Establishing the Environment for Implementation of a Data Quality Management Culture in the Military Health System

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Abstract

This paper will explore the literature to establish the importance of data quality, assess environmental factors, and define data quality. It will then turn to a discussion of the problems with data quality, their causes, assessment and solutions. Findings from the literature are paralleled to applications within the Military Health System (MHS).

With the background established, we propose application of total data quality (TDQM) concepts with emphasis on leadership intervention and the importance of data quality measurement to implementing the first step of TDQM, establishing a data quality environment. Finally, a large-scale data quality measurement initiative is described and recommendations are made for organizations to incorporate TDQM into their business processes.

Acknowledgements

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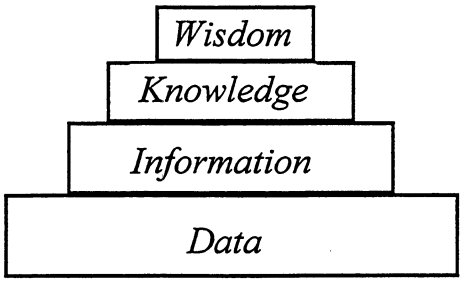
1.0 Introduction

Data quality is critical to the survival of organizations because, in the words of Ballou and Tayi (1), "data has become the raw materials for the information age." On the information pyramid (6) in Figure 1 below, data is depicted as the building blocks upon which is built the foundation and structure of corporate information, knowledge and ultimately, wisdom. After people, data may be the most important resource for the long-term survival of many organizations.



Information Pyramid

Figure 1

In business, "data is the key to competitive advantage" according to Chris Firth of Citibank (8). His statement can be expanded by adding: "Good data is the key to competitive advantage. Bad data is the key to competitive disadvantage."

Dr. Richard Wang, Co-Chairman of the Total Data Quality Management Program, Sloan School of Business, Massachusetts Institute of Technology, has said "The social and economic impact of poor-quality data costs billions of dollars" (12). For example, in 1993, an operational data error led to the loss of $500 million for Salomon Brothers (8). Poor data quality was also sited as a major reason for TRW being sued in 1992 (8), and there are many other examples.

The quality of data is also important to health care systems, although this research did not reveal extensive treatment of this subject in the health care literature. Vast amounts of healthcare data are collected for clinical, financial, employer reporting, physician profiling, and utilization analysis, among other reasons. Organizations which process health care claims data received from multiple, disparate sources, "face tremendous challenges in converting this data into a usable product" in the words of Melissa Tzourakis (10).

The Department of Defense's (DOD) Military Health System (MHS) implemented major initiatives to improve data quality (3). Senior leaders of the MHS believe that in military health care, poor data quality can result in outcomes that range from bad business decisions to the loss of life. Colonel Gail Maestas, Executive Director of the Corporate Executive Information System (CEIS), an executive information/decision support system currently being deployed throughout the MHS, has depicted the assumptions that must be made in order for an MHS leader or manager to believe that data quality is important (13). These assumptions are shown in Figure 2 below.

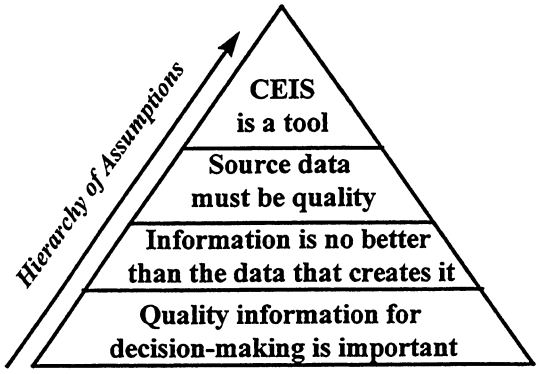


Figure 2

At the base of the diagram is the assumption that quality information is important for making good decisions. The second assumption is that information is no better than the data that creates it. The third assumption states that source data must be quality in order for quality information to be produced. The forth assumption made by Col Maestas is that CEIS is useful as a decision-making tool only if the source data is of high quality. The first three of these assumptions are self-evident to any audience. The forth assumption is contextually bound with the CEIS effort. This project encompasses a $800 million life-cycle project to migrate 117 automated information systems into one executive information system to provide a quality decision-support capability to what otherwise has been a universe of data which previously have been difficult to refine, distill and use for decision-making.

1.1 Environmental Factors

Environmental factors have added to the pressure to rely more heavily on data for decision-making. The health care scene, as well as the general climate in business, has been one of turbulence for at least the last decade. The 1990s is a decade marked by cutbacks, reorganizations, and corporate failures, as well as the introduction of new technologies for doing business. This environment has impacted most organizations.

Like other large corporations, the MHS has been downsized and consolidated. As the size of the military force has been reduced over the past several years, the size of the medical infrastructure has also been reduced. As reductions have occurred, consolidations have taken place to gain efficiency and reduce costs. In the past, each of the three major military Services, Army, Navy and Air Force, has operated its own medical system, complete with separate cultures, priorities, budgets, management and information systems. The Department of Defense's (DOD) efforts to mesh these organizations into an interoperative medical system has had, and continues to have its operational challenges. A side benefit of this merging of capabilities, however, has been the uncovering of data quality deficiencies that plagued their information systems for years, many unrecognized and most unresolved.

The political environment also impacted MHS operations. Budget deficiencies are one impact that resulted from dollars being committed to support priorities other than health care. Another outcome is the outsourcing of parts of the MHS to civilian health care companies

through contracts under a program named TRICARE, which is the DOD's managed care plan. This "triple option" health care plan encompasses a health maintenance organization (HMO), preferred provider organization (PPO), and standard indemnity options for beneficiaries. It is being implemented world-wide throughout the MHS.

It is generally agreed that managed care lives and dies by the quality of its data. The MHS is finding truth in this statement. TRICARE created new risks for several reasons. The major risk stems from the fact that the TRICARE contractor is paid based on data from information systems. The DOD bases these payments on combinations of data reflecting the volume of enrollees and types and amounts of services provided. Inaccurate data can result in huge overpayments to managed care plans. Poor quality data could spell disaster for the MHS. This risk to system viability is compounded by the necessity for interoperability among information systems. Not only do these information systems need to communicate with one another, they must now communicate with the systems of civilian managed care plans. Therefore, vulnerability is heightened for generating poor data quality.

1.2 Data Quality Defined

The literature supports the premise that data quality is important and provides a framework for managing data and its improvement. Operational definitions are the logical place to start. A widely accepted definition of data considers it as having three components (11). First, it is an "entity" which is a model of some part of the real world. Second, a data item is defined by a list of attributes. These attributes identify individual occurrences, for instance, "employee number" or specify a fact or property, like "employee date of birth." The third component of a data item is that it has a value or domain, which consists of a set of values permissible for the attribute.

Data quality is a measure of conformance to a set of standards. The Federal Information Processing Standards (FIPS) publication 11-3, American National Dictionary for Information Systems (February 1991) (17) defines data quality as "the correctness, timeliness, accuracy, completeness, relevance, and accessibility that makes data appropriate for use." This definition includes some of what Strong, Lee and Wang call the dimensions of data quality (16). They identified 16 dimensions of data quality in four categories which are intrinsic, accessibility, contextual and representational. Including these dimensions in considering data quality acknowledges the fact that data's value is not in its own right but rather in what it contributes in a larger perspective. Data must be of quality at the intrinsic level but must also be accessible to be useful. It must be data of a type that has meaning in the context of the activities being performed, and it must be understandable to users to have meaning. Deficiencies in any of these dimensions render data unfit for use and, therefore, of poor quality.

2.0 The Problem With Data Quality

There are many reasons for data quality problems. The literature is replete with indications of these problems. Washington Technology reported on December 7, 1995 that, "It's

one of the unpleasant axioms of the computer revolution: Bad data has a tendency to drive out good data as databases expand to billions and even trillions of bytes." Technology provides the capacity to access, capture, organize, manipulate and store previously unthinkable volumes of data in computers. Segev wrote, "Advances in communication and computing technologies coupled with cross-functional business have changed data flows dramatically" and therefore, data have proliferated in an "unmanaged manner" (15). Not surprisingly, data is being used in ways it was never intended, so in some cases, it may not be the data that should have been designed for the intended purpose.

Today, wherever data originates and regardless of its design, it is likely destined for storage in a data warehouse. The risk created when this occurs is substantial in the transactions that populate these warehouses. Celko and McDonald (2) said that legacy data contamination has a compounding effect in a data warehouse. They estimated that 80 percent of queries accessing information from a data warehouse will access areas of contaminated data. They say that "garbage in, garbage out is true with a vengeance in a data warehouse." The risk is that contaminated data is being interfaced with data from other systems and broadcast to the world in an unmanaged manner, resulting in further compromised data, impaired decision-making and poor outcomes.

According to Heinz and Tzourakis, "As data and information become key strategic resources, poor quality can have significant consequences on the ability of organizations to fulfill their missions." From their experience, data from state health databases is "so highly suspect" that, in many cases, it can not be used for making policy decisions or related analysis (10).

2.1 MHS Data Quality Problems

The mere fact that the MHS is composed of three separate military services, which have not worked in close cooperation in the past, is an important factor responsible for variation that is seen among the Services' methods for managing information. Different cultures, regulations, management priorities, policies and procedures govern the facilities of the three Services. With the size and complexity of the MHS, as well as the varied information systems and associated policies, it is easy to understand why data quality is an issue.

The MHS is the largest health care system in the United States (9). It is responsible for the health care of approximately 8.2 million beneficiaries, provides services world-wide, operates 107 hospitals and 480 clinics, has 150,000 employees and partners with thousands of civilian physicians and other health care providers. It carries out these responsibilities in peace- and wartime and in facilities from 1000 bed medical centers to tents in the desert. Patient care ranges from the encounter of a patient sitting on an exam table talking directly with a doctor to organ transplantation, or even to evaluation of an electronic image beamed half-way around the globe via telemedicine technology.

Every patient interaction is reflected in "data" that reside in one of 100s of databases. Data standardization, consistency, timeliness, accuracy, and completeness are all recognized as long-standing problems. Despite significant progress in the last ten years in standardizing

medical information systems across the three Services, Service-unique information systems and lack of consensus on a number of information management issues still exist. Reaching consensus on these unresolved issues and system changes offers unique challenges to the institution of a data quality assessment program throughout MHS. Described below are some of the specific data quality issues experienced throughout the MHS.

System Interoperability. Most of the current major standard medical information systems have been operational for over fifteen years. These systems have, by-and-large, been classic "stove-pipe" systems where a particular medical function recognized a need for a specific application and built an isolated system to fill that need without consideration of other applications that might also be able to use the same data. In some cases the functionality of these systems was mandated by Congressional or other regulatory mandate. The differences in hardware, software, data definitions, etc., made interoperability among information systems difficult at best. These differences also promoted double-entry of data with the corresponding inconsistencies. Each system defined some of the most basic data elements differently, such as "outpatient visit," "bed day," "patient identification," and "provider identification." These are all well-known problems in the MHS, and a number of efforts have been taken to resolve them with varying degrees of success. Additionally, incorporating large managed care support contractors as partners in delivering care to military beneficiaries under the TRICARE program, has generated new information system problems. Engineering the civilian managed care contractors' information systems to interface with MHS facilities' information systems, particularly in the areas of enrollment, patient appointments, and scheduling, poses substantial interoperability and data quality issues. When fully implemented, the CEIS effort is intended to be the long-term solution for many of these problems.

Relevance to Facility Users. In the past, most of the MHS information systems were built using a top-down approach. The designers of the systems were primarily at headquarters levels, where they understood the corporate uses of the data but were not as familiar with the facility-level uses and problems of the data that were entered at the facility level. Due to these practices, the facilities received little value from that data. They did not feel obliged to take ownership of the data, and they had no incentive to assure its quality. Not only were the incentives lacking, but the tools, metrics, and guidance for a facility to determine the quality of their data were virtually nonexistent. Thus, it would have been difficult for a facility to measure its data quality, even if that was its desire. One of the basic objectives of CEIS is to turn this paradigm around. Medical facility managers are being given ownership of the data and the responsibilities that go with ownership. In return, the facilities are being provided systems, such as CEIS, training in data quality processes as well as metrics enabling the to use their data in real time to make the critical decisions required in the dynamic environment. The presumption is that once facilities understand the value of accurate data in their day-to-day operations, they will be motivated to improve data quality so they can operate at optimal efficiency.

Changing Data Requirements. In concert with initiatives in the civilian medical community, the MHS made significant changes in the last few years in the philosophies of health care delivery. One of the major changes is the movement into managed care, which is often said to be "data driven." Along with the move of the MHS toward managed care has been the

accompanying movement into capitation budgeting. Resources were formally allocated to facilities based on historical workload volume and intensity. The incentive was for facilities to deliver more care and thus receive more resources for the workload they produced. This "churn and earn" philosophy kept facility workloads high but also made the total cost of health care in the MHS skyrocket. Under capitation budgeting, the health care system is paid one fixed price per enrollee to manage all covered health care and associated costs for the beneficiary population. This change in business practice caused a shift in MHS information requirements. Previously, there was little interest in per capita statistics; these are now critical performance indicators. To effectively manage making use of per capita data requires accurate actuarial, cost, and utilization data and the ability to analyze and make decisions based on this data. In managed care, the very existence of the organization depends upon the quality of its decision-support data.

Interpretation Variance. Even when there is consensus among the three Services on data definitions, policies, and standards, there have been different interpretations of some of these definitions among the Services and even among the different facilities within a single Service. One of the objectives of the data quality assessment effort is to identify, clarify, and standardize those areas subject to different interpretations through the implementation of standard business practices, education, data elements and data definitions.

Faulty Business Rules. In an organization practicing the total quality management (TQM) philosophy, one of the indicators of a faulty business system is the practice of members of the organization circumventing the business rules to accomplish their work functions. Under TQM, the assumption is that people want to do a good job and given the right tools, they will do so. In the MHS there are instances of wide-spread circumvention of business rules in order to accomplish the mission. Even with clear guidance, personnel in a facility may purposely input erroneous data for the sake of saving time. For instance, if there is a forty five minute patient waiting time at the pharmacy for a prescription and the pharmacy technician receives a prescription without an expense code, he or she can either make an assumption about the code, thus expediting the prescription, or take the time to call the prescribing provider to get the proper code. Expediency will likely win out over accuracy. In another case, all personnel employed in MHS medical facilities are required to complete monthly time sheets indicating the accounts (work centers codes) to which their time should be charged. Faced with twenty seven different time codes and the daily demands of patient care, many busy providers do not understand or consider the importance of these time sheets. They may not complete these reports, or they may have an assistant record standard times to save time. There are numerous other cases where business rules promoted or allowed manipulation of data to the detriment of the quality of the data.

Timeliness. Timeliness may actually be a symptom of the lack of leadership support and emphasis. Those things that are considered most important by the leadership are the things done first and well. Data quality recently gained importance as indicated by DOD's commitment to the development of CEIS. With increased emphasis by MHS leadership, increased confidence in the data, and more necessity to rely on data for decision-making, timeliness issues should subside. Data quality improvement activities will have to answer these issues and include better education and system support if they are to improve these business processes.

2.2 New Information Requirements

With the aforestated problems and data quality challenges, the MHS's predicament has, in many ways, mirrored the challenges and problems borne out in the literature. The MHS initially entered partnerships with managed care plans under multi-billion dollar contracts using many of the same business practices and information systems it used when most all of its health care services were provided by its own medical facilities. Many of the MHS's business practices and information systems have been in place for many years. These practices and systems were not designed for tracking and analyzing managed care contracts, improving clinical care or as a basis for budgeting based on the health care needs of an enrolled population. As stated earlier, they were designed for reporting activity and providing accountability to Congress. They justified the allocation of resources based on volume of work done.

When MHS business changed under TRICARE to one based on meeting the health care needs of an enrolled population, business practices and information systems have also had to change to support new priorities. Not surprisingly, the data needs also changed. Thus, the "dimensions" of data quality which are important to MHS business changed and the time requirement for the management system to react to the new requirements is a major risk.

On the other side of the spectrum, advances in technology, such as the use of the open systems environment, distributed data processing, data warehouses and the Internet, coupled with increasing user friendliness of information systems, have created new information processing capabilities which have been followed by new business practices. In the MHS, use of these capabilities has transformed data use and communication processes. In the old world, MHS systems were not interoperable with one another. The costing, workload, and enrollee tracking systems did not communicate. They could report information from each of these systems but it could not be determined, for instance, how much it costs for enrollee, John Smith, to have bypass surgery at Walter Reed Army Medical Center. Under TRICARE, it is crucial to know this type of patient level information to be prudent purchasers of care. Since data wasn't combined into this type of information in the past, it was unknown where the data quality problems were or their impact. In the old world, volume of data was the most important thing, for instance, numbers of patient visits, hospitalizations, babies delivered, etc. Data Quality was largely assumed. In the new environment, under TRICARE, data quality and the impetus for data to become decision-support information has risen to a peak of importance.

3.0 The Corporate Solution

The MHS is implementing CEIS to meet its requirements for a decision support capability in the new business environment. Through implementation of this system, the MHS is attempting to manage and control the proliferation of data. CEIS has a client-server architecture and uses commercial off-the-shelf (COTS) technology for the application layer and database management system (5). It is a system for integrating executive information support requirements across the MHS to provide timely, accurate and useful information to assist MHS medical facility and corporate managers in directing their organizations. The CEIS is being

installed in all MHS hospitals and clinics where it collects data from source systems and transfers it to one of twelve regional data warehouses. From the data warehouses, data are made available to users through data marts which provide standard and ad hoc reports. The front-end user interface is through commercial products from HBO&C, called TRENDSTAR, TRENDPATH, and QUANTUM.

During the design and testing phases of this implementation, the migration of data from the legacy systems to the data warehouse was an eye-opening experience for MHS managers. This process revealed many of the variations in data. Even though, in many cases, the data definitions were the same among systems and Services, the interpretations of the definitions were different. Definitions as basic as the "admission" of a patient to a hospital had been interpreted differently among the military services. Because of the criticality of establishing and maintaining quality data in CEIS, an organization was established to oversee and champion the cause of data quality in the medical system. The functions of this organization will be presented later in this discussion but it has been largely responsible for proliferating the concepts and processes used to improve data quality.

3.1 Concepts on the Achievement of Data Quality

Concepts on the achievement of data quality are not been widely prevalent in health care or management literature. However, there is a growing body of knowledge on this subject in the information management literature. Evans (7) proposed a total quality management based framework for achieving data quality. His model focuses on the customer's needs, leadership, teamwork, continuous improvement, measurement, benchmarking, and the Plan-Do-Check-Act process. Segev proposed a "Framework for Information Quality" (15) which establishes organizational awareness, defines data quality, establishes information flows, identifies problems and solutions, and evaluates costs/benefits tradeoffs.

The *Department of Defense (DOD) Data Quality Management Guidelines* depicts a process for continual improvement of data quality. The steps in the process are depicted as follows, and in Figure 3: to establish the environment, scope data quality projects, develop implementation plans, implement data quality projects and evaluate the data quality management process.

TDQM Process

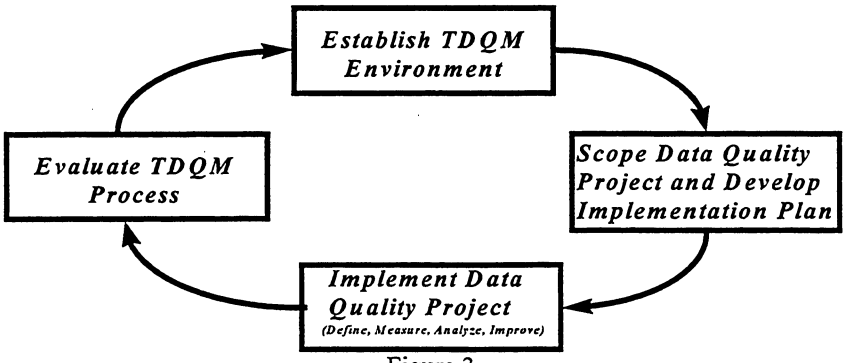


Figure 3

With each of these processes, the key ingredients are management attention, a continual process of determining what is important, working on initiatives to improve them, evaluating actions and results and starting over again. In general, the literature indicates that data quality is a subject area to be managed just like the other core functions of the business.

4.0 Application of Total Data Quality Management in the MHS

The processes of quality management are beginning to be applied to the management of data quality in the MHS. These processes refine the activities of data quality management into those that impact three primary components of organizations; culture, process, and people (4). These are the focus areas for effectively managing data quality as depicted in Figure 4 which follows.

Organizational Components Impacted by TDQM

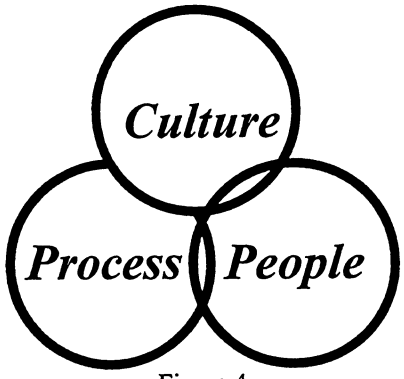


Figure 4

This paper will spotlight the cultural issues being addressed by the MHS to achieve data quality and focus on possibly the most powerful cultural tool available to the manager, measurement.

Establishing an organizational culture that believes and acts as if data quality is important is an imperative to obtaining systemic organizational data quality. The *DOD Data Quality Management Guidelines* explains that the first step is to establish a total data quality management environment. This is the most difficult step because it involves changing the culture of the organization. "Corporate culture is not something that just appears. Companies - and bosses - have to work at it" (14). The leadership of the organization must buy-in to the belief that data quality is important and must be managed and not merely assumed. The MHS has stated its belief in the importance of data quality at the highest management level. The Army Surgeon General made the following comments in his June 1998 update (18). "Good data is not only critical ...., but data quality will be increasingly critical to our success in managing our day-to-day operations in a managed care environment...Without good data into the system, there is no way we can get good data and information out. Ensuring that attention is given to data quality is a leadership issue. I'm committed to ensuring we have the best possible data so we can make the best possible decisions."

4.1 Leadership Intervention

The DOD established a vision of "Information Dominance" as its guiding beacon. This goal cannot be achieved without data quality. Major steps were taken to establish a total data quality management environment. These steps include the development of a strategic plan which encompasses data quality, a data quality plan for the MHS and active hands-on management of the cultural environment.

The strategic plan provides overall direction for data quality management. The MHS Data Quality Plan supports the strategic direction of the MHS by establishing goals, objectives, strategies and process for obtaining them. Other related support documents provide process and strategy guidance.

Management of the cultural environment involves providing incentives and support that cause actions which improve data quality. The many needs for MHS data quality improvement, apparent from earlier discussion in this paper, led to the establishment of a data quality organization, the Statistical Quality Control Branch (SQCB). The mission of SQCB is to facilitate data quality improvement through implementation of data quality practices and assisting with cultural change.

SQCB's early efforts were to educate MHS leadership and medical facility personnel on the importance of data quality and assist facilities in improving data quality. This office conducted five data quality conferences across the United States and in so doing provided data quality education and training to approximately 1,200 personnel from 126 medical facilities and several corporate headquarters. The education portion of the conferences focussed on the more theoretical concepts of the importance of data quality. The training aspects of the conferences centered around practical applications in conducting measurements of the data quality at medical facilities. The centerpiece of this training effort was a guide, the *CEIS Data Quality Management Guide*. It explained procedures for measuring the data quality of the source data collection systems that would populate CEIS. The primary reason the guide was developed was to show military leadership the status of their data before implementation of CEIS so they would understand the quality of the data being reported through CEIS after its implementation. The information about MHS data quality gained from conducting these metric assessments garnered further cultural change by illuminating the need for and importance of data quality to the strategic business processes of the MHS.

5.0 Data Quality Measurement Study

The methods, procedures and results of this substantial data quality measurement effort are reported in the analysis which follows.

5.1 Design of Measurement Process

Medical facilities which participated in the data quality conferences were asked to participate in an assessment of data quality at their facilities using the metrics contained in the

CEIS Data Quality Management Guide. This guide contained eleven metrics developed by a working group of functional expert users of the information systems in medical facilities. The data elements assessed were selected based on their relative importance to managed care success as assessed by working group members. The working group developed formulas and a template of information to be assessed by the metrics. The metrics and their operational descriptions are described at Appendix A.

Medical facility personnel were given approximately thirty days to conduct the data quality self-assessment process. Then they were requested to answer a survey about results of their data quality assessment. The survey instrument administered is at Appendix B. Its purpose was to: document the baseline data quality metric scores of medical facilities, determine why facilities didn't meet the standard established for each metric, determine the value of the metrics contained in the guide, determine the clarity of the guide and determine the level of effort required to complete the data quality self-assessment process.

Follow-up telephone calls and written correspondence were sent to facilities which did not respond to the initial survey request with positive results. Facilities were also provided assistance in completing the baseline assessment/metric survey process through telephone/email access to a subject matter expert. Results of the initial baseline assessment of data quality are presented in the following section.

5.2 Survey Response

One-hundred-one (101) surveys were returned from a population of one-hundred-eleven (111) potential respondent facilities for an overall response rate of approximately .91. However, not all facilities assessed all metrics and/or answered all questions. In some instances, non-responses were appropriate. For instance, metrics 5 and 7 did not apply to clinics, so they would not be expected to have answered them. Thus, survey results have varying response rates for each metric.

5.3 Analysis of Metric Values

As Table 1 depicts, most of the metrics had a standard of one hundred percent. However, values greater than or less than one hundred percent were reported. This fact had the impact of rendering the arithmetic mean of the metrics of limited value. To control for this circumstance, reported values of greater than one hundred percent were converted to their inverse. For example a value of one hundred-twenty (120) percent (120/100) was converted to 83.3 percent (100/120). This adjustment made the mean of the individual metric values much more meaningful for comparative purposes and provided a more accurate representation of the actual mean scores. For historical purposes, the metric values as reported (before conversion) are provided in Appendix C. One additional change was made to simplify the analysis. Except for Metric 6, the standard for each numeric metric (Metric 9 was reported as "Yes" or "No") was one hundred (100) percent. The standard for Metric 6 was five (5) percent. For the purpose of calculating the overall average of all metrics combined, Metric 6 values were converted to a one hundred (100) percent standard by subtracting the reported value from one hundred (100) percent (e.g., a

reported value of twelve (12) percent would be converted to eighty eight (88) percent). This conversion was made only when calculating the overall metric averages.

Table 1 summarizes responses to Question 1 of the survey by reporting metric standards and the adjusted averages of the reported metric values for the DOD and all three Services. The DOD column represents the aggregate of all three Services. Differences of more than two (2) percent between the DOD average and Services' averages were "flagged." Differences of a positive nature were **bolded**. Differences of a negative nature were *italicized.* Differences of more than five (5) percent were also underlined. Appendix D displays the DOD and Service metric values in a line graph format.

Table 1 Metric Results

	Metric Description	Stand	DOD Avg	Army Avg	AF Avg	Navy Avg
Metric 1	CHCS Providers vs. Staffing Docs	100%	84%	86%	**87%**	*74%*
Metric 2	CHCS Providers by MEPRS Code	100%	86%	*80%*	**90%**	*82%*
Metric 3	CHCS Providers by Provider Type	100%	89%	**92%**	88%	87%
Metric 4	Locations: CHCS vs. MEPRS	100%	82%	*77%*	82%	**87%**
Metric 5	NAS Comparisons	100%	86%	*83%*	87%	87%
Metric 6	Incomplete ADS Visits	5%	15%	14%	14%	17%
Metric 7	Bed days: MEPRS vs. WWR	100%	99%	99%	99%	99%
Metric 8	Visits: MEPRS vs. WWR	100%	98%	98%	99%	*94%*
Metric 9	Clinical Pathology Comparison	None	N/A	N/A	N/A	N/A
Metric 10	SADR Encounters vs. WWR Visits	>=100%	61%	**70%**	*48%*	**72%**
***Average**			86%	86%	85%	85%

* When calculating the averages, Metric 6 values were subtracted from 100%.

The overall DOD mean for all metrics and all facilities was eighty six (86) percent. The mean for each of the three Services was within one (1) percent of the DOD average (Army, eighty six (86) percent; Air Force and Navy, eighty five (85) percent) indicating that all three Services can be considered among the same population as relates to the data quality of their information systems. The metrics involving Worldwide Workload Report (WWR) comparisons (Metrics 7 & 8) scored highest across the board. The DOD averages for these two metrics were ninety nine (99) percent and ninety eight (98) percent, respectively. The Ambulatory Data System (ADS) metrics (Metrics 6 & 10) were consistently the most problematic. The DOD average for Metric 6 was fifteen (15) percent and for Metric 10 was sixty-one (61) percent. This status is likely attributable to ADS being a newly implemented system. In general, the four metrics involving Composite Healthcare System (CHCS), staffing and locations (Metrics 1-4) and the Standard Ambulatory Data Record (SADR) encounter metric (Metric 10) showed the highest variability among the Services. Metric 10, in particular, showed a great variance (twenty four (24) percent) with the Air Force reporting forty eight (48) percent and the Navy reporting seventy two (72) percent. The variance among the Services for Metrics 5-8 was less than five (5) percent for each metric.

As shown in Appendix C, the reported cause of data quality problems was consistent across all three Services and virtually all metrics. Data Entry problems ("Errors" or "Delays") were identified as the major reason for problems for nine of the ten metrics. Metric 5 (non-availability statements (NAS) comparison) reported "System Errors" as the leading problem. There seems to be a broad perception among respondents that "Data Entry" is a major problem. "Insufficient Training" was identified as the major secondary cause of problems for the metrics. These perceptions may indicate that personnel entering data at facilities are not being well-trained and/or that there are not sufficient management controls in place to monitor the quality of data quality at the point of input. This issue should be researched further.

5.4 Metric Evaluation

In addition to reporting metric values and associated problems, the survey also evaluated the metrics themselves. The level of effort to complete each metric, an assessment of the value of the metric to the facilities, and an assessment of the clarity of the metric guidance were all included in the metric summary. Table 2 shows the results of the metric evaluation.

TABLE 2 - METRIC EVALUATION

		Quest 3	Quest 4	Quest 5	Quest 6	Quest 7
		Avg	Avg	Avg	Agree	Guide
	Metric Description	People	Hours	Days	Import	Clear
Metric 1	CHCS Providers vs. Staffing Docs	3.2	9.7	4.8	3.0	2.2
Metric 2	CHCS Providers by MEPRS Code	2.9	8.3	4.2	2.9	2.1
Metric 3	CHCS Providers by Provider Type	2.4	8.0	3.9	2.8	2.4
Metric 4	Locations: CHCS vs. MEPRS	2.2	4.5	2.3	3.1	2.6
Metric 5	NAS Comparisons	2.0	3.7	2.8	2.9	2.9
Metric 6	Incomplete ADS Visits	1.5	4.2	2.0	3.4	2.9
Metric 7	Bed Days: MEPRS vs. WWR	1.7	2.0	1.7	3.3	3.2
Metric 8	Visits: MEPRS vs. WWR	1.7	3.2	2.2	3.3	3.2
Metric 9	Clinical Pathology Comparison	1.6	3.9	2.0	2.9	2.7
Metric 10	SADR Encounters vs. WWR Visits	1.7	3.5	1.8	2.7	2.9
DOD	Total	20.9	51	27.7		
	Average per Metric	2.1	5.1	2.8	3.0	2.7
Army	Total	20.3	70.4	25.2		
	Average per Metric	2.0	7.0	2.5	3.3	2.8
Air Force	Total	21.7	41.7	22.1		
	Average per Metric	2.2	4.2	2.2	2.9	2.6
Navy	Total	19.6	48.8	44.5		
	Average per Metric	2.0	4.9	4.5	3.1	2.9

5.4.1 Level of Effort (Questions 3-5)

According to the averages reported for all DOD Facilities, it took 2.1 people at each medical facility a total of 5.1 hours over a 2.8-day period to complete each metric. The average total time to complete all 10 metrics was fifty one (51) hours. There was considerable variation in the time reported to complete the metrics among the Services. One medical facility reported that it took one hundred seventy (170) individuals a total of three thousand two hundred forty (3,240) hours to complete a single metric (Metric 8). Since this was clearly an outlier which would greatly skew the averages, these values were not included. The Army reported that it took 70.4 hours to complete the ten metrics while the Air Force reported only 41.7 hours. The Navy reported 48.8 hours. Most of the variance was caused by the differences in calculation time for the first three metrics. The larger size of the facilities in the Army versus the Air Force may account for the additional time required for the Army to calculate those first three metrics. The Navy's completion times were unremarkable except for Metric 9, on which it reported an average of almost eight hours to complete the metric, which was well over twice the average for the Air Force and Army. Tables depicting the results of Questions 3-7 by Service can be found in Appendix E (Army), Appendix F (Air Force), and Appendix G (Navy). A line graph depicting the results of Question 4, "Average Hours to Complete the Metric," is shown in Appendix H.

5.4.2 Importance of Metric (Question 6)

Facilities were able to rate the importance of each metric by choosing a letter between "a" and "e" inclusive with "a" representing strong agreement that the metric was important to their medical facility in measuring data quality and "e" indicating strong disagreement with the value of the metric as an indicator of data quality. A weighting method similar to scholastic grade point calculations was used to aggregate reported responses. An "a" was assigned four points, "b" three points, "c" two points, "d" one point, and "e" zero. Thus, an average of 4.0 would be a perfect score and would mean that every medical facility "Strongly agreed" that the metric was very important. Table 2 shows that the overall average for all medical facilities for all metrics was 3.0. The Army consistently thought the metrics were more important than the other facilities in its reported average of 3.3. The Navy average was 3.1 and the Air Force average was 2.9. The Army and Air Force rated the individual metrics consistently relative to grading severity. That is, the Army consistently graded higher than the grand mean and the Air Force consistently graded lower; however, both Services scores consistently moved in the same direction. Except for Metric 5 (Navy rated 2.6, which was lowest score of all Services for all metrics) and Metric 6 (Navy rated 3.6, which was highest score of all Services for al metrics), the Navy was very close to the DOD average. A line graph displaying the ratings by Service and by metric is provided in Appendix I.

5.4.3 Clarity of Guidance (Question 7)

Question 7 was analyzed in the same manner as Question 6 by using the scholastic grade point average methodology. Table 2 shows that the overall rating for all 10 metrics for all reporting facilities was 2.7. For this question, the Navy proved to be the most generous rater

with an overall average of 2.9. This was followed by the Army (2.8) and the Air Force (2.6). Guidance for the first three metrics was rated lowest by all three Services. The average for all facilities for these three metrics was 2.2, 2.1, and 2.4, respectively. On the high side, Metrics 7 and 8 had the highest ratings at 3.2. Again, these high ratings were consistent among all three Services. Appendix J displays the ratings in a line graph format.

5.5 Summary

In general, the analysis showed that comparison among the Services is more remarkable in similarities rather than differences. Consistently across the Services, Metric 10 showed the largest variance from the standard and Metrics 7 and 8 showed the smallest variance. There was also a great deal of consistency as to which metrics were considered important and for which metrics the guidance was clear. That is, if the Air Force thought a Metric was important and the guidance clear, so did the Army and Navy. The most significant variance had to do with the amount of time required to complete the surveys. The Army reported it took more than 50 percent longer to complete the survey than the Air Force (70 hours vs. 42 hours).

5.6 Conclusion

This analysis provides valuable insights into the use of metrics as indicators of data quality within the MHS. The metric assessment conducted by medical facility personnel revealed significant data quality problems within important data elements used by the MHS. The aggregate eighty six (86) percent score is well below the MHS standard. This circumstance could have significant negative impact on the financial and resource allocations received by MHS facilities.

Overall, the metrics were considered valuable by the medical facility personnel as indicated by the "B" average they received. Given that the metrics "clarity" was scored by respondents as a high "C" average, they may be made more valuable by explaining them more clearly in future versions of the *CEIS Data Quality Management Guide*. Given the unfamiliarity of the concepts and procedures being described in the guide, respondents likely require more detail in both areas. The amount of time required to assess the metrics by facilities, from forty (40) to seventy (70) hours, is wholly unacceptable for metric assessments to become a standard process within medical facilities. However, some of this time was likely devoted to data cleansing during the assessment process. With additional training and practice, personnel will likely be able to conduct the assessment much faster, however, this process should be automated for greatest efficiency and accuracy. Continued metric assessments should be initiated within the MHS to perpetuate the improvement process. In this regard, a reassessment of these metrics has been initiated and will be reported in subsequent studies.

6.0 Benefits of Data Quality Improvement Efforts

Data quality improvement initiatives have several positive aspects on the MHS and other organizations. When total data quality methods are used, they facilitate systematic improvements in data rather then "shot gun approach" fixes to symptoms caused by data quality

problems. Data improvements are enduring rather than temporary. Data quality initiatives highlight defective business practices. Since data is a reflection of the business itself, where problems in data are identified, there are often times business processes identified which are not operating in the desired manner or the processes themselves may be flawed. In managed care where reimbursement to facilities is based on enrollment and resource use, total data quality management (TDQM) results in the correct payment and resourcing to medical facilities. The data quality process itself requires teaming of medical facility personnel which encourages cross-functional understanding and cooperation.

As specifically borne out in this research, measurement is one of the most effective ways to help change the culture. The old adage, "what gets measured gets fixed" is as true with data quality initiatives as other sciences. Measurement has the power to put common meaning to all who observe its results.

7.0 Keys to Achieving Data Quality

There is a pronounced process that organizations can use to increase the quality of their data. First and foremost, data quality has to be managed to be maintained. It is too important to be assumed or left to the information systems office. This research recommends the use of some form of quality management process, whichever adapts best to the organizational management practices. The three key areas for management focus are culture, process, and people. First and foremost, a culture for quality must be established. It must be important to senior management. They should consider making data quality the subject matter of their strategic and operational plans as well as an agenda item at the highest levels. Establishment of responsibilities for data quality and building them into positions is one effective way to change behaviors and emphasize the importance of data quality management . Data quality should be marketed within organizations, not through slogans but through actions.

Data quality will vary with the quality of business processes. This research recommends the following actions. Develop a strategic plan for data quality. Establish procedures to standardize business processes and the data they generate. Use teams of functional and information systems personnel to develop business rules that build in data quality form the start. Use cross-functional teams to prioritize and solve data quality problems. Make measurement and reporting of data quality a cornerstone of data quality practice. Taking these actions, will assure the organization's ability to use its data for competitive advantage.

Appendix A

Summary Of
Self Assessment Metrics And Reports

Credentialed Providers, Metrics 1-3: These metrics identify the quality of the data elements that comprise the provider file in the Composite Health Care System (CHCS). This file is critical for accurately assigning workload and costs to specific clinical services and providers. It is populated by the medical facility; thus, this is the only place where this file can be corrected and accurately maintained. It is critical that the ancillary medical facility provider files match the quality assurance (QA) module provider list.

1) PROVIDER LIST IN CHCS, METRIC 1

% OF CREDENTIALED ACTIVE PROVIDERS IN PROVIDER FILE IN CHCS VS. MEDICAL FACILITY STAFFING DOCUMENTS

OF CREDENTIALED ACTIVE PROVIDERS IN CHCS X 100
OF CREDENTIALED ACTIVE PROVIDERS PER medical facility STAFFING DOCUMENTS

2) PROVIDER LIST BY MEPRS CODE IN CHCS, METRIC 2

% OF CREDENTIALED ACTIVE PROVIDERS IN QA MODULE OF CHCS AT 3RD OR 4TH LEVEL MEPRS CODE THAT MATCHES medical facility PROVIDERS IN THE medical facility STAFFING DOCUMENT

OF CREDENTIALED ACTIVE PROVIDERS BY MEPRS CODE IN CHCS THAT MATCHES CREDENTIALED PROVIDERS BY MEPRS CODE IN THE medical facility STAFFING DOCUMENT X 100
OF CREDENTIALED ACTIVE PROVIDERS BY MEPRS CODE IN THE medical facility STAFFING DOCUMENT

3) PROVIDER LIST BY PROVIDER CLASS IN CHCS, METRIC 3

% OF CREDENTIALED ACTIVE PROVIDERS BY PROVIDER CLASS IN QA MODULE IN CHCS THAT MATCHES CREDENTIALED ACTIVE medical facility PROVIDERS IN THE STAFFING DOCUMENTS

OF CREDENTIALED ACTIVE PROVIDERS BY PROVIDER CLASS IN CHCS THAT MATCHES CREDENTIALED ACTIVE medical facility PROVIDERS IN THE STAFFING DOCUMENTS X 100
OF CREDENTIALED ACTIVE PROVIDERS BY PROVIDER CLASS PER medical facility STAFFING DOCUMENTS

Active Hospital Locations, Metric 4: This metric identifies the quality of the data elements that report ancillary workload (Pharmacy, Laboratory and Radiology) in CHCS. It assists in properly assigning ancillary workload to a specific clinic (hospital location), which is critical to effectively analyzing resource sharing agreements with the managed care support (MCS) contractor.

4) ACTIVE HOSPITAL LOCATIONS IN CHCS, METRIC 4

% OF ACTIVE HOSPITAL LOCATIONS IN CHCS THAT MATCHES ACTIVE LOCATIONS IN MEPRS DOCUMENTS (OR WHATEVER DOCUMENT HOLDS THE CURRENT HOSPITAL LOCATION FILE LIST)# OF ACTIVE HOSPITAL LOCATIONS IN CHCS THAT MATCHES
ACTIVE LOCATIONS IN MEPRS X 100
OF TOTAL ACTIVE HOSPITAL LOCATIONS IN MEPRS OR CHCS (WHICHEVER HAS THE MOST ACTIVE LOCATIONS)

Non-Availability Statements (NAS) Issued, Metric 5: This metric identifies the quality of the data elements that report the issuance of NASs for Civilian Health and Medical Program of the Uniformed Services (CHAMPUS)-provided care. The NAS issuance is a primary element in the "O" factor for bid-price adjustments. Identification of the accurate reporting system is critical throughout the life of the MCS contract.

Appendix A

Summary Of
Self Assessment Metrics And Reports

5) NASs ISSUED, METRIC 5
% OF NAS COUNTS IN INFORMATION SYSTEM (IS) VS. DEFENSE ENROLLMENT ELIGIBILITY REPORTING SYSTEM NAS REPORT

$$\frac{\text{\# OF NASs ISSUED IN IS X 100}}{\text{\# OF NASs ISSUED IN DEERS}}$$

Ambulatory Data System (ADS) Encounters, Metric 6: This metric identifies the quality of the data in ADS by providing an indication of the completion of these records. The ADS is the system that permits ambulatory workload to be reported based upon acuity and severity and utilization within the medical facility.

6) ADS ENCOUNTERS, METRIC 6

% OF INCOMPLETE ADS ENCOUNTERS AT 4TH LEVEL MEPRS CODE VS. TOTAL ADS ENCOUNTERS

$$\frac{\text{\# OF ADS INCOMPLETE ENCOUNTERS X 100}}{\text{\# OF ADS ENCOUNTERS}}$$

Medical Expense and Performance Reporting System (MEPRS) - Worldwide Workload Report (WWR) Bed Days, Metric 7 and Visits, Metric 8 : These metrics identify the consistency of inpatient and outpatient workload reporting across reporting systems. Use of these metrics will increase the level of accuracy and confidence in workload data reported.

7) MEPRS - WWR BED DAYS, METRIC 7

% OF MEPRS BED DAYS VS. WORLDWIDE WORKLOAD REPORT BED DAYS AT 3RD LEVEL MEPRS CODE

$$\frac{\text{\# OF MEPRS BED DAYS X 100}}{\text{\# OF WORLDWIDE WORKLOAD REPORT BED DAYS}}$$

Appendix A

SUMMARY OF
SELF ASSESSMENT METRICS AND REPORTS

8) MEPRS - WWR VISITS, METRIC 8

% OF MEPRS VISITS VS. WORLDWIDE WORKLOAD REPORT VISITS AT 3RD LEVEL MEPRS CODE

$$\frac{\text{\# OF MEPRS VISITS}}{\text{\# OF WORLDWIDE WORKLOAD REPORT VISITS}} \times 100$$

MEPRS Ancillary Workcenter Cost, Metric 9: This metric identifies the quality of the step-down ancillary cost in clinic MEPRS cost. The accuracy of this data is critical to resource sharing agreement costing.

9) MEPRS ANCILLARY WORKCENTER COSTS, METRIC 9

COMPARISON OF CLINICAL PATHOLOGY COST PER VISIT BETWEEN TWO OR MORE CLINICS THAT HAVE THE SAME 3RD LEVEL MEPRS CODE

$$\frac{\text{TOTAL MEPRS EXPENSE FOR DBAA}}{\text{MEPRS VISITS FOR 4TH LEVEL MEPRS CODE}}$$

Standard Ambulatory Data Report (SADR) Encounters Vs. WWR Visits, Metric 10: This tool identifies medical facility compliance in activating the ADS, clinics' compliance with reporting all encounters into the system, and the medical facility's compliance in the transmittal of the SADR to Fort Detrick.

10) SADR ENCOUNTERS VS. WWR VISITS, METRIC 10

% OF CLINICS WITH SADR ENCOUNTERS THAT MEET OR EXCEED WWR VISITS AT 3RD LEVEL MEPRS CODE

$$\frac{\text{\# OF CLINICS AT THE THIRD LEVEL MEPRS CODE WITH SADR COMPLIANCE OF 100\% OR GREATER}}{\text{\# OF MEPRS CLINICS REPORTING}} \times 100$$

Appendix A

SUMMARY OF
SELF ASSESSMENT METRICS AND REPORTS

Pharmacy Workload\Cost and Provider Visit Model, Metric 11: This **optional** tool assists in validating the assignment of pharmacy workload\costs to the correct clinical service and provider. It demonstrates how the metrics can be used to validate the data facilities generate. This report is produced by the Statistical Quality Control Branch at the request of the facility and results are provided to the medical facility for validation and to identify opportunities for improving local data quality. This report will eventually be reproducible locally through CEIS.

11) PHARMACY WORKLOAD/COST AND PROVIDER VISITS MODEL

CALL SQCB FOR ASSISTANCE WITH THIS OPTIONAL METRIC

Appendix B

Ceis Data Quality Survey Questions

1. What is the metric value for your MTF? (paraphrased)
2. If your MTF did not meet the metric value standard, what is the major reason? (paraphrased)

   a. Data Entry Errors b. Data Entry Delays c. System Errors

   d. System Performance e. Insufficient Training f. Other (specify)

3. How many individuals were directly involved in completing this metric?
4. How long did it take to complete the metric (Total of all individuals)?
5. Over how long a period did it take to complete this metric?
6. "This metric will be very important to our MTF for the purpose of monitoring CEIS Data Quality." (circle one)

   a. Strongly Agree b. Agree c. Not Sure, Don't Know d. Disagree e. Strongly Disagree

7. "The guidance for the completion of this metric was very clear." (circle one)

   a. Strongly Agree b. Agree c. Not Sure, Don't Know d. Disagree e. Strongly Disagree

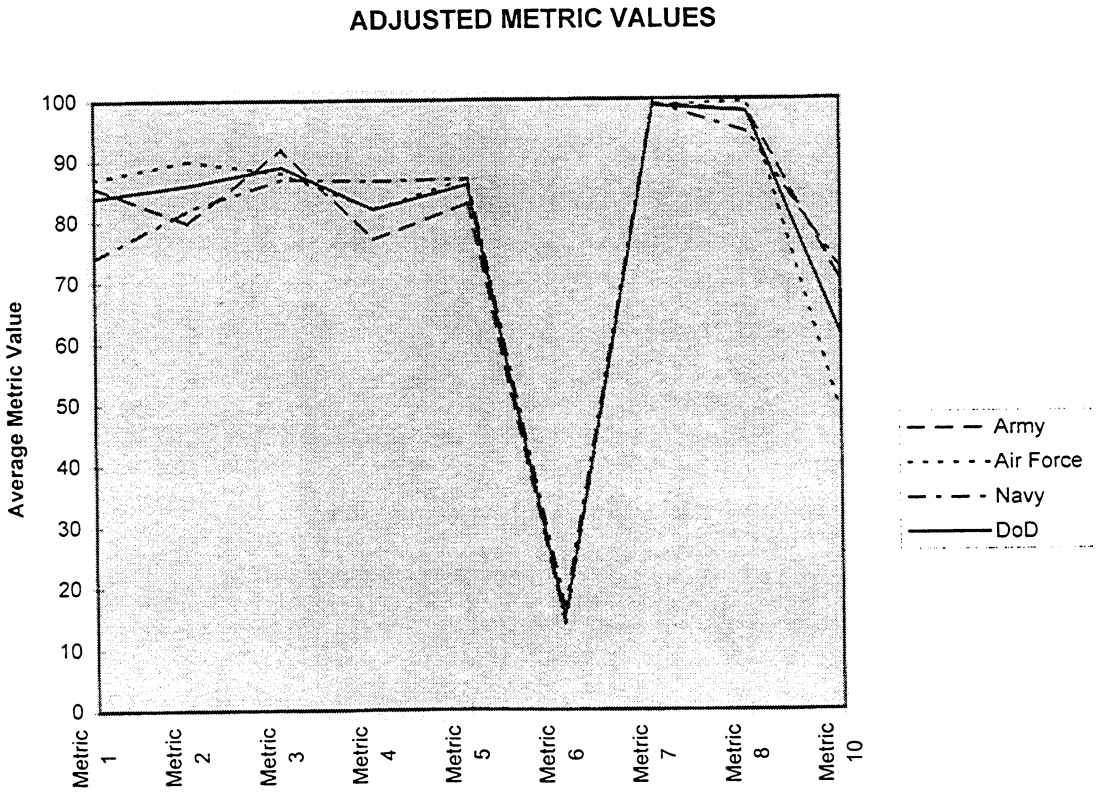
Appendix C

Unadjusted Metric Values And Reasons For Problems
Regions 1-5, 6, 9, 10, And Central

	Metric Description	Stand	Avg Score	Metric Stand	Major Reasons for Problems	% Of MTFs
Metric 1	CHCS Providers vs. Staffing Docs	100%	124%	43%	Data Entry Err	13%
Metric 2	CHCS Providers by MEPRS Code	100%	114%	44%	Data Entry Err	20%
Metric 3	CHCS Providers by Provider Type	100%	105%	52%	Data Entry Err	20%
Metric 4	Locations: CHCS vs. MEPRS	100%	92%	43%	Data Entry Err	24%
Metric 5	NAS Comparisons	100%	116%	46%	System Errors	12%
Metric 6	Incomplete ADS Visits	5%	13%	44%	Data Entry Err	25%
Metric 7	Bed Days: MEPRS vs. WWR	100%	99%	78%	Data Entry Err	9%
Metric 8	Visits: MEPRS vs. WWR	100%	101%	70%	Data Entry Err	11%
Metric 9	Clinical Pathology Comparison	None	N/A	70%*	Data Entry Err	24%
Metric 10	SADR Encounters vs. WWR Visits	>=100%	79%	9%	Data Entry Del	20%

*Represents percentage of MTFs answering "No".

Appendix D



Appendix E

ARMY SUMMARY
Regions 1-5, 6, 9, 10, and Central

	Metric Description	Quest 3 Avg People	Quest 4 Avg Hours	Quest 5 Avg Days	Quest 6 Agree Import	Quest 7 Guide Clear
Metric 1	CHCS Providers vs. Staffing Docs	3.6	14.7	5.0	3.2	2.0
Metric 2	CHCS Providers by MEPRS Code	2.4	14.3	3.9	2.9	1.8
Metric 3	CHCS Providers by Provider Type	2.4	12.8	3.5	3.0	2.1
Metric 4	Locations: CHCS vs. MEPRS	2.1	4.5	1.9	3.4	3.0
Metric 5	NAS Comparisons	2.4	4.5	2.1	3.3	2.8
Metric 6	Incomplete ADS Visits	1.4	5.9	1.8	3.6	3.1
Metric 7	Bed Days: MEPRS vs. WWR	1.7	2.1	1.4	3.5	3.3
Metric 8	Visits: MEPRS vs. WWR	1.8	4.8	2.1	3.5	3.3
Metric 9	Clinical Pathology Comparison	1.5	3.3	1.5	3.3	2.8
Metric 10	SADR Encounters vs. WWR Visits	1.0	3.5	2.0	3.0	3.3
Total		20.3	70.4	25.2		
Average		2.0	7.0	2.5	3.3	2.8

Appendix F

AIR FORCE
Regions 1-5, 6, 9, 10, and Central

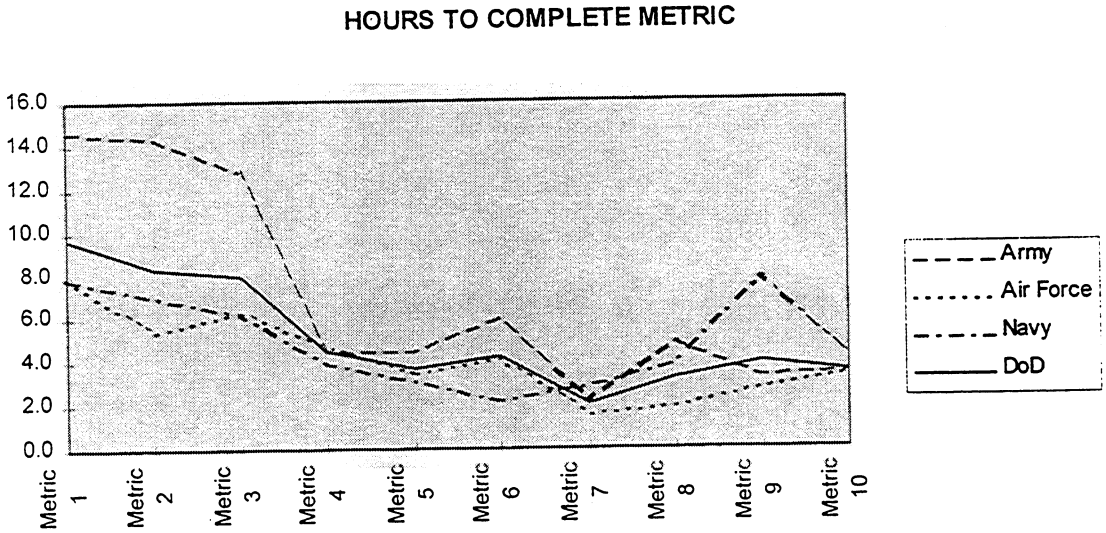
	Metric Description	Quest 3 Avg People	Quest 4 Avg Hours	Quest 5 Avg Days	Quest 6 Agree Import	Quest 7 Guide Clear
Metric 1	CHCS Providers vs. Staffing Docs	3.2	7.9	3.3	2.9	2.3
Metric 2	CHCS Providers by MEPRS Code	3.3	5.4	3.1	2.8	2.2
Metric 3	CHCS Providers by Provider Type	2.5	6.3	2.9	2.7	2.4
Metric 4	Locations: CHCS vs. MEPRS	2.2	4.7	2.1	2.9	2.4
Metric 5	NAS Comparisons	1.9	3.5	3.1	2.9	2.9
Metric 6	Incomplete ADS Visits	1.7	4.1	1.9	3.1	2.8
Metric 7	Bed Days: MEPRS vs. WWR	1.6	1.6	1.2	3.2	3.1
Metric 8	Visits: MEPRS vs. WWR	1.7	2.0	1.3	3.2	3.1
Metric 9	Clinical Pathology Comparison	1.7	2.8	1.5	2.8	2.6
Metric 10	SADR Encounters vs. WWR Visits	1.9	3.4	1.7	2.6	2.6
Total		21.7	41.7	22.1		
Average		2.2	4.2	2.2	2.9	2.6

Appendix G

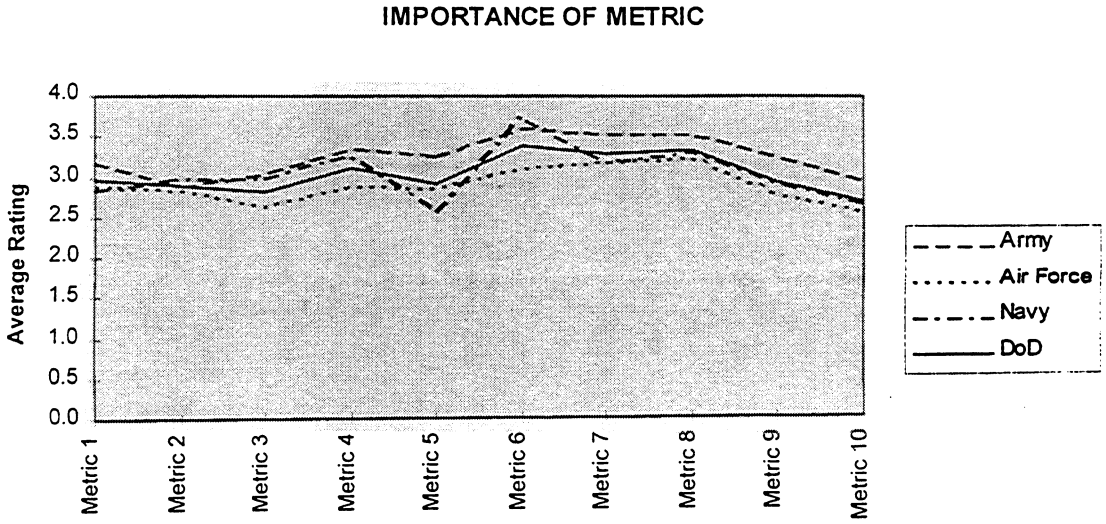
NAVY
Regions 1-5, 6, 9, 10, and Central

	Metric Description	Quest 3 Avg People	Quest 4 Avg Hours	Quest 5 Avg Days	Quest 6 Agree Import	Quest 7 Guide Clear
Metric 1	CHCS Providers vs. Staffing Docs	2.6	7.8	8.0	2.9	2.2
Metric 2	CHCS Providers by MEPRS Code	2.5	7.0	7.3	3.0	2.3
Metric 3	CHCS Providers by Provider Type	2.5	6.3	6.6	3.0	2.7
Metric 4	Locations: CHCS vs. MEPRS	2.2	4.0	3.2	3.3	2.5
Metric 5	NAS Comparisons	1.7	3.1	3.4	2.6	3.0
Metric 6	Incomplete ADS Visits	1.2	2.2	2.7	3.7	2.9
Metric 7	Bed Days: MEPRS vs. WWR	1.7	2.8	3.1	3.2	3.1
Metric 8	Visits: MEPRS vs. WWR	1.6	3.9	4.3	3.3	3.3
Metric 9	Clinical Pathology Comparison	1.6	7.7	3.9	2.9	2.9
Metric 10	SADR Encounters vs. WWR Visits	2.0	4.0	2.0	2.7	4.0
Total		19.6	48.8	44.5		
Average		2.0	4.9	4.5	3.1	2.9

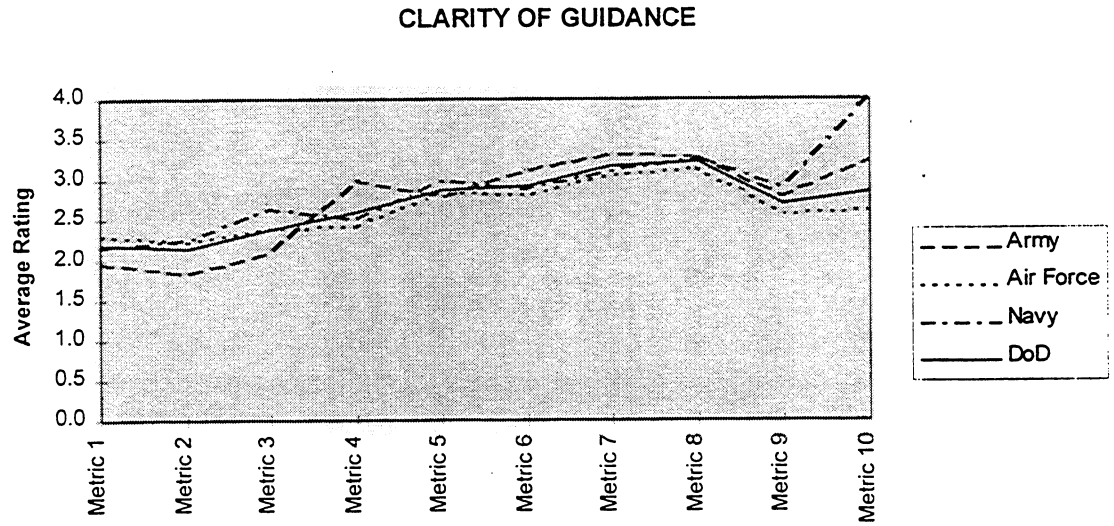
Appendix H



Appendix I



Appendix J



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