columbus	Georgia
Moncrief ACH	Fort Jackson	Columbia	South Carolina
Winn ACH	Fort Stewart	Hinesville	Georgia
Bassett ACH	Fort Wainwright	Fairbanks	Alaska
Weed ACH	Fort Irwin	Barstow	California
AHCs:			
Munson AHC	Fort Leavenworth	Leavenworth	Kansas
RW Bliss AHC	Fort Huachuca	Sierra Vista	Arizona
Guthrie AHC	Fort Drum	Watertown	New York
Kenner AHC	Fort Lee	Petersburg	Virginia
Kimbrough ACC	Fort Meade	Odenton	Maryland
McDonald AHC	Fort Eustis	Newport News	Virginia
BG Crawford Sams AHC	Camp Zama	Tokyo	Japan
Lyster AHC	Fort Rucker	Enterprise	Alabama

Appendix C. FY 2008 Ortho PPS Rates

MTF	PPS Rate
Bayne Jones ACH-Ft. Polk	$58.56
Brooke AMC-Ft. Sam Houston	$58.44
Darnell AMC-Ft. Hood	$58.44
Evans ACH-Ft. Carson	$59.59
Irwin ACH-Ft. Riley	$58.26
FLW ACH-Ft. Leonard Wood	$57.23
Munson AHC-Ft. Leavenworth	$58.26
RW Bliss AHC-Ft. Huachuca	$60.14
Reynolds ACH-Ft. Sill	$58.56
WilliamBeaumont AMC-Ft. Bliss	$58.44
Dewitt ACH-Ft. Belvoir	$63.53
Guthrie AHC-Ft. Drum	$60.38
Ireland ACH-Ft. Knox	$58.69
Keller AHC-West Point	$61.17
Kenner AHC-Ft. Lee	$59.53
McDonald AHC-Ft. Eustis	$59.53
Patterson AHC-Ft. Monmouth	$62.25
Kimbrough ACC-Ft. Meade	$61.77
Walter Reed AMC	$63.53
Womack AMC-Ft. Bragg	$58.69
Blanchfield ACH-Ft. Campbell	$58.69
Eisenhower AMC-Ft. Gordon	$58.69
Fox AHC-Redstone Arsenal	$59.17
Lyster AHC-Ft. Rucker	$59.17
Martin ACH-Ft. Benning	$58.69
Moncrief ACH-Ft. Jackson	$58.93
Winn ACH-Ft. Stewart	$58.69
Bassett ACH-Ft. Wainwright	$64.37
Madigan AMC-Ft. Lewis	$59.35
Weed ACH-Ft. Irwin	$60.92
Tripler AMC-Hawaii	$60.32

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