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INTEROPERABILITY ISSUES WITH MHS GENESIS

by

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The MHS GENESIS electronic health record software purchased by the Defense Health Agency (DHA) is not interoperable with the healthcare managed organizations network of care. Twenty percent of all specialty care health records are not returned to the medical treatment facility. This represents a significant loss of health records, a potential loss in medical readiness, as well as the ability to deploy. The purpose of this study was to demonstrate if the market-comparable electronic health record retrieved health records better than MHS GENESIS. The hypothesis H1: MyChart electronic health record is more interoperable, making it more accurate than the MHS GENESIS electronic health record. H2: Changes to the DHA's health record policy will make MHS GENESIS more interoperable. The research design was a mixed-method approach. The comparative analysis of interoperability between MyChart software and MHS GENESIS software used nominal, ordinal, and interval-based methods to calculate results. The research design used for the qualitative analysis section was based on the Qualtrics XM software's word cloud. MHS GENESIS is capable of interoperating with HMO providers, but it is limited by DHA's health record policy. The survey revealed beneficiaries are concerned with the accuracy and accessibility of a complete interoperable system. Due to limited technical knowledge of MyChart and MHS GENESIS, we recommend study of MHS GENESIS within the large MTF multi-market regions.

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INTEROPERABILITY ISSUES WITH MHS GENESIS

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TABLE OF CONTENTS

LIST OF FIGURES

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LIST OF TABLES

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LIST OF ACRONYMS AND ABBREVIATIONS

AHLTA	armed forces health longitudinal technology application
AMD	activity manpower document
API	application programming interface
BUMED	bureau of medicine and surgery
CAC	common access card
CBI	critical barriers to implementation
CHAMPUS	Civilian Health and Medical Program of the Uniformed Services
CHCS	composite health care system
CLR	clear and legible report (patient encounter)
CONUS	continental United States
COTS	commercial-off-the-shelf
CSF	critical success factors
DHA	Defense Health Agency
DOT&E	director of operational test and evaluation
EHR	electronic health record
Essentris	inpatient documentation software
GAO	Government Accountability Office
FOT&E	follow-on operational test and evaluation
HAIMS	health artifact and image management solution
HIPAA	health insurance portability and accountability act of 1996
HIE	health information exchange
HMO	health maintenance organizations
IOC	initial operational capability
IOT&E	initial operational test & evaluation
IPM	Interim Procedures Memorandum
JITC	joint interoperability test command
MHS	military health system
MTF	military treatment facility
NCR	national capital region
NDAA	National Defense Authorization Act

NMRTC	Naval Medical Readiness and Training Command
RM	Referral Management
RMC/O	Referral Management Clinic/Office

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I. INTRODUCTION

The History of the health record in the military is an important place to start the discussion. It demonstrates the development and progress of the Health Record and the need for further progress. The Electronic Health Record (EHR) made its first appearance in the Navy in 2006 with the armed forces health longitudinal technology application system (AHLTA) (Defense Health Agency , 2021). This led to the transition from a paper record to an Electronic Health Record (EHR) as the primary method of chronicling medical treatment. The paper record is still in existence and is still used today, but it functions as the secondary source for medical documentation chronicling (Bureau of Medicine and Surgery, 2021). The Bureau of Medicine and Surgery uses the manual of medicine chapter 16 for its guidelines on the Health Record (Bureau of Medicine and Surgery, 2021).

The Military Health System (MHS) has implemented a new electronic health record (EHR), which will impact 2.9 million Department of Defense (DOD) beneficiaries and over 205,000 MHS employees globally (HealthIt.gov, 2022). Kurt Lewin's Change Theory provides insights into critical success factors (CSFs) and critical barriers to implementation (CBIs). Lewin's theory provides us with the concept of keeping the status quo or countering to a new aim and reveals driving forces for change (Akram et al., 2018). Interoperability is the main factor in go-live efforts and software development for the MHS GENESIS Electronic Health Record (EHR) (Woody, 2020).

The purpose of MHS Genesis is to integrate "best-of-suite" solutions to provide seamless access to medical and dental information "across the continuum of care" (Oswell, 2020). As with most heterogeneous systems, this system requires careful integration (in this case with legacy systems) and interoperability with all Military Treatment Facilities (MTF) and Healthcare Maintenance Organization (HMO) contracted network providers. Complex systems need interoperability to contain costs and improve performance during the product's life cycle (Gay & Turso, 2008). The interoperability with care received within the contracted network care is paramount to accuracy, accessibility and availability.

A. THE PROBLEM

The ten-year $4.3 billion contract for MHS GENESIS's Electronic Health Record (EHR) software provided to the Defense Health Agency (DHA) by the Leidos-Cerner company joint venture is not interoperable with the Healthcare Managed Organizations (HMO) medical provider's network of care (Defense Health Agency, 2018). This lack of interoperability is a problem because twenty percent of all patient health records are inaccurate (MHS GENESIS Thesis Interview, 2021). Patient health records are mandated to be a complete history of chronological care. (Manual of Medicine and Surgery, 2021). The policy for maintaining the proper chronology of care is based on the manual of medicine P-117 chapter 16, health records (Manual of Medicine and Surgery, 2021). The policy is at the center of this problem. The process is at the center of the policy.

Maintaining the health record is essential to understand as it is central to the problem of the twenty percent inaccuracy rate in patient health records. The process for maintaining and updating health records has changed over the recent years. The process for updating a health record in the United States Navy until 2017 was for the patient to check out their health record and take it with them to all appointments considered ancillary or specialty care (Manual of Medicine and Surgery, 2021). The record would then be kept up to date by the member by collecting the health records for the care given at the appointment and placing it into the paper record (Manual of Medicine and Surgery, 2021)

The process mentioned above cannot be completed in an electronic health record; thusly, a new policy was implemented. The new policy implemented a new approach. The process is key to understanding why the error rate is at twenty percent of all health records. This process does not allow members to check out their paper health records. The member is not authorized to place medical documentation into their health record. The current process utilized by the Navy is referenced in BUMEDNOTE 6150, which states that all health records will be maintained by the Patient Administration department in coordination with the Healthcare Business department. The Healthcare Business department is responsible for retrieving all ancillary and specialty care provided from the HMO network of care (Defense Health Agency Interim Procedures Memorandum, 2020).

This process requires the medical treatment facilities providing the ancillary or specialty care within the HMO to fax health records to the MTF for those patients. The patient must bring all health records received from ancillary and specialty care to the Patient Administration department to be placed in their health record. This policy is the subject of this research.

The HMO network of care is the medical facilities provided to the active-duty service members and all other beneficiaries. This network provides care to over 2.9 million people in over 21 different states (HealthNet Federal Services, 2021). This represents a significant portion of the care supplied to the military. The care provided includes more than twenty-five other medical specialties (HealthNet Federal Services, 2021). The care provided is crucial to the medical readiness of the military force, and therefore it is also crucial to force readiness. The Clear and Legible Reporting system is how the DHA maintains its health records database from the HMO's network of care (Defense Health Agency Interim Procedures Memorandum, 2020). These records are placed into the health records of all 2.9 million patients in the MHS GENESIS EHR (Defense Health Agency , 2021).

The Clear and Legible Reporting system (CLR) is the process for retrieving health records from the HMO's network of care for ancillary and specialty care services. The CLR retrieval process utilized by the Defense Health Agency is a fax-based manpower retrieval system. This process requires every Medical Treatment Facility (MTF) that processes and stores health records to have a dedicated, viable, usable telephone number connected to a facsimile machine capable of receiving CLRs 24 hours a day (Defense Health Agency Interim Procedures Memorandum, 2020). The CLR process is under the directorate for Healthcare Business within Naval Medical Forces Pacific and Naval Medical Forces Atlantic (Health.mil, 2021). The director of Healthcare Business is tasked with ensuring the CLRs are received; they are then transferred to the patient administration department to be placed in the appropriate member's health records (Defense Health Agency Interim Procedures Memorandum, 2020).

Twenty percent of all HMO, network-provided ancillary, and specialty care is not reported in the patient's EHR (DHA, 2021). This lack of reporting represents a significant

loss of medical readiness and repetitive erroneous medical care. This study will compare the interoperability of a market comparable electronic health record to the MHS GENESIS electronic health record.

The 80% accuracy rate of the MHS GENESIS electronic health records poses a significant problem for military medicine (Defense Health Agency , 2021). According to the Veterans Administration, the VA paid $92.32 billion in disabled veterans' benefits last year alone (Veterans Administration, 2021). This represents a significant amount of government taxpayer money being spent. The process for benefits to be awarded to veterans is directly related to the member's percentage of disability granted by the Veterans Administration. The health records are the primary documents for review in the decision for disability benefits (Veterans Administration, 2021). Missing documents from the health record could create a need to re-locate the document requiring person-hours or unnecessarily repeat medical examinations, costing the DOD time, manpower, and potential loss of revenue. This underscores the lack of trust within the veteran community. These benefits for injuries that occurred are not a privilege, they are a right, and we should be diligent, careful, and accurate stewards of this process.

In his vision statement for the force, Rear Admiral Bruce Gillingham, the Surgeon General of the Navy, states, "Navy Medicine is a high-reliability team trusted by warfighters to build and sustain medical readiness as a critical component of integrated American Naval Power" (Navy Medicine, 2020). The loss of medical records creates a loss in revenue for disability benefits and directly goes against the vision of the Surgeon General. The Surgeon General states plainly that Navy Medicine is highly reliable and trusted by its warfighters. How can a military member trust its medical experts if they cannot retain members' medical records?

The COVID-19 pandemic has illustrated the need for accurate medical records documentation. Without accurate medical record documentation, military members who have received the COVID-19 vaccination will remain non-compliant with military standards by no fault of their own. As of November 28, 2021, records show that 19,000 Sailors and Marines were non-compliant with the vaccine mandate, of which 5% of reported non-compliance was due to discrepancies in the data-tracking system (Bureau of

Medicine and Surgery, 2021). This defeats the trust in military medicine, degrades medical readiness, and takes military members out of the fight (Chief of Naval Operations, 2021). If the military member does not meet the COVID-19 vaccine mandate, they are not deployable (Chief of Naval Operations, 2021).

Navy Administrative Order 256/21 states the definitions for receiving the COVID-19 vaccination. It says that if a service member does not meet fully vaccinated status by a specific time, they will be recommended for general separation (Chief of Naval Operations, 2021). Suppose the current error rate for medical record accuracy stands correct. Twenty percent of service members who willfully received the COVID-19 vaccination within the appropriate time could be recommended for general separation. This underscores the importance and significance of medical readiness and the ability to have accurate, available, and complete medical records.

Although the COVID-19 vaccination is just one of many mandatory vaccinations in the military, it brought a public examination of proper medical documentation (Horton, 2021). COVID-19 highlighted the need for an electronic health record that is accurate and accessible to patients and health care providers alike.

Evaluating the interoperability problem with the MHS GENESIS EHR, which currently results in the loss of approximately twenty percent of the network-provided medical record documentation, will present relevant and original data (DHA Interview with LT Collazo and LT Vollstedt, September 3, 2021). The data collected will divulge if implementing a new policy and process will produce a more efficient method of collecting medical record documentation from the network-provided care. It will evaluate if the ability to update patient records or Clear and Legible Reports (CLRs) utilizing the existing HIE will produce a more accurate EHR while reducing costs to the MTF compared to the current EHR system.

The comparison model will be EPIC's MyChart (known as MyChart henceforth), an industry-leading electronic health record, and compare its features to the MHS GENESIS electronic health record within the Military Health Systems. The goal is to compare the significant categories and features of the two electronic health records based

on the outcome of the survey provided to approximately 250 active-duty members. Although a limitation, this will result in a much more accurate comparison.

The comparative analysis showed accuracy, availability, completeness and user-friendly interaction with patients and how important they found them.

An interview was done to discover the initial policy problem and a survey was given to rank in order of most important to least important what specific users of the MHS GENESIS EHR find to be the most important aspects of the system. The survey and interview were used in conjunction with each other to create a mixed method approach to the analysis. The survey and interview data showed previously unknown information that could be used by the DHA for possible decision-making and policy change.

The policy issue created the interoperability issue. The twenty percent error rate in the health records stated by DHA officials represents a gap in the current process (MHS GENESIS Thesis Interview, 2021). The study will address if correcting the interoperability issue makes health records more accurate, available, completeness and user-friendly by comparing the MHS GENESIS EHR to the MyChart EHR. Based on the literature review, the current underutilization of significant features effect on the current process creating the gap and error rate (DHA Interview with LT Collazo and LT Vollstedt, September 3, 2021).

B. HYPOTHESIS/RESEARCH QUESTIONS

The following are the proposed hypotheses and research questions for interoperability with MHS GENESIS:

- HO: Epic's MyChart electronic health record is not more interoperable, making it less than or equal to the accuracy of the MHS GENESIS electronic health record.

- H1: Epic's MyChart electronic health record is more interoperable, making it more accurate than the MHS GENESIS electronic health record.

- HO: Changes to the Defense Health Agency Interim Procedures Memorandum (DHA-IPM) policy for health records will not make MHS GENESIS more interoperable.

- H2: Changes to the Defense Health Agency Interim Procedures Memorandum (DHA-IPM) policy for health records will make MHS GENESIS more interoperable.

- Would it benefit the Defense Health Agency to adopt the interoperability techniques of the MyChart Electronic Health Record?

- Will a change to the Defense Health Agency Interim Procedures Memorandum (DHA-IPM) policy for the MHS GENESIS electronic health record a create more interoperable health record?

C. OPERATIONAL DEFINITIONS

The following are the operational definitions for the qualitative and quantitative research for this study:

- E-health exchange: a "network of networks" that connect and enable medical data to be exchanged throughout the U.S. (eHealth Exchange, 2022).

- Carequality: An initiative dedicated to interoperability among multi-platform networks, health care providers, payers, EHRs, and Health Information Exchange (HIE) vendors (Carequality Principles of Trust , 2015).

- The Sequoia Project: An independent advocate for nationwide HIEs. Their role has been to identify and address interoperability gaps in HIEs. The work has resulted in the creation of Carequality and improvements to the HIEs (The Sequoia Project , 2022).

- Mobile Application: Software applications specifically developed to run on small wireless computing devices (i.e., smartphones and tablets) (IBM, 2022).

- Patient Portal: A secure website for accessing patient health information via the internet. Patient portals are usually secured using a username and password (HealthIT.gov, 2022).

- Internet Accessible: The ability to access the electronic health record from any internet capable computer device.
- Single Sign On (SSO): Allows a user, in this case a patient, to sign into multiple application utilizing a single set of credentials such as username and password.
- Customer services: The ability to provide online and telephonic patient support for issues related to their health records.
- Web Portal: A website that serves a single point of access for information.
- Accuracy**:** Correct and up to date health record.
- Availability**:** Always accessible to you when needed.
- Completeness**:** A comprehensive chronological record of care.
- User-friendliness**:** Ease of use and ability to understand and access the systems
- Other**:** List any other features not listed above.

D. THE PURPOSE OF RESEARCH

The purpose of this study is to identify whether the interoperability issues with the MHS GENESIS electronic health record are due to the functionality of features, or policy. The usefulness of this research will significantly affect active-duty military members. The MHS GENESIS electronic health record must improve the health record accuracy, availability, completeness and user-friendliness of its patients or why are is the DHA spending the money for it?

The ability to conduct a comparative analysis of the best-in-class market comparable, MyChart electronic health record to the Leidos-Cerner to the MHS GENESIS electronic health record, will determine whether MHS GENESIS can be improved with effective solutions to address the inaccuracy problem in the military electronic health record. A fundamental limitation of this research is the scope; however, it will serve as a reference point for further research into this topic.

The information gained from the comparative analysis between the two electronic health records will explain if MHS GENESIS is less interoperable than MyChart's electronic health record. This study could potentially demonstrate how to improve interoperability and policy within the DHA. The conclusions of this research could prove useful for the potential future research and development of an EHR application that can be readily accessible and transferable by each individual active-duty member, dependent, or retiree member. This could ease the transferability of individual medical records and improve the accuracy of medical records.

The comparative analysis will demonstrate the need for future improvement in interoperability, and policy. The MHS GENESIS electronic health record must first be proven to improve accuracy, availability, interoperability, and transferability. The comparative analysis between the interoperability features of MHS GENESIS and MyChart can provide useful information to improve the error rate in the military health record. The information from this study will be crucial to the future implementation plans of the multi-billion-dollar MHS GENESIS software application.

The data collected comes from interviews, surveys, and a literature review on both the market comparable MyChart and MHS GENESIS. The data collected from the survey will ask active-duty military members in the United States of America what features of an electronic health record they find most important to them. They will rank in order of precedence, with 1 being the highest rank and 4 being the lowest rank what electronic health record categories are of the highest importance them. The categories are accuracy, availability, completeness, and user friendliness. The other category serves as a fill-in for the member to add separate data of their choice. These categories will then be weighted with the specific features of both the MyChart and MHS GENESIS electronic health records, further details will be discussed in the methods section.

The data collected from the interviews will be transcribed and used as a primary reference for this research. The interviews conducted are from key members of the DHA team, FEHRM team, MyChart team, and the MHS GENESIS team. The specific names of the people interviewed will be placed in the reference list of this thesis. The positions held by those interviewed will be listed in the appendix of this thesis. They are considered

experts in their field and specific leaders in the industry. This will provide both reliability and validity to the quantitative and qualitative data.

The information gained from this comparative analysis should be used to determine the best way forward for future implementations of MHS GENESIS. MHS GENESIS is currently being implemented at over 180 MTFs worldwide. (Defense Health Agency, 2018). The potential to improve the EHR is the goal of this study.

The data collected from the survey told us the users' perspective of the categories of importance on their EHR. The focus area of the survey will be based on four categories that the users of the MHS GENESIS system ranked. The four areas of concern were chosen based on the assumption they would all have a high level of importance to the constituents. This will determine what the users of the MHS GENESIS system want from their EHR.

E. THE SIGNIFICANCE OF RESEARCH

The significance of the research is it will demonstrate the need for specific features from the MHS GENESIS EHR that will improvement of accuracy, availability, accessibility, and interoperability to the nearly 2.9 million DOD users of the system. This will be a policy shift from the current process. The need for policy and process improvement must be discovered.

This process improvement will be based on an effective comparative analysis of MyChart to Leidos-Cerner's MHS GENESIS. The research will give an answer on how to best correct and retire the fax-based CLR retrieval process policy currently being used by the DHA. As previously stated, MHS GENESIS's Electronic Health Record (EHR) software provided to the Defense Health Agency (DHA) by the Leidos-Cerner company joint venture is not interoperable with the Healthcare Managed Organizations (HMO) medical provider's network of care (Horton, 2021). The comparative analysis will highlight this ineffectiveness and demonstrate there is a need to improve the implementation and utilization and sustainment of the MHS GENESIS software.

This comparative analysis can facilitate future software acquisition strategies by being prescriptive in the requirement development process. The desired outcome is to

prove this system, as with most heterogeneous systems, requires careful integration and interoperability with all MTFs and contracted network providers. Complex systems need tight integration and interoperability to contain cost, schedule of performance during the life cycle of said product (Gay & Turso, 2008).

The current state of MHS GENESIS cannot allow direct scanning of the CLR from the network provider or the contracted HMOs. This kind of deficiency in the chosen EHR can lead to a direct and significant negative impact on patient care and can negatively impact force readiness. Correcting this deficiency will correctly align MHS GENESIS with DHA's charge of maintaining a "Medically Ready Force and a Ready Medical Force."

The comparative analysis will highlight specific features important to the consumer. This will improve the user experience with the military healthcare system. The consumer of the military healthcare system is active-duty military members as well as others. The successful interaction of the active-duty military member and the military healthcare system improves force readiness and makes the United States military a stronger fighting force.

F. SUMMARY OF INTRODUCTION

The problem in the MHS GENESIS platform is a lack of electronic health record interoperability. This is a problem because MHS GENESIS's electronic health record is not 100% accurate. The research for this study was to test MHS GENESIS in a comparative analysis to the market comparable MyChart. The study tested MHS GENESIS for interoperability and compared it to MyChart for interoperability. The purpose of this study is to identify whether the interoperability issues with the MHS GENESIS electronic health record are due to the functionality of features, or policy. The significance of the research is it will demonstrate the need for specific features from the MHS GENESIS EHR that will improvement of accuracy, availability, accessibility, and interoperability to the nearly 2.9 million DOD users of the system.

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II. LITERATURE REVIEW

Beginning in 1968, The DOD relied on several electronic health record systems to manage the health documentation of all servicemembers and their beneficiaries; these legacy systems are the Composite Health Care System (CHCS), Armed Forces Health Longitudinal Technology Application (AHLTA), Essentris, and the Corporate Dental System (Congressional Research Service, 2019). It was not until the early 1990s that interoperability between the DOD and Veteran Affairs (VA) systems became a concern. This was mainly due to the mounting issues surrounding VA beneficiaries receiving care post active-duty service. Concern about interoperability between the medical record systems were not raised until this time. This severe gap has had an impact on the accuracy and overall completeness of the medical health records. After various solutions were attempted by DOD and the VA, Congress mandated that a new system be developed to address this lack of interoperability. In 2015, the DOD awarded Leidos Partnership for Defense Health (LPDH) the contract to head up the new EHR system, MHS GENESIS. This endeavor was intended to be an initial investment of $4.3 billion, with the ordering period possibility extended over ten years (Congressional Research Service, 2019). The contract award ceiling was increased by $1.2 billion in 2018 to include the U. S. Coast Guard in the MHS GENESIS transition (Congressional Research Service, 2019). This venture represents a significant investment in capital from the taxpayer to address a severe gap in interoperability within the DOD Health care system. It is incumbent on DOD to deliver a product that meets the acceptable threshold of interoperability and joint integrated EHR.

This chapter will establish some familiarity and understanding of current research related to DOD choice of the EHR and market comparable (i.e., MHS GENESIS and MyChart, respectively). Conducting a thorough research review in interoperability, DOD policy, and market comparable can reveal, if any, gaps in the MHS GENESIS platform that hinder the application's ability to be interoperable with network providers. This interoperability or lack thereof can impact access to care and overall accuracy or that record of care.

A. INTEROPERABILITY WITHIN EHR PLATFORMS

The continuity of care for active-duty members and beneficiaries lies at the heart of this research. Universal interoperability can only be achieved when all participants agree to establish operational procedures (Subramanian, 2010). Operational procedures are used in the form of business rules which are the methods used to ensure interoperability (Naval Health Clinic Lemoore, 2020).

Interoperability, according to Merriam-Websters dictionary online is defined as, "The ability of a system (such as a weapons system) to work with or use the parts or equipment of another system" (Merriam-Webster, 2022). In the article, "Meaningful Use: Regulation for Electronic Health Records" published in *The New England Journal of Medicine*, Dr. David Blumenthal espoused the criticality of interoperability within EHR systems. The success of implementing an EHR is short-lived unless the data can "flow freely, privately, and securely to the places where they are needed" (Blumenthal, 2010, pp. 501–504). The focus of this research is Medical Treatment Facilities (MTF) and civilian facilities located in the Continental United States (CONUS). Networked care in areas Outside Continental United States (OCONUS) represents a separate set of challenges that lie outside the scope and resources of the authors of this thesis.

In the article, "Barriers and Facilitators Associated with the Pilot Implementation of a New Electronic Healthcare Record in the Military," Megan Martin identified three strategic recommendations for the MHS Genesis implementation; she notes that one of the three is interoperability, and it is key to the implementation of commercial-off-the-shelf (COTS) software (Martin, 2021).

One of the key advantages MHS GENESIS boasts is its interoperability between the Veteran's Affairs (VA) and the DOD. Approximately 6 million patients have been seen within the VA and DOD systems (Shulkin, 2017). A seamless transition from the DOD to the VA requires a cost-efficient electronic exchange of medical records (Shulkin, 2017).

However, the interoperability of EHR systems across all networked medical providers providing care to servicemembers is not feasible through MHS GENESIS. There are over 1,000 network providers in the western region alone, and all represent their

medical practice, and are not necessarily exclusively seeing DOD patients (HealthNet Federal Services, 2021). Adopting a new EHR would come at a considerable cost for every network provider (Thompson, 2019). Approximately, 16.7% of hospitals had adopted an EHR system to meet the American Hospital Association EHR standards (Thompson, 2019).

The literature clearly states the need for interoperability for a new software application. The MHS GENESIS system is, however, lacking in interoperability. The specific area in which interoperability will be addressed is a software application.

B. GOVERNING POLICY

The purpose of the health record is clearly defined in the *Manual of Medicine and Surgery* (Bureau of Medicine and Surgery, 2021). It provides an individual chronological record of all medical treatment provided to members (Bureau of Medicine and Surgery, 2021). The health record has significant value to the United States government as well as the individual member and is also considered a legal document (Bureau of Medicine and Surgery, 2021). This requires classifications of the health record. The health record is divided into multiple different sub-types of records.

The primary record is divided into three parts, the health record (HREC), the outpatient records (OREC) and the inpatient record called the (IREC). The health record is defined as a complete chronological medical history of the patient (Manual of Medicine and Surgery, 2021). The current state of accuracy within the chronological medical history of the members health records is eighty percent (DHA Interview with LT Collazo and LT Vollstedt, September 3, 2021). The inpatient records are not the issue. These records are located within the local MTF and are part of the new MHS GENESIS electronic health record (Navy Medicine, 2020). The concern is the outpatient records generated from the Health Maintenance Organization network of specialty and ancillary care (Navy Medicine, 2020).

C. HEALTH INFORMATION EXCHANGE

Meeting the intent of the governing policy and the goal of building an interoperable EHR with MHS GENESIS, a system of information exchange would have to be leveraged. The Health Information Exchanges or HIE is a platform in which patients and healthcare professionals (e.g., doctors, nurses, pharmacists) can securely access and exchange patient information electronically (Atwal et al., 2020). The real benefits of using HIEs are to improve the speed, quality, safety, and overall costs associated with patient care. As it stands, many health care facilities and practices still utilize mixed modes of patient communication via mail, fax, or the patients traveling with their records in hand. Although these methods of handling patient care are still suitable, the completeness of said records, history, current medications, and other information are significantly increased when using HIEs.

As of 2014, over 50% of private office health care professionals and 80% of hospitals are using an EHR that requires some electronic exchange of patient information (The Office of the National Coordinator for Health Information Techonology, 2014). Approximately 50% of hospitals in the U.S. can electronically search for patient data from outside their organization or health system (Office of the National Coordinator for Health IT, 2014).

Similarly, the DOD, Department of Veterans Affairs (VA), and U. S. Coast Guard (USCG) (as part of the Department of Homeland Security) have expanded their version of the HIE through the Federal Electronic Health Record Modernization (FEHRM) program that includes the CommonWell Health Alliance (Oswell, 2020). This addition expands the 40,000 community partners that are already within the joint HIE to add 15,000 hospitals and clinics. Through this modernization, healthcare providers will have access to DOD, VA, and USCG, enabling enhanced "continuity of care" for service members, veterans, and their families (Oswell, 2020).

D. CONTINUITY OF CARE

The continuity of care for active-duty members and beneficiaries is at the center of this research. The American Academy of Family Practice (AAFP) has postulated that an

EHR system focused on continuity of care is critical in improving patient outcomes, decreasing costs, reducing errors, and improving patient compliance (Antonucci, 2010). To achieve a consistent level of continuity, a system must be interoperable at the Military Treatment Facility (MTF) level and the HMOs network of care. While maintaining an effective EHR is significant for beneficiaries, this becomes especially critical when discussing how a lack of continuity can dramatically decrease readiness in active-duty members. This represents the gap in the research.

E. DEFENSE HEALTH AGENCY

In 2013, the Secretary of Defense was concerned about the effective management of the TRICARE program. This was also to address the growing concern relating to continuity of care within the DOD. He created the DHA to coordinate and manage multi-service healthcare markets and MTFs in the National Capital Region (NCR). They were also given the authority to exercise management responsibility of the military health system's shared services, functions, and activities. DHA is currently in the process of administering and managing all MTFs in addition to being a combat support agency, a command designated to fulfill combat support functions for joint operations (NDAA, 2017). The Defense Health Agency (DHA) has been the leader in developing the requirements for MHS GENESIS.

In 2019, DHA submitted a report to congress to provide background and address issues regarding MHS GENESIS to ensure the program's effectiveness and suitability, it must undergo an IOT&E review mandated by DOD (Office of the Undersecretary of Defense for Acquisitions and Sustainment, 2020). The report provided the critical data needed for the stakeholders involved (i.e., acquisition and functional leadership) to decide whether the program should proceed with implementation. Between September and December 2017, the Joint Interoperability Test Command (JITC) conducted the Initial Operational Test & Evaluation (IOT&E) at each of the initial operational capability (IOC) sites. In addition to assessing cybersecurity capabilities, interoperability, and day-to-day staff performance within the platform, the Director of Operational Test and Evaluation

(DOT&E) reviewed the report JITC produced and applied them to the following criteria within the DOT&E report:

- Does MHS GENESIS provide the capabilities to manage and document health-related services?
- Do MHS GENESIS interfaces support or enable the accomplishment of mission activities and tasks?
- Does MHS GENESIS usability, training, support, and sustainment ensure continuous operations? (Mendez, 2019)

The report indicated that MHS GENESIS was "neither operationally effective nor operationally suitable." (Government Accountability Office, 2021). The report goes on to say that MHS GENESIS does not have the functionality necessary to manage patient health care records fully (Government Accountability Office, 2021).

More recently, in September of 2021, the Government Accountability Office (GAO) published a report regarding DOD's progress toward implementing the EHR and continued challenges. This study was mandated by the DOD and Labor, Health and Human Services, and Education Appropriations Act, 2019, and Continuing Appropriations Act, 2019. The objective of the MHS GENESIS report was to determine if the implemented EHR had made any progress in identifying and addressing critical risks within the platform (Government Accountability Office, 2021). The GAO reviewed the following to determine the progress made toward implementation:

- JITC's test reports
- Test and incident report documents
- Interviews with testing officials, Program Executive Office, and DHA. (Government Accountability Office, 2021)

In the report, they found that MHS GENESIS faced training and communication challenges.

Finally, relating to JITC's test reports conducted in January and February 2020, they found the following issues remained: "MHS GENESIS is operationally effective for basic operations in conventional clinics. However, the EHR has proven ineffective in specific specialty areas" (GAO, 2021) Additionally, MHS GENESIS requires work

regarding medical readiness, referral management, business intelligence, billing, coding, and reporting.

During the Follow-on Operational Test and Evaluation (FOT&E), they found that "information exchange with required external systems was sporadic, and patient data in MHS GENESIS were sometimes inaccurate and incomplete" (Congressional Research Service, 2019).

The Defense Health Agency Interim Procedures Memorandum (DHA-IPM) is DHA's governing document for the Referral Management (RM) process and would be considered the governing policy for electronic health records. This document provides most of the information for this study. The DHA-IPM is clear in its direction for ensuring its retrieval of network provided care. It gives directions on how each CLR should be recovered. It defines job roles and responsibilities for the members of the RMC/O at every MTF. It makes it clear the responsibility for recovery of all CLRs is the job of the RMC/O.

The DHA-IPM has a section for the process of unrecoverable CLR's. This process is key to understanding the fax-based CLR retrieval process of network-provided care. The fact, the IPM has a process in place for lost or unrecoverable CLR's is evidence the system is not 100% effective. This demonstrates a gap in the process and the focus of this study.

F. HEALTH MAINTENANCE ORGANIZATION

Health Maintenance Organizations (HMOs) were introduced in 1973 to address the rising cost of health care within the United States. A network of providers was created to provide patient care at a pre-paid cost resulting in cost-efficient quality care (Luft & Morrison, 1990). Theoretically, managed care created a cost incentive for providers to provide cost-effective quality care instead of the fee-for-service model that only served to motivate doctors to provide inefficient care at a premium.

To address the climbing costs of health care delivery within the DOD, DOD proposed the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) Reform Initiative (CRI) to offer beneficiaries an alternative of enrolling in a network-style HMO known as CHAMPUS Prime (Anderson et al., 1999). It was not until

1994 when congress enacted the NDAA that directed DOD and its military health system (MHS) to create a comprehensive health plan comparable to the managed care in the civilian sector. This created three different plans within MHS known as TRICARE Prime, TRICARE Standard, and TRICARE Extra (Jones & Bartlett, 2013). TRICARE Prime is an HMO-like program that allows beneficiaries to enroll in Prime Service Aeras (Jones & Bartlett, 2013). TRICARE Standard is the fee for service initially known as CHAMPUS. Although similar to Standard, TRICARE Extra requires beneficiaries to choose from a limited list of "in-network" providers.

G. DIFFERING POINTS OF VIEW

The differing point of view on the implementation of a Health Information Exchange (HIE) is the potential risk of personal health information being stolen and accessible over the internet. The security of personal information has been a problem within the DOD. The Office of Personnel and Management (OPM) was breached in 2015 and is an example of the potential problem of personal health information being stored in an online Health Information Exchange (Office of Personnel Management , 2022).

H. CURRENT STATUS

As of April 2021, and according to the GAO report, DOD has successfully deployed MHS GENESIS in its fifth (out of 24) planned phases. Figure 1 illustrates the actual deployments, with the scheduled deployments stretching to 2023. Of note, DOD is deploying MHS GENESIS in waves. Each wave consists of 3,400 and 15,000 users at the various MTFs across DHA (Government Accountability Office, 2021).

As it relates to this research, TRICARE requires its network providers to submit patient encounters—known as clear and legible reports (CLR) to the referring hospital or clinic (HealthNet Federal Services , 2021) These patient encounters or CLRs have varying time frames in which they are to be submitted to the managed care network providers (i.e., Humana if you are in the East or HealthNet for West), varying from two business days for urgent care received from a civilian provider to seven business days for other types of care or mental health providers Once received via CLR fax, the military treatment facility

(MTF) has three business days to upload the report into the Health Artifact and Image Management Solution (HAIMS) (DHA-IPM 18–001, 2020).

As noted in the third finding during the FOT&E, JITC found that "information exchange with required external systems was sporadic, and patient data in MHS GENESIS were sometimes inaccurate and incomplete" (Government Accountability Office, 2021). The lack of interoperability with the CLRs from networked providers to the local MTFs remain as one of the challenges that continue to contribute to the issue of "inaccurate and incomplete" records.

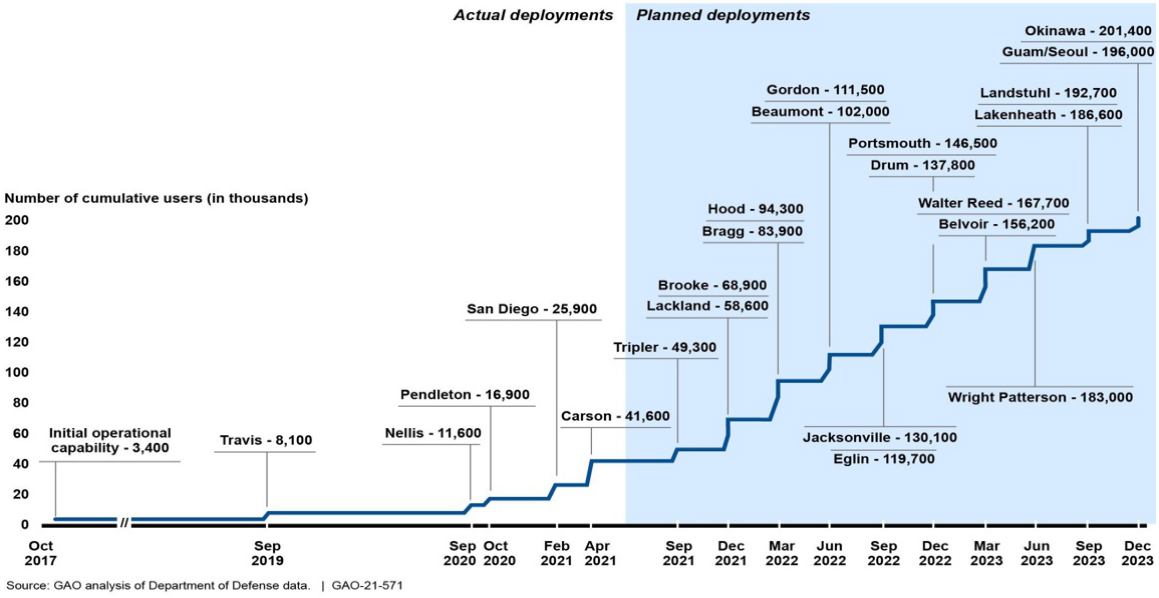

Figure 1. MHS GENESIS Phased Wave Implementation Plan.
Source: Government Accountability Office (2021).

I. AREAS OF CONCERN

The current state of MHS GENESIS cannot allow a direct scanning of health records from the network provided specialty or ancillary care. The feasibility of leveraging the joint Health Information Exchange within MHS GENESIS to create interoperability between the network civilian providers in the Continental United States (CONUS) and the MTF is limited to only active-duty military members within this research. The viability of

the results of this comparative analysis may need to be expanded to all other users of the military healthcare system. The solution to the interoperability issue may not serve as a solution to all users of the military healthcare system.

The Medical Readiness Reporting System (MRRS) is an example of a software application that must operate within the MHS GENESIS health record. This system however operates as a stand-alone system which requires the information from MRRS to be input by humans creating the same issue as the CLR fax-based retrieval system. and

As with most heterogeneous systems, this system requires careful integration with legacy systems and interoperability with all MTFs and contracted network providers. Complex systems need tight integration and interoperability during the life cycle of the product (Gay & Turso, 2008). While integration with legacy systems presents its own set of complications, interoperability with care received within the contracted network of care is the focus of this research.

J. MYCHART AND MHS GENESIS ELECTRONIC HEALTH RECORDS

Epic's MyChart EHR is one of the many EHR platforms that operate within the Health Information Exchange (HIE) and is the market comparable to evaluating MHS GENESIS. MyChart is a robust patient portal created by Epic Software that offers "best-of-suite" health solutions to patients, hospitals, healthcare professionals, and stakeholders. The platform provides patients easy access to all their medical records and their family's health information (via web browser and mobile application). MyChart can be tailored to fit the specific workflow requirements from a clinical perspective. Workflows include ancillary clinics such as behavioral health, cardiology, rehab, OBGYN, urgent care, etc.

1. Patient Mobile Application

MyChart offers many features to patients and clinicians to better manage the health of the former and provide adequate care by the latter. Patients can message their provider, complete questionnaires, schedule appointments, access patient education, and stay engaged with the care team throughout their patient experience via their web browser or mobile application (Epic Systems Corporation, 2022). Also, the patient can provide access

to their record using the Share Everywhere feature native to MyChart. This method gives non-participating organizations temporary access to patient records to review medications, allergies, immunizations, and more via their web browser. Notes are then generated by the provider using the Share Everywhere feature and then sent back to the healthcare organization, where they are securely filed in the patient's medical record (Epic Systems Corporation, 2022). Finally, MyChart offers an inpatient mobile application called the MyChart Bedside. The MyChart Bedside app allows hospital patients to share data with the patient treatment team (i.e., scheduled procedures, lab results, educational services, and questionnaires) (Epic Systems Corporation, 2022). Initial access to the MyChart system requires an activation code provided with an "After Visit Summary" email or text. Instructions to create a user account and associate a patient's care record with the newly created account are provided to grant access to the MyChart system (Epic, 2022).

MHS GENESIS offers many of the same features via their MHS GENESIS Patient Portal. The MHS GENESIS Patient Portal Factsheet defines the patient portal as a secure site that can be accessed via any internet-connected device (Military Health System, July). The portal allows the patient to view health information, exchange secure messages with the care team, prescription management, schedule appointments, questionnaires, and all other health-related information from one location. An essential difference in both EHRs is how access is granted. The MyChart patient portal requires a Defense Self-Service Logon (DS Logon). A DS Logon is a website that maintains a beneficiary's financial and benefits information across DOD and VA partner sites (Defense Manpower Data Management, 2020). Eligibility for an account requires a beneficiary to be enrolled in the Defense Enrollment Eligibility Reporting System (DEERS). A member's identification must be validated using their Common Access Card (CAC), DFAS myPay credentials, or in-person proofing to create a DS Logon. Once the DS Logon is validated, it can then be used to access the Premium Access (Level 2) to access their health record via MHS GENESIS (Military Health System, July). As of this writing, there is no mobile application for the MHS GENESIS Patient Portal.

Physicians and other health care professionals can leverage many of the features both EHRs offer in the clinical setting. However, there are some fundamental differences when MHS GENESIS is compared to MyChart.

2. Clinical Setting

The software's interoperability makes MyChart essential in a patient's continuity of care. With MyChart, physicians can access and update a patient's record even if the organization uses a different EHR platform other than MyChart or does not have an EHR (Epic Systems Corporation, 2022). According to Epic, health care organizations can connect to MyChart utilizing three different methods (Epic Systems Corporation, 2022).

The first interoperability method is through the EHR itself using the Carequality network. Carequality is an initiative dedicated to interoperability among multi-platform networks, providers, payers, EHRs, and Health Information Exchange (HIE) vendors (Carequality Principles of Trust , 2015). The network allows providers to exchange healthcare-related data across EHRs that support national standards (Epic Systems Corporation, 2022). Community partners can share healthcare-related data.

According to the Epic Systems Corporation website, the second method is via community partners that utilize a MyChart platform using the EpicCare Link (Epic Systems Corporation, 2022). This feature allows a web view of a patient's record. Via the link, health care professionals can evaluate patient records, book appointments, etc. Another method a community partner can use is the Community Connect program which allows partners to extend Epic's platform to an organization that does not host its Epic system. Community Connect enables non-participating organizations to benefit from the EHR platform and access the national exchange network (Epic Systems Corporation, 2022). Theoretically, non-participating organizations can seamlessly submit patient encounters (Clear Legible Reports within the MHS) to the patient's primary record. Like the patient experience, MHS GENESIS shares many of these features save for a few that could be verified via published literature, policy, and interview with DHA personnel.

The MHS GENESIS EHR can also share health data with community partners and network providers through the eHealth Exchange and the Sequoia Project initiative. As part

of the Sequoia Project, an advocate for national HIEs, it is possible for active-duty members and participating civilian beneficiaries to share health data securely with private health care providers and organizations (The Sequoia Project , 2022). MHS GENESIS differs in how patient encounters or CLRs are returned to the patient's primary medical record. Where an EHR such as Epic's MyChart would allow patient encounters to submit to the primary medical record from network providers, MHS GENESIS, however, relies on legacy methods and software to complete this process. According to the DHA personnel interviewed, this mixed mode of new and legacy can potentially create issues regarding the accuracy and overall completeness of an EHR (MHS GENESIS Thesis Interview, 2021). The DHA-IPM, DHA's policy on referral and medical records management, promulgates the continued use of legacy systems (i.e., facsimile, CHCS, and AHLTA) for CLR retrieval and submissions (Defense Health Agency Interim Procedures Memorandum, 2020).

3. Security

Both the MyChart and MHS GENESIS comply with regulatory trust principles that must be agreed upon when utilizing the Carequality framework (The Sequoia Project, 2015). These standards include but are not limited to the following:

- Security and privacy practices in accordance with HIPAA rules.
- Transparency relating to information management within the Carequality framework and made publicly available.
- Acceptable use in connectivity through Carequality as outlined in the Carequality implementation guide.

MHS GENESIS is bound by additional security requirements inherent within the DOD. As part of DHA's IT modernization, MHS GENESIS meets DOD's information assurance standards with continuous monitoring and protection of health care data (Military Health System, 2019). Although DOD's policies are more stringent regarding military health data, the goal is to maintain a robust cyber posture for the government and commercial partners. DOD maintains its cyber postures by using the risk management

framework that categorizes information systems, security controls, assessments, authorization, and constant monitoring (Military Health System, 2019).

The apparent inability to fully utilize the interoperability functionality within MHS GENESIS appears to be hampered by policy and other potential concerns that have not been made clear in any literature or research thus far. However, answering the question of whether DHA should update its policy to make MHS GENESIS more interoperable to improve its accuracy and overall completeness was one that required input from the end-users. Although limited in population scope, a survey of NPS students would facilitate the answer to this question. The survey will help decide which features matter most to the end-user or beneficiary and illustrate the need to make MHS GENESIS more interoperable.

K. SUMMARY OF LITERATURE REVIEW

Interoperability is crucial to the function of an electronic health record. The ability for systems to interact with systems is crucial to accuracy. The governing policy for health records states that the patient's medical record must be a chronological list of all care provided to the member. This highlights the gap in the research as MHS GENESIS does not account for all care provided to the member. The Health Information Exchange is crucial to interoperability and the accuracy of health records. The Defense Health Agency (DHA) was created to assume responsibility for the medical assets in the military. This was a notable change in operation. The DHA created a policy for electronic health records called the DHA-IPM. It gives a detailed process of how medical records are to be collected and stored. The HMO is an integral part of the health records process and is used actively by military members. The differing points of view about interoperability and accuracy suggest that the best security of health records would not be to use a HIE. The current status of interoperability with MHS GENESIS is problematic. It must have a tight integration with its legacy systems as well as its HMO. The MyChart and MHS GENESIS electronic health record platforms are market compatibles. They both have a list of features. The features of each platform are important to interoperability and accuracy. Security is an important aspect of any electronic health record and should be considered.

III. METHODOLOGY

The method for examining the problem of lost individual health records was a comparative analysis of interoperability features between the market comparable electronic health record MyChart and MHS GENESIS. The literature and interviews of key DHA professionals identified the problem as interoperability related to the features of the retrieval system for health records provided by network specialty or ancillary care. The root cause of this is the policy, but the policy cannot be changed without understanding what categories and features will improve the MHS GENESIS electronic health record**.**

The comparative analysis of MyChart EHR's functional features were compared to Leidos-Cerner's MHS GENESIS EHR's functional features. This provided a quantitative answer to which electronic health record was more interoperable. This was based on the categorical selections. The categorical selections divided the features into sub-sections.

The features of the two platforms will be listed in a side-by-side comparison to show if the MyChart is more interoperable than MHS GENESIS. If MyChart is more interoperable then policy changes may be done to improve the MHS GENESIS platform to function as a best-in-class electronic health record.

The study analyzed the data by assigning the features with a category. The categories were weighted based on the survey results from the users of the MHS GENESIS system. A point system was assigned to each feature then multiplied by the weighted percentage based on the survey results to give an overall score. The platform with the highest score was more interoperable based on the statistical data outcome. The assignment of the weighted point score was based on the outcomes of the survey given to active-duty members. The survey given to the active-duty military members, allowed the active-duty military members to rank the key issues according to their own personal preference of importance with health records in the DHA system.

A. SETTING

The setting for this study took place at Naval Postgraduate School Monterey, California. Much of the study was completed by a review of the literature, interviews of

key personnel within the Defense Health Agency and MyChart. The survey was conducted online via Qualtrics.com and administered to NPS students and staff. This survey asked students to prioritize their preferred features in an EHR. An example of the questionnaire for thesis on MHS GENESIS issues can be found in Appendix A.

For the interview, an email was sent to DHA RMF Leads to solicit their participation in said interview. The leads were given flexibility regarding the date, and platform of the interview. Due to geographical and COVID-19 challenges, it was agreed that all participants utilize Microsoft Teams as the virtual platform to perform the interview. All participants agreed to have the interview recorded and used for the purposes of this research. However, it was agreed that all comments and answers to questions would not be attributed to a specific person or position. The interview was conducted by LT Roberto Collazo and LT Ross Vollstedt. The interview was subsequently transcribed however no coding was needed to complete.

B. PARTICIPANTS

The study used United States active-duty military members from Naval Postgraduate School Monterey, California, to conduct its survey. The range of student population varied in rank from E-7 to O-6. The study did not develop a range in age as all students were considered adults in the military. The study did not test for ethnicity, race or gender as these areas were not the focus of this study. This would be considered some of the limitation of this study.

The initial data was collected by participating interviews with key DHA staff members directly involved with the referral management process policy. The goal was to establish potential inefficiencies within the Leidos Cerner MHS GENESIS platform. The discussion focused on the referral management process, specifically on patient encounter documentation. The process specifically for managing patient encounters is the Clear and Legible Reports (CLR).

Additional data relating MHS GENESIS' market comparable, MyChart, was provided by Epic's technical communications point of contact. The data provided gives a high-level overview of MyChart's interoperability capabilities and its Application

Programming Interfaces (API) to facilitate organization integration that do not run Epic software.

The Institutional Review Board (IRB) determined the results from the interview and survey can be shared because the results will not be extrapolated to the general population. This determination was instrumental in the collection of data and surveys.

C. INTERVENTIONAL MATERIALS

The strategy used to conduct this study was to compare the MHS GENESIS electronic health record to the MyChart electronic health record. A mixed-method approach for quantitative data and qualitative data analysis was selected.as the methodology. Surveys, interviews, a word cloud and a comparative weighted analysis to developed to select the overall preferred choice for interoperability The individuals surveyed were given specific definitions to use for completing the survey. The survey was given to analyze the hypothesis, specifically the independent and dependent variables.

- The independent variables for the comparative analysis were the DHA-IPM policy and electronic health records.
- The dependent variables for this study were interoperability and categorical features.

D. MEASUREMENT INSTRUMENTS

The materials used to conduct the study were interviews and surveys. The Qualtrics software was used to produce the survey and to develop the statistical analysis of the data. The survey was accessible via a bulk distribution email to the NPS student population in the form of a link. The quantitative method used was a weighted analysis, with points assigned to each of the categories. The point weight system aligned with a four-point system. The ranking of the categories was done on a one to four system as well giving it balance.

E. PROCEDURES

The procedures used to conduct the analysis of the data in this study were:

- Conducted interviews of the key DHA employees to understand what the problem with the current fax-based health records retrieval system was
- Received corporate literature relating to the technical features of the market comparable, MyChart.
- Conducted interviews with DHA person in charge (POC) of the Federal Electronic Health Record Modernization (FEHRM) program management office to define a list of features for MHS GENESIS.
- Conducted surveys of active-duty military members defining the areas of concern in order of importance to the military member.
- Used the survey information to weight the features in order of importance to the military members areas of concern.
- Assigned the features of both electronic health records to the categories as defined by the active-duty military members responses to the survey.
- Compared the two platforms by assigning weighted points of each feature based on the active-duty member survey.
- Gave an overall reason why MHS GENESIS is not interoperable with its network provided care.

F. DATA ANALYSIS TECHNIQUE

A quantitative statistical analysis of the data collected from the interviews and surveys resulted with an overall selection of a platform based on a point assignment of the individual features of both the MyChart and MHS GENESIS platforms. The features used a weighted analysis assigning more weight to the more favored features and less weight to the less favored features based on the results of the survey given to the active-duty military members. The selection of an overall platform was based solely on the greatest level of interoperability.

A qualitative analysis of the data collected from interviews was completed. A word cloud was selected as the method for drawing conclusions. The Qualtrics software used a collection of the words from the survey to develop the word cloud. The word cloud was edited to exclude common phrases and words that were not assignable to the methodology.

G. SUMMARY OF METHODOLOGY

The setting for the study was conducted at Naval Postgraduate School (NPS). The interviews were conducted with key DHA officials who were part of the CLR process. The participants of the study were NPS students ranging from E-7 to O-6. The other participants were the electronic health records MyChart and MHS GENESIS. The IRB did not require acceptance because the data from the study would not be generalizable to the population. The strategy used to measure interoperability and accuracy was a comparative analysis of MyChart and MHS GENESIS as well as a qualitative analysis of what the members surveyed wanted from their electronic health record. The measurement instruments were a survey to allow members to provide the weighting of categories for the comparative analysis and to provide key categories of interest. The procedures were listed in a step-by-step method as to provide for an ease of understanding. The Qualtrics XM software was used for the data analysis as well as excel and will be illustrated in the analysis of results section of this paper.

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IV. ANALYSIS OF RESULTS

Data for this thesis was collected and analyzed using a mixed-methods approach that, according to Creswell, holds a pragmatic worldview (Creswell & Creswell, 2018). It was determined that a mixed-method approach would provide us with diverse data types which would create a more complete understanding of the research problem.

The data collection began with an interview of crucial DHA personnel with open-ended questions to collect detailed information on the referral management process and its guiding policies. The interview was transcribed and analyzed to identify and document themes that would help in with the research questions and hypothesis. Through transcription of the meeting via Teams. Additional data was collected via electronic survey given to NPS students and staff. Lastly, a comparative analysis was performed utilizing MyChart EHR as the market comparable to MHS GENESIS.

A. QUALITATIVE ANALYSIS

1. Interview of Defense Health Agency

The interview with the DHA staff members directly involved with the referral management process policy was transcribed using a personally acquired application called SpeedScriber. The interview was singularly focused on the CLRs, and the analysis will focus on the accuracy and completeness of the EHR. The full transcript of the interview is provided in Appendix B, Interview Transcript with Defense Health Agency. The interview questions have been provided in Appendix D, Clear and Legible Reports Interview questions

The following were the salient points of the CLR and referral management process as it relates to the hypothesis:

Regarding timeliness, the policy has been that CLRs for beneficiaries seeing network providers should be returned within ten days. According to the DHA personnel interviewed, this has not been worked into the contract; however, it is in their DHA policy for routine care. The responsibility of returning said CLRs to the MTF was, at one point,

the responsibility of the managed care support contractor. Still, due to the limited visibility of the CLRs, they were unsuccessful in meeting that responsibility. The accountability of retrieving the CLRs then fell back to the MTFs.

When asked about the percentage of CLRs that successfully make it back to the beneficiaries record at the MTF, we used Naval Medical Center San Diego as the sample empanelment. It is estimated that eighteen to twenty percent of the referrals that go out to the network providers have CLRs that come back to the MTF for processing. The incomplete records were attributed to incompatible systems and policy limitations. Currently, network providers must fax CLRs back to the referring MTFs to include in the beneficiary's EHR. The limit goes further in that if a patient is seen by a network provider but subsequently requires multiple visits, only one CLR is needed to be sent back to the MTF. This policy limitation theoretically impacts the accuracy and overall completeness of the beneficiary's medical record. Additionally, many network providers have access to the HIEs that make EHRs interoperable. However, it is limited within MHS GENESIS. Although MHS GENESIS has the technical capability of participating within the HIE and making it interoperable with other commercial EHRs, it is unclear if it is limited by policy or other technical limitations.

2. Survey Process

The NPS Dean initially approved solicitation for the survey of Students. It was decided that the NPS active-duty population would be the ideal pool of candidates to survey. The email solicitation, (found in Appendix C), asked NPS students to actuate a link that referred them to the Qualtrics XM Platform. Appendix A is a duplication of the "Questionnaire for Thesis" asked within the Qualtrics XM Platform.

3. Survey Word Cloud

The weighted survey results can be viewed in the quantitative analysis portion of this thesis. However, utilizing the word cloud feature found within the Qualtrics software enabled us to provide some qualitative context related to the hypothesis. A word cloud is a visual representation of textual data. The word cloud used measures the frequency in which certain words are mentioned and, based on the number of times cited; its importance is

represented based on size. The larger the phrase within the cloud, the more important or weight is given to that keyword. To better focus the word cloud, it was decided that the following terms would be excluded from the word cloud synthesis: medical, record(s), and integers. These excluded keywords were deemed redundant or unnecessary given the metadata collected.

Figure 2, Survey Word Cloud, was sourced from question 4 of the survey. In addition to the standard ranking question provided in the survey, respondents were also allowed to list any other features not listed in the survey. Of the 242 respondents, 43 provided additional data within the scope of question 4. When asked to provide additional comments on the features not mentioned in the survey, most respondents were concerned about the proposed EHR's access, accuracy, and completeness. Although question 4 provided an opportunity for respondents to provide additional features not mentioned in the ranking question, they were ultimately still concerned about the features mentioned earlier (i.e., accuracy, availability, completeness, and user-friendliness) that support an interoperable system.

Figure 2. Survey Word Cloud. Source: Qualtrics XM (2022)

The following are comments from the survey that further support that claim.

- I have had the entire anthrax series twice as a result of a medical professional mismanaging my record and having lack of access to the online system.
- I have had Marines with severe drug allergies almost be given the drugs they are allergic to thanks to poor record-keeping—accuracy is important.
- Ease of transfer between IT systems
- Available on a single, intuitive, system.
- Interoperable: interoperable with other digital medical records systems to facilitate an ease of transfer of information when transitioning out of the military.

B. QUANTITATIVE ANALYSIS

The quantitative analysis evaluated the H1 and H2 hypotheses simultaneously using a comparative analysis. The comparative analysis was used to determine which electronic health record was more interoperable and if one was more operable, if it was due to policy. The comparative analysis between MyChart and MHS GENESIS demonstrated a clear selection for preference based on interoperability. The winner of the comparative analysis was based on the overall scores of the categories. The electronic health record with the highest score was deemed more interoperable. The comparative analysis compared MyChart and MHS GENESIS side-by-side in categories of features. The categories selected for interoperability were based on the literature review, active-duty member responses from the survey and key DHA officials. The categories were selected based on the key features of interoperability. The features of the two electronic health records were then placed into their respective categories by the operational definitions.

1. Operational Definitions

The following are the operational definitions for the qualitative and quantitative research for this study:

- E-health exchange: a “network of networks” that connect and enable medical data to be exchanged throughout the U.S. (eHealth Exchange, 2022).
- Carequality: An initiative dedicated to interoperability among multi-platform networks, health care providers, payers, EHRs, and Health Information Exchange (HIE) vendors (Carequality Principles of Trust , 2015).
- Sequoia Project: An independent advocate for nationwide HIEs. Their role has been to identify and address interoperability gaps in HIEs. The work has resulted in the creation of Carequality and improvements to the HIEs (The Sequoia Project , 2022).
- Mobile Application: Software applications specifically developed to run on small wireless computing devices (i.e., smartphones and tablets) (IBM, 2022).
- Patient Portal: A secure online website that allows patients to access their health information from anywhere provided they have access to the internet. Patient portals are usually secured using a username and password (HealthIT.gov, 2022).
- Internet Accessible: The ability to access the electronic health record from any internet capable computer device.
- Single Sign On (SSO): Allows a user, in this case a patient, to sign into multiple application utilizing a single set of credentials such as username and password.
- Customer services: The ability to provide online and telephonic patient support for issues related to their health records.
- Web Portal: A website that serves a single point of access for information.
- Accuracy**:** Correct and up to date health record.
- Availability**:** Always accessible to you when needed.
- Completeness**:** A comprehensive chronological record of care.

- User-friendliness**:** Ease of use and ability to understand and access the systems
- Other**:** List any other features not listed above.

2. Tables, Figures, and Data

The respondents of this survey are shown in Table 1 and Figure 3. The responses are from a mixture of Enlisted and Officers from the Navy, Marines, Army, Air Force and Cost Guard. They come from multiple different branches of the Armed Forces, but the majority of respondents to the survey were from the Navy. The tables and figures explain the breakdown of Officers and Enlisted as well as the breakdown by service of who responded to the survey.

Table 1. Survey Respondent Breakdown by Branch. Source: Qualtrics XM (2022)

	Answer	%	Count
1	U. S. Navy	61.16%	137
2	U. S. Marines	22.77%	51
3	U. S. Army	9.38%	21
4	U. S. Air Force	6.25%	14
5	U. S. Coast Guard	0.45%	1
	Total	100%	224

Figure 3 is an excellent representation of the ranks of members from all branches in the above table. This figure is important for understanding the need for further research to develop a larger sample size as well as a sampling that is more diverse and representative of the Armed Forces. Figure 3 is a graphical chart displaying the breakdown by rank of the members who responded to the survey. This brings clarity for the later discussion of limitations.

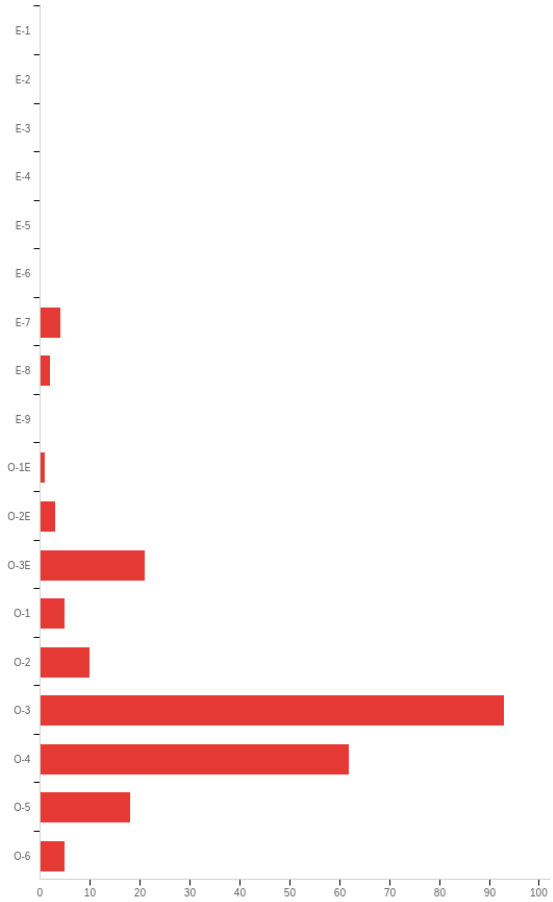

Figure 3. Responses by Rank. Source: Qualtrics XM (2022)

The numerical survey results shown in Table 2 were used to define the weighted points to each of the categories for the comparative analysis between MyChart and MHS GENESIS shown in Table 3. The initial survey given asked the participants to answer one question related to the purpose of interoperability within the electronic health records. The question asked the respondent to rank from highest to lowest with one being the highest and four being the lowest, "What was most important to them?," regarding their medical health records (see Appendix A for the exact text of the questionnaire).

The statistical data from the survey question served as the reference point to develop the weighted point system assigned to the categories of features for interoperability. This was done to ensure validity of the comparative analysis seen in Table 3. The validity was done by using the survey results for categories of interoperability. The

category that the survey respondents found was most important was weighted with the highest number. This same process was done for all four categories.

There were 225 respondents shown in Table 2. This table shows the exact output for each category. The scale was rate from one to four, with one being the highest and four being the lowest what is most important to you as the user. The respondents chose as their first-choice accuracy, their second choice, was a tie between availability and completeness, the third selection was availability and the fourth was user-friendliness.

Table 2. Numerical Survey Results for Interoperability. Source: Qualtrics XM (2022)

Question	1		2		3		4		Total
User Friendly	28.00%	63	14.22%	32	13.78%	31	44.00%	99	225
Completenes	9.33%	21	36.00%	81	36.00%	81	18.67%	42	225
Availability	14.67%	33	36.00%	81	36.44%	82	12.89%	29	225
Accuracy	48.00%	108	13.78%	31	13.78%	31	24.44%	55	225

The Figure 4 chart is a graphical representation of the data from Table 2. It shows the rationale for the assignment of points for the comparative analysis in graphical form.

The small sample size from the survey conducted on active-duty military members at Naval Postgraduate School from the majority of the branches of the U.S. military in graphical representation, makes it more convenient to develop the best possible method for the quantitative analysis.

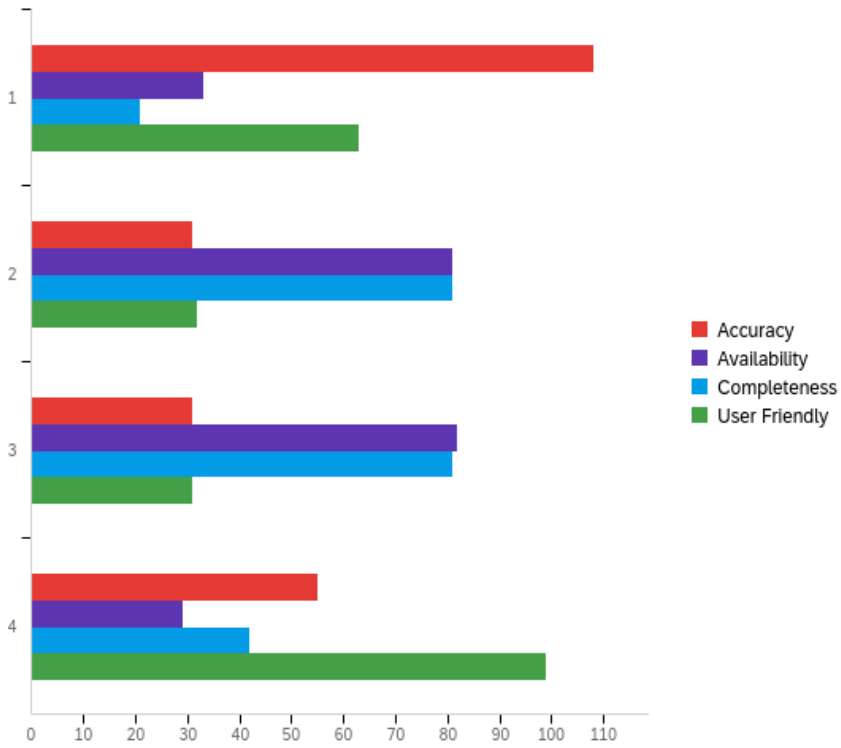

Figure 4. Survey Results for Interoperability. Source: Qualtrics XM (2022)

The Table 3 comparative analysis of MyChart vs. MHS GENESIS results listed show the results of the comparison with the weighted point system assigned and the features of each electronic health record that were analyzed. The comparative analysis between the market comparable MyChart and MHS GENESIS showed a clear preference towards MyChart.

The output of the comparison shown in Table 3 below used the weighted point system based on the survey results. The category accuracy was assigned four points. This assignment of points was based on the survey results. The survey results showed accuracy as the most important feature of interoperability. The assignment of 3 points was followed to availability as it was the second most important category selected by active-duty military members from the survey conducted. The assignment of two points was given to completeness as it was the third most important category selected by active-duty military members from the survey conducted. Lastly, 1 point was assigned to user-friendliness as it

was the least important category selected by active-duty military members from the survey conducted.

Table 3 utilized every feature available to the MyChart EHR and the MHS GENESIS EHR from the literature review. The comparison listed the features in a side-by-side comparison, assigned an answer of Yes or No to each feature within each category. This then was given a score based on the categories weight which was based on the survey results as seen in Figure 2.

Table 3. Comparative Analysis of MyChart vs. MHS GENESIS

	Comparison of MyChart and MHS GENESIS Electronic Health Record Features				
Categories		MHS GENESIS		MyChart	
Accuracy	Features included in EHR	Yes	No	Yes	No
	E-Health	x		x	
	Sequoia Project	x		x	
	Carequality	x		x	
	Mobile application		x	x	
Total points	4 points assigned	12		16	
Availability					
	patient portal	x		x	
	Mobile application		x	x	
	Internet accessible	x		x	
Total points	3 points assigned	6		9	
Completeness					
	Internet accessible	x		x	
	web portal (Specialty/primary Dr)	x		x	
	Mobile application		x	x	
	customer service	x		x	
Total points	2 points assigned	6		8	
User Friendliness					
	Single Sign-on	x		x	
	mobile application		x	x	
	web portal	x		x	
	1 point assigned	2		3	
Total points		26		36	

The results of the comparative analysis can be seen in Figure 5. This chart representation of Table 3 illuminates the results. It shows, the MyChart electronic health record not only outperformed with regards to interoperability, the MHS GENESIS electronic health record overall, but also outperformed the MHS GENESIS electronic health record in each individual category.

The major feature difference between MyChart and MHS GENESIS however is a little more nuanced. The only feature difference between the two electronic health records is the smart phone application.

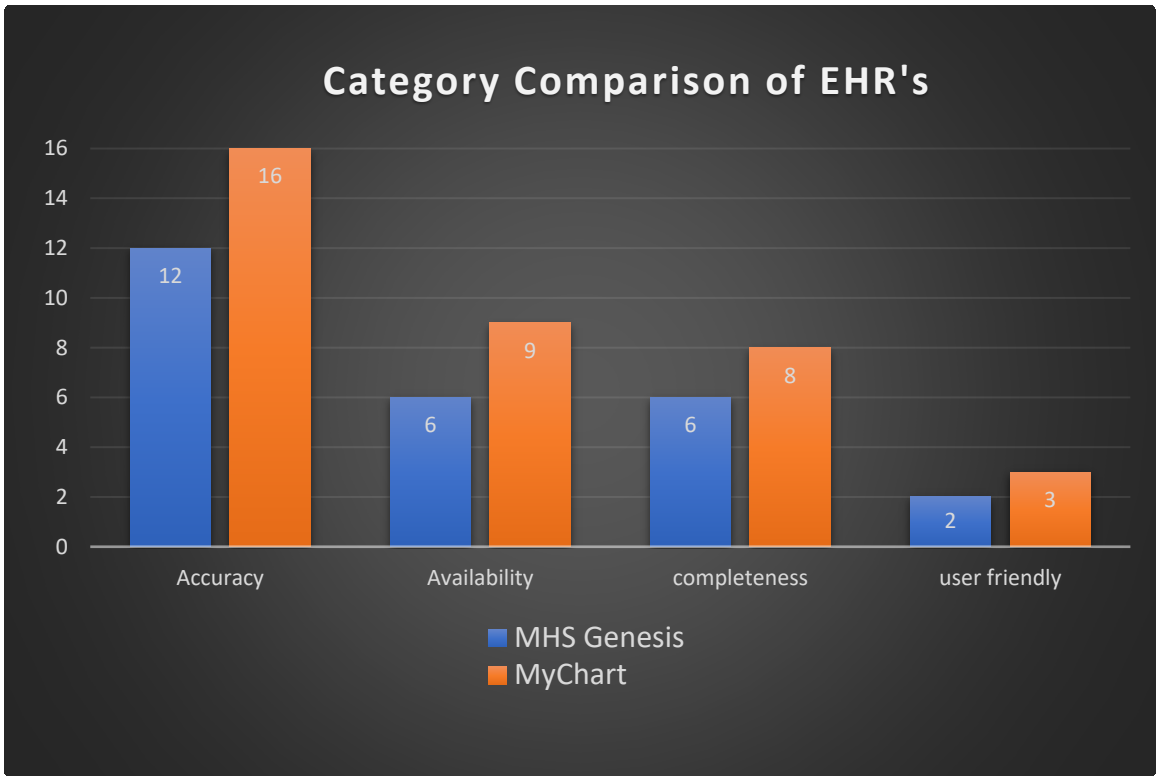

Figure 5. MyChart vs. MHS GENESIS Comparative Analysis Chart

C. VALIDITY AND RELIABILITY OF QUALITATIVE AND QUANTITATIVE ANALYSIS

The validity of the data collected from the interview and survey as well as the graphical analysis of that data is within the appendix and methodology section of this paper

and are readily available for review. The technique for weighting the categories can be duplicated and has been explained in detail within the methodology section. The operational definitions for the features and categories have been written and placed within the methodology and introduction sections of this thesis. The ability to replicate the study and have the exact same results should be easily duplicated.

The qualitative and quantitative analysis are both valid and reliable based on the survey process listed in the qualitative analysis section. It utilized an approved email to the student population of Naval Postgraduate School. The responses were tracked and analyzed utilizing the Qualtrics XM platform. The Qualtrics XM platform utilized a choice count. The quantitative analysis did not use information from the Word Cloud, but simply used the information provided by the survey results from the Qualtrics XM platform. This provided the basis for the comparative analysis that used both nominal and ordinal methods for the statistical analysis.

The potential for error is an important aspect of this study. The measurement was done by a sampling population and could possibly produce type 1 and type 2 errors due in part to the limitation of the study.

Type 1 errors could have led us to accept the hypothesis and reject the null hypothesis by accepting that both policy and electronic health records do effect interoperability. However, even with a quality sampling of Armed Forces military members, only 224 members were sampled. This could lead to the wrong conclusion and a type 1 error.

Type 2 errors could also be present although the hypothesis was accepted, the data could have opposed the hypothesis and would have made a rejection of the two hypothesis and accept the null hypothesis. This is again demonstrated by the small sample size.

D. SUMMARY OF RESULTS

The results from the study were broken down into two major sections. There was a qualitative and quantitative analysis. The qualitative analysis was represented in a word cloud where size of the word determined importance. The word cloud ultimately showed

the categories of interoperability were the same as the ones selected for the survey. This verifies the importance of accuracy, accessibility, completeness, and user-friendliness. The quantitative analysis used operational definitions, categories and features to arrive with an overall selection for interoperability. The tables, figures and data were instrumental in drawing conclusions.

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V. CONCLUSION

A. DISCUSSION

The following summarizes the findings based on the initial qualitative data and subsequent quantitative analysis. This section aims to attempt to answer the initial research question related to the proposed hypothesis: Should the Defense Health Agency adopt interoperability techniques of the MyChart Electronic Health Record?

Qualitative data of this research were primarily sourced from the interview with key DHA staff members that work closely with the referral management process and, more specifically, CLRs. The secondary data was sourced from question 4 of the survey given to NPS active-duty students. Question 4 asks respondents to provide additional comments on the features not mentioned already in the survey. Data from question 4 was captured with the Qualtrics XM platform and illustrated using the platform's embedded Survey Word Cloud function.

1. Summary of Qualitative Findings

During the interview with the DHA personnel, many of their concerns stem from the inability of networked providers to provide CLRs promptly and directly to the MHS GENESIS EHR. Furthermore, they were concerned that although MHS GENESIS was the new EHR contracted to replace legacy systems (e.g., CHCS, AHLTA), the system relied heavily on legacy processes (i.e., facsimile) and the legacy systems mentioned earlier to operate.

As for the results of question 4 of the survey, the culmination of text data in the form of a word cloud gave us some insight into what is vital to active-duty members when it comes to their respective EHRs. Although most are platform agnostic, primarily due to lack of knowledge of the legacy and current EHRs, many of their concerns support the research question and hypothesis of a need to have more interoperability with MHS GENESIS.

The following are comments from the survey that support the H2 hypothesis, Changes to the DHA health record policy Defense Health Agency's Interim Procedure Memorandum (DHA-IPM) will make MHS GENESIS more interoperable:

- "I have had the entire anthrax series twice as a result of a medical professional mismanaging my record and having lack of access to the online system."
- "I have had Marines with severe drug allergies almost be given the drugs they are allergic to thanks to poor record-keeping—accuracy is important."
- "Ease of transfer between IT systems."
- "Available on a single, intuitive, system."
- "Interoperable: interoperable with other digital medical records systems to facilitate an easy(ier) transfer of information when transitioning out of the military."
- Interoperability with the MHS GENESIS platform can increase the quality of care received by active-duty and beneficiaries.

2. Summary of Quantitative Findings

The independent variables of electronic health records and policy were evaluated in the comparative analysis between MyChart and MHS GENESIS. The results showed the dependent variable of interoperability is affected by categories and features related to policy and electronic health records.

The null hypotheses should be rejected in the quantitative analysis, and hypothesis H2 should be accepted, that electronic health records and policy are correlated to interoperability based on features. This correlation can be related to policy. The MHS GENESIS electronic health record has shown it is not as accurate, available, complete, or user-friendly as the market comparable MyChart.

The dependent variable interoperability is affected by the features and categories of the electronic health records. They are related to interoperability; thus, features and

categories should be considered before implementing the independent variable of an electronic health record.

As the study showed, MHS GENESIS and MyChart have nearly identical features, categories, and roughly comparable interoperability. The difference between the industry best in class MyChart and MHS GENESIS is the better utilization of features within each category. MyChart's advantage is a mobile application. This supported the H1 hypothesis that interoperability based on features is a driving factor for success.

B. ASSUMPTIONS

MHS GENESIS will work with E-health, Carequality because it has the technical hooks in place to operate on the HIE. This information was assumed because high ranking members within the FEHRM told us they worked. The assumption the information given to us by the DHA's FEHRM team and other DHA professionals involved with the implementation of the MHS GENESIS electronic health record are accurate and true. This assumes they have no vested interest in falsifying information provided.

The information given to the study from EPIC about MyChart is true and accurate is an assumption. The technical information obtained from EPIC is the basis for the features and capabilities of MyChart and it is assuming this information is accurate.

The major assumption that reflects to the overall purpose of this research is the 224 responses received will reflect the opinion of the Armed Forces. This assumption understood the population at Naval Postgraduate School to reflect students from all branches of the military and that it is a cross-section of the military making the respondents a good representation of the military in general. The ability to generalize this information to the military is a limitation of the study and is why it is mentioned in both the assumptions and limitations.

C. LIMITATIONS

The study had multiple limiting factors that must be discussed. Specifically, the size of the sample population was limited to only active-duty Naval Postgraduate students. The sampling had a second limiting factor. The enlisted population of active-duty members

is very limited at Naval Postgraduate School. The few enlisted are from the ranks of E-7 to E-9. This makes them senior enlisted members with more than ten years of active-duty service.

The lack of the Leidos-Cerner and DHA's MHS GENESIS technical data limited research. This specifically interfered with interoperability and capabilities for the electronic health record. This limited the depth of research into the hypothesis. The information provided by the DHA professionals was the driving force for this research. The research was limited to available non -classified information or controlled unclassified information.

The DHA's Federal Electronic Health Record Modernization (FEHRM) team did allow us communication. However, they offered limited access to the contractual agreements between Leidos-Cerner and DHA. This limited the research capabilities to know whether a feature would be implemented for MHS GENESIS in the future or not. It also limited the scope in being able to answer why a feature was or was not implemented. This limiting factor does hold weight when discussing the H2 hypothesis. The H2 hypothesis stated, that policy was the driving force between both electronic health records.

The limited technical data for EPIC's MyChart was a factor in this research. The company provided technical data, but it was limited in scope. It did not go into a detailed account of the inner workings of the features and capabilities other than what the representative from MyChart made.

Time was a limiting factor to the depth of discovery. It would be beneficial to develop a study to look at the implementation of MHS GENESIS over time. This study however was done as part of the compulsory completion of the Naval Postgraduate School Master's degree, which does not allow for a longitudinal study.

Funding was a limiting factor to the ability to be embedded into the MHS GENESIS team. The ability to be an internal member of the team would have improved the level of understanding of the system and increased the overall depth of the study.

D. RECOMMENDATIONS

The first recommendation is to conduct a larger study of the MHS GENESIS electronic health record. This recommendation would be to utilize active-duty members from large MTFs in large multi-market regions. This would improve the sample size of this study and increase the statistical efficacy. This would also improve on the diversity of the study. This study has limited access to the largest constituents of the military, which is the enlisted population. This study has limited access to the enlisted members. An increase in enlisted personnel to the study would again improve the statistical efficacy.

The second recommendation would be to conduct a longitudinal study. The MHS GENESIS electronic health record is still in its initial implementation phase. The electronic health record is not in its final format. This would lend to further studying over time for the same features and capabilities and do the comparative analysis with the same market comparable in that time. This would prove to be a useful continuation to the study.

The study would be greatly improved by having a team of independent researcher's embedded with the Federal Electronic Health Record Modernization team. This would not only give the team a goal to strive towards but would also give them a baseline to perform against. This would require funding from the Defense Health Agency.

The funding would have multiple sections for utilization. It would cover travel to the multiple multi-service markets and large MTF's. The funding would need to cross section the Army, Navy, Air Force and Marine Corps medical treatment facilities. This would need to sub-section travel to study the Veteran's Administration's implementation of MHS GENESIS.

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APPENDIX

A. QUESTIONNAIRE FOR THESIS ON MHS GENESIS ISSUES WITH INTEROPERABILITY

Questionnaire for Thesis on MHS Genesis Issues with Interoperability

Introduction: Interoperability with the military electronic health record and the Defense Health Agency's (DHA)s contracted health managed organization is of the utmost importance to the military member. The purpose of this survey is to find out how to better serve military members' Healthcare experience within the DHA as part of the Department of Defense. The health record is the specific topic of focus for this survey. We would like your opinion on health record accuracy, availability, completeness, and user-friendliness. Please follow the directions below.

Directions: Please Rank the following factors in order of personal importance to you, the military member. You will be given a list of areas of concern. Please rank them in precedent order from this list, with 1 being the most important or concerning issue and 4 being the lowest importance or concerning issue with your military health record. Definitions of terms:

Accuracy: How important is it to you that your health record is correct and up to date with all medical information?
Availability: How important is it to you that your health record is always accessible to you when needed?
Completeness: How important is it to you that your health record is a comprehensive chronological record of care?
User-friendliness: How important is it to you that your health record is easy to use and understand?
Other: List any other features not listed above.

Survey Question 1: Please state your branch of service_____
Survey Question 2: Please state your rank_____
Survey Question 3: Please place the following Electronic Health Record features in order of personal preference. If you had to choose an Electronic Health Record, what features would be most important to you?

Accuracy ___
Availability ___
Accessibility ___
Complete ___
User friendly ___

B. DHA INTERVIEW

Speaker 2 [00:03:23]

All right. I'll just go ahead and go first. Again, my name Farah Sarshar and the MHS Genesis business functional champion. And what that means generally is that I coordinate amongst all of the business communities that being the access to care/ scheduling community that also includes. Patient administration, health information management, medical record coding, it also includes referral management, billing, data quality, a lot of the patient check in or registration processes. So all of that and making sure that the requirements and the resulting capabilities that will be implemented at at MTFs really meets the requirements of the DOD. And just for your awareness. The baseline that is currently deployed at many of our locations does not include the full suite of revenue cycle capabilities. We will start implementing those revenue capabilities beginning in February 2022. However, what you're most interested in at this point, I believe, is the referral management processes that we have implemented with our managed care support Contractors in that capability is operational today, except for some of the capabilities such as fur? And some capability that we know we need. In addition to current capability to ensure that what I'll call subsequent information exchanges or subsequent to seventy eight exchanges can be captured within MHS Genesis. So I'll kind of leave it at that, but that that's who I am and what I do.

Speaker 1 [00:05:33]

Thank you.

Speaker 3 [00:05:36]

And good morning, this is Robin Abbott on the DHA referral management lead in health care optimization, and we are responsible for policy and execution related to referral management. We work very closely with Ms. Sarshar and her team. To ensure that we are configuring the system in a way that supports the MHS mission and policy, and then also to ensure the field that the system is able to support what we have in policy and the standards. And so we work closely with the SMEs, we've got a really excellent community that helps us with understanding more complex problems and what's happening down at the MTF level. And so it's been a good partnership with MHS Genesis. What's been nice about it as well is. Change is possible. We started at a certain place back in 2017. The referral capability that existed at that time. Was something that was put together to meet the deployment timeline, and since then. A formal referral capability was implemented, and there are updates that happen with the system, and we cannot necessarily say that as confidently about our legacy systems. So I work with a small team of service leads because we are all coming from different services. And now that the DHA transition is happening and we're standing up the markets, we are working to kind of formalize that communication and and again ensure that. They have the community has what they need in terms of policy and an understanding of how to use the system and that the system can support. Meeting the standards that are outlined in the IPM 18–001. So let me turn it back over to the next person.

Speaker 2 [00:08:18]

Can I just add something to what Robyn what Robyn mentioned? So this partnership between her office, the business functional office, has also really. It also includes the clinical perspective because obviously all of these referrals are for our patients and making sure that they are getting the right care at the right time at the most efficient location. It really has also involved the collaboration of the business functional champion in the biz. I'm sorry, the clinical functional champion and the clinical side to ensure that we're also meeting clinical requirements. So we want we're trying to break some of the historical stovepipes and only looking at things either from a clinical or business standpoint, it really has to… We've really been on a journey to try and find

collaborative solutions that meet our system as a whole, not just one functional area or the other. That's all I wanted to say.

Speaker 3 [00:09:34]

OK. And the remainder of us on the call support Ms. Sarshar and or Miss Abbott in their efforts Ms. Liu, Mr. News? and myself are here to support them.

Speaker 1 [00:09:51]

All right. Awesome. Well, thank you so much. I really appreciate that so so so the purpose of the meeting and the purpose of our thesis, really? And Ross, correct. Correct me if I'm if I get this wrong. But the basis is or we want to, we want to just look at an opportunity to create an efficient any efficiency. And I do understand that MHS Genesis is not fully deployed yet. So you know, there are going to be efficiencies that will come later on. But at this point, we're just kind of taking a snapshot of what we can see and hopefully create some kind of efficiency. Specifically today, I think most of our questions are going to be centered around the CLR process. That's one of the areas that we felt that we can maybe create some kind of efficiency in there that may not exist right now. So what I would like to do is just ask a series of questions relating to the sealer. And I do get I do get that some commands are still in there, complete like they have their complete legacy practices and systems in place. There's and again, correct me if I'm wrong. So a lot of the sites that have rolled out MHS genesis are still using it in a in a sort of a legacy hybrid because things still have to go through games alter in that part once it gets to the Health Care Business Office. So it's no. The. So, so, so before I even get to the rest of this, would you be able to just define for me what exactly is a CLR? I'm not an expert like I would like to get the expert answer and not what I think it is or not what I've read of what and then what I think it is. So what exactly is a CLR?

Speaker 3 [00:11:47]

So we can give you the formal definition because it is defined in the DOD, I and I can bring that up. But the clear and legible report is a DOD specific term to identify the records that are in the network. For Kerry, that's been referred out. And so me one second. But I can I can certainly send that definition to you.

Speaker 4 [00:12:54]

OK. Can I jump in, Rob? Yes. We're just asking your opinion of what it is. I mean, I think we both have like the definition, but we want to know what from your role and perspective in the whole process, what you actually just straight from your heart, your own words. Don't worry about any sort of having to quote.

Speaker 3 [00:13:23]

Yeah. So for us, it's really the result coming back from the network for care rendered.

Speaker 1 [00:13:35]

OK. All right, so. So having said that, what is the what is the process once the sellers create CLR was created from the network provider? What exactly is the process for getting that CLR to the to, eventually back to the beneficiaries record?

Speaker 2 [00:14:00]

Boy, that's the million dollar question.

Speaker 3 [00:14:02]

Now we have that all outlined out. We we've done the process. So each provider in the network signed an agreement with our managed care support contractor. And actually, before we continue on with this discussion, it would be kind of nice to know what your background is and specifically if you have experience working in referral management or with a collection of class.

Speaker 1 [00:14:32]

So I myself, I am I am a Medical Service Corps officer. However, I have not worked in referral management.

Speaker 4 [00:14:38]

Lieutenant Vollstedt Yeah, I am also a Medical Service Corps officer. I was a department head for health care business at Lemoore and I was in on the implementation of MHS Genesis so I'm pretty well versed in the processing.

Speaker 3 [00:14:59]

Perfect. So each of our network providers, they signed an agreement with the managed care support contract. So in the West, that's health net, and in that agreement they talk about, you know, we expect you to send your CLR back to the MTF And each MTF is expected to go into our contractor system, provide a fax number to send that back to. And so when the provider in the network receives that referral. They have at the bottom of it, please send the result back to this fax number. We do not have in the contract at this time that it has to be returned within 10 days. That is usually seen as the expectation for, you know. Routine care that goes out to the network. But that's not something that we are able to enforce at this time, and we are working on that.

Speaker 2 [00:16:21]

So Robin, I also want to make one point. The responsibility of returning the CLR used to be used to lie with the managed care support contractor, and I think they didn't do what I'll call a stellar job to manage that process, and that process then was transitioned for the responsibility of that process transition from the managed care support contractors to the MTFs that happened many years ago. I think that might have been under 10x(unintelligible), but at this point as well, it's not easy or for the managed care support contractor to track any, whether that network provider has submitted that CLR back to the MTF. There isn't any monitoring on their side to do that. Correct?

Speaker 3 [00:17:30]

Ask that one. That last part, one more time.

Speaker 2 [00:17:33]

There isn't any monitoring of by the managed care support contractor to ensure that the providers that network provider has submitted a CLR back to the MTF.

Speaker 3 [00:17:50]

Correct, at least in our contract. We don't have that built into it when we've talked with TRICARE Health plans. There's always this discussion about when they submit the claim. Are they also

attaching the sailor with it? And if that were the case, we've never been able to get that and we've talked with Mr. Merrow at length about is, does that actually occur? And if so, you know, what could we do? We are shifting away strategically from having the providers fax it to us. In the next version of the contract, and so. There will be a shift towards making the CLRs available in the health information exchange. And if they are not a part of a health information exchange that allows us to be able to look and pull that record, you know, from within joint legacy viewer, then they would fax it to us. So lots of changes are going to not lot, but it's a big shift for the D.O.D. to to look at leveraging the return of the CLR. You know, through the health information exchange, and so I realize we're starting to digress from the original question, which is the CLR process.

Speaker 1 [00:19:37]
Well, this is good. This is good. Yeah, actually.

Speaker **4** [00:19:39]
I wanted to tag a question that in there because you said health information exchange, is that health information exchange going to be the joint legacy viewer? Are you going to through both of those in? And is that going to be available to all of the network providers?

Speaker 3 [00:19:57]
So we we are not expected to make. A health information exchange available to a network provider, they are able to join exchanges. Certainly, some of them have it as a part of their electronic health records system. So we call ours joint legacy viewers. So when you're in AHLTA or you're in Genesis, there is an icon for JLV that you can click on to be able to view and search external records. Is everyone familiar with JLV?

Speaker **4** [00:20:50]
JLV was going to be a specific topic of conversation. So, OK, that is, I don't know, Rob, do we want to jump in here right now?

Speaker 1 [00:21:00]
If it makes sense, if it makes sense to talk about it in the process as it is to be of this process, then please us. We could talk about it now. That was going to be my last question. But yeah, if it makes sense to talk about it now, let's do it.

Speaker 3 [00:21:13]

All right. So, again, joint legacy viewer, that's what we call it, right, and that is how we access external records. And so. We are also leveraging capabilities from Cerner, is my understanding, I'm not the expert in this, I just know how we get to it. So in the contract, they worked with members from that program office to have language that basically said, You know, we want you to be on an HIE that's compatible with what we have. Meaning whatever exchange you use, if we can see it, that that pretty much meets the requirement. And I don't know what the formal language is for that. But in lay terms, if we can, if it's compatible, that means we're able to view it.

Speaker 2 [00:22:15]

So just to jump in, and I'm not the health information exchange expert either, but there is a program office over in the PEO-, the DHIMS or the MHS Genesis PEO, which manages the DOD's Connect, what I'll just call connections to national health information exchanges. So commonweal happens to be, I think, a big one. They work to. Accessed those HIEs to be participants of those HIEs so that it makes it easier for information on our patients that may have been generated. In, you know, in those by those network providers for us to be able to access that information in as easiest a way as possible, HIV is being one of them. So if you have some specific questions regarding those health information exchanges that DOD and VA participate in.

Lance Scott is probably the best person talk to about relationships or of those connections that we've established. But we do obviously have that. We do have those associations with the national HIEs.

Speaker 1 [00:23:57]

OK, so, so for the CLRs, that would be the vision that where we would want to go, is that or you're saying that that what's coming, what's on the horizon is this contract change that will enable or open up the use of the health information exchanges for these providers to more efficiently submit CLRs back to the sites.

Speaker 3 [00:24:21]

It would really just be make them available. And this is a big discussion right now because. It begs the question, how would the MTF know that there's anything there, right? We. Right now, the system is set up that. They fax it to us, and so it's being it's being pushed to us. It shows up on the fax machine. I go in, I find the referral that's associated with it. You know, I annotate that we have received the sealer, I upload it into the record and then in Genesis. They can have a notification go to the to the provider, shows up in a separate like message center area that they have results to review for the CLRs. And so that that moves right along if we don't receive that referral passively. Then we have to go look for it. So years of experience and playing around with it, The SMEs at that time said, you know, it's really best to wait until 60 days after the referral was ordered. To start what we call chasing a referral. So if we haven't received the referral, I'm sorry if we haven't received the CLR we are going to start chasing at that point. And so we start pulling claims data. And matching it up. To see if there is a claim, and that's the only way that we know that the patient was seen that there may be a CLR to request. And so if we find a claim, then we fax over our request to the provider saying, please send us that caller. OK.

Speaker 1 [00:26:40]

No.

Speaker 3 [00:26:40]

I'm sorry, continue. I know you're taping this, too, and I think I probably have made some workflow diagrams that we can share on this. OK, so go ahead.

Speaker 1 [00:26:52]

I was going to say, so is it is it at the beginning of that chase process that you engage the managed care support contractor? Or do they getting are they engaged at all in that process?

Speaker 3 [00:27:03]

Now we are just searching for claims data. All right, we pull the claims data and start checking out. OK. For all of our open referrals that we expect to CLR on do we have a claim in the system? So one of the things that we worked on many times for our legacy systems was, Hey, if you have that claims data that comes into the system.

Speaker 1 [00:00:00]
Hey, if you have that claims data that comes into the system, although it may take time, is there any way that. You could feed that information back into our legacy system so that when we look at a referral, we can see whether there was a claim. We don't care what the number is. All we want to know is yes or no. Is there a claim? Because that's an indication that. There should be a sealer that we could go request. So again, once we start doing that, that's, you know, we have to chase it

down. If it's an HIV, though, how do you know it's there and when do you start looking for it? So. If it's in the HIV, if the patient comes in for an appointment, there are some things in Genesis that will let them know that there's stuff in the HIV if they want to look at it and view it. But other than that, somebody is going to have to go look in the eye and find it. And we have a requirement for that sealer to be actually in the medical record. So although it's visible out in the exchange, we need to pull that record in and Genesis has some things in it to help with that process to make it easier. And then we still have to make sure that the provider sees that. And closes the loop on it. So we're working with a request to say, how can we figure out when there is? Information in the HIV for an open, open referral.

Speaker 2 [00:02:02]
Yeah. OK. I just want to throw out there because I understand that. MHC Genesis will. And I might not be using the right terminology, because sometimes I don't. If there is information in an HIV for one of our beneficiaries. I think there is some mechanism to auto digest that computable data that might be out in the East, but in this instance, because typically we're asking for some type of report, a summary of the findings of the of the provider that we referred the patient to it. That collection of information in a report may not isn't computable data, so the system may not be able to, in essence, auto pull that report into the patient's records. So I think we're trying to find how to. Easily. How do we make it easy for us to find the information that might be out there that's relevant to us in as easy and means as possible because finding or going out and looking in and HIV might be one way to be able to do that. And rob and remember, we also talked about having those direct trust accounts in order for providers to directly, you know, contact other providers or contact our referral management centers and have the ability to send that information directly from one to another in a secure in a secure manner as opposed to using like a fax machine. But I'm not sure we have cracked the tonight on what those all of the combination of or easy solutions are, but we want as we want to make it as easy on our network providers as possible to get that information back to us because obviously we have equity in making sure that information is available to the provider that referred the patient to the network provider.

Speaker 3 [00:04:38]
And that kind of gets to the almost to the crux of what we're what we're looking at is trying to shorten that distance between the embedded NTF provider and the network provider, you know, kind of bend space and time and get those to get those records directly from one point to the other. So and that's why I guess that's why that's why we're so interested in knowing the full the full process of submitting a sealer. So I mean, I guess kind of a loaded question here, but what exactly is the role of the managed care support contractor then in this process?

Speaker 1 [00:05:17]
That is a great question, and that's one that's actually being asked right now by senior leadership because they are very much interested in this discussion with the class. So at this time, you know, the managed care support contractor is responsible first for setting up the provider agreement so they find the providers in the network. And it's in the agreement that they're going to send us this information. They'll send it to the fax number that's designated. If that is not happening. The contractor relies on the office to report it, that there are non-compliant providers out there. And so each of the. Each of the managed care support contractors has a process for dealing with providers that are failing to send the class. And so typically it starts with education, right? We will. Send a report saying, you know, here's the folks that have not been turning in their class. And then the contractor, we'll talk to those providers. And then if it continues, you know, the burdens on the MTF to report, Hey, this is still this is still occurring. They can further escalate up until the point where the MTF could request to just pull that provider out of their directory. Meaning we would no longer send patients to that network provider. And you probably understand that the TRICARE network really relies on network providers that want to see TRICARE patients across the country. There is it's difficult to find special specialists in general. And so. Not every provider wants to see TRICARE patients. And we struggle with that. So if you're in Alaska and you have a provider that's not giving you your class and all these efforts have been made to get them. They can't

afford to just say, oh, then we're not going to send our patients to you anymore. They are they need that provider. And so that's one of the things that we come up against, particularly in the West region, is that there's a shortage of providers, not all of them, except TRICARE. And so. We really need the relationship to work. Our most successful MTA. It's unfortunate that they have to do this, but some of them. They take a uniformed person and somebody from the referral management center and they go visit the network provider.

Speaker 3 [00:08:42]
Oh geez.

Speaker 1 [00:08:44]
And they love up on them and thank them for seeing TRICARE patients. And some of them have made little like certificates or plaques, and they give it to them. And believe it or not, that's one of the most effective means we have of improving. The return of class is just saying, you know what? How thankful we are that you see TRICARE patients, how they're, you know, providing a service to their country and really just appealing to that aspect of the provider.

Speaker 3 [00:09:20]
Wow, that's quite interesting. I didn't know that.

Speaker 2 [00:09:25]
Wow, that really. I didn't know that either, Robin, but that's really putting a more personal association between us and those network providers. Because when you when you know the face that's associated to the patients, you know, the person who's directing patients your way. Maybe it's a little bit, you know, it's harder to ignore the fact that, hey, you know, lieutenant or commander or whoever just visited us, and now we feel more compelled to provide the information back to them for their patients. That's interesting.

Speaker 1 [00:10:05]
Yeah, provider offices, they're very, very busy, too. And so I can see how, you know, certain dogs are.

Speaker 3 [00:10:29]
I'm sorry, I don't know if I have. I'm like over a plane path here, so I apologize. So you mentioned before that the managed care support contractors were part of that of that seal our process correct. They lose everybody. I'm reading you.

Speaker 2 [00:10:57]
No, I can hear you, I'm in. OK, maybe want Robin to respond, but I think what I would say.

Speaker 1 [00:11:06]
Oh, I'm sorry.

Speaker 2 [00:11:08]
More on the fringe of that process than in what would, I would say, a direct participant of it. But Robin can better.

Speaker 3 [00:11:19]
So, so. So my question is. So at one point, they were more they were more engaged in that similar process. Do you see that coming back so that they can make sure that the sailors are being submitted? Or do you just see just a better version of what we currently have?

Speaker 2 [00:11:36]
Yeah. So the historical, you know, of some of the what I'll call the early the early TRICARE contracts did have that managed care support contractor responsible for getting those sailors back.

But because we didn't see. We didn't see them being overly successful. We took that requirement out of the contract and placed the responsibility at the interface to quote unquote chase the sealer. But I'm not sure that necessarily resulted in better. Receipt of the sealer, I think what Robin and her team have been trying to accomplish over the last several years is what really is the best means to get that color back, not only from a process standpoint, but also from what tools. So what mechanism faxing being one way will able get it or identify it via an HIV? We've also talked about direct trust, but there's multiple ways I think that that that information could come back to us. But what's the most efficient and expedient way to get that information back?

Speaker 1 [00:13:07]
So just so, you know, again, this is an active discussion that we are having because we would like to make the contractor more accountable in the process. And what they're saying is. We only receive a handful of reports from the MTF saying there's non-compliant providers, and so. What they're saying is, well, you're not doing your part to report it. If you tell us who's not giving you your colors, we'll address it. And they will. But we're a couple of years into the current contract and after a certain number of attempts, you know, there's fatigue and loss of confidence in the process. So that doesn't occur, OK? And so we are looking at, do we need to reinvigorate that effort or is there a way to automate it? Is there a way to see like, could we pull a list of here's all the referrals that we found a claim for, and they were close saying that we couldn't get the caller. That's a question we asked, could we pull a report and then sort it by who the network provider was? And then turn that over to the contractor. That's one topic we're discussing now because they want to do it at the MTF level, which is where it sits at this time. And my question is, is there any way to do that at the enterprise level? I myself, we don't have the bandwidth to do that. Yes, but that question is being we have thought about, you know, could we do that?

Speaker 3 [00:15:04]
OK?

Speaker 1 [00:15:06]
Also, good to know. I just want to just because I don't want to leave the topic incomplete if the new contract overseas. The contractors taking responsibility to return the sailors to the MTA. That's the first time since, like 2000, I don't know if it was 12, where we cut it, where we switched over eight. But it's the first time in a long time that a contractor is getting involved. In the seller business, essentially interested in, is that right?

Speaker 2 [00:15:44]
I'm just wondering, is that because of translation requirements? So obviously, you know, that caller could potentially come back in a language other than English, huh? Who's the new overseas contractor? Is there a new one?

Speaker 1 [00:16:07]
There is a new one and I for. I forget the name of the contractor itself.

Speaker 2 [00:16:14]
But it's not ISIS.

Speaker 1 [00:16:17]
I think it might be ISIS still.

Speaker 2 [00:16:21]
OK.

Speaker 1 [00:16:22]
Let me check. Yeah. And so that's new to us. There's still a lot of unsolved and or unsolved questions about that. We're asking questions about how will that occur? And they're going to let

us know. OK. The requirement is still right now with the MTA to provide the killer to chase, to do whatever they need to get it right. There tends to be a little bit more coordination overseas for care that goes out to the network. And so. We don't see this as being the same level of effort there as it is here where you know the better half of our referrals are going out to the network for specialty care.

Speaker 3 [00:17:09]
OK, so. Well, all right. Well, I had another question regarding, you know, relating to how many seals are processed within a day. But I think I think since you mentioned it, if you had a slap again, you're not going to be quoted on this. But if you had to slap a percentage on how many records are, let's say, like at a San Diego, how many incomplete records exist, especially in our active duty where it affects readiness? Like, what would you say would be like the average of how many records are incomplete at this point because seals are failing to make it all the way back?

Speaker 1 [00:17:48]
So we're estimating that we close about 18 percent of referrals. Wow. As. I think claim received, and please send these if you're going to ask for numbers like these, please send these to me in writing so we can make sure that we give you the appropriate data. Yes, but I think it's close to 18 percent. We're closing as they had a claim, but we kind of get the sealer.

Speaker 3 [00:18:19]
Oh, OK. Wow. And again, we're going to have a more refined data collection process. And at that? Absolutely. I would love to send you these and get like some, you know.

Speaker 1 [00:18:31]
Give us a couple weeks, though it is very, very busy right now with like multiple things happening.

Speaker 3 [00:18:39]
Understood. Boy two. So would you be able to so the hang up, the hang up typically is in the provider side of things. Is that what I'm hearing? That it's not the it's just you're getting providers in the network that are not doing their part and submitting the sealers on time.

Speaker 1 [00:19:06]
Correct. OK.

Speaker 3 [00:19:08]
OK. Correct.

Speaker 1 [00:19:09]
That's probably the number one hang up. Now some will say, you know, do we have a lag or in? Can we can we guarantee that every referral was chased, that that comes up as well? OK. OK. You know how much of an effort was made to actually track down that killer?

Speaker 3 [00:19:34]
Right? And then and that would be more of an internal business practices that would need to be audited. Correct, I. Yeah. Yeah. So as far as the headquarters big picture view, what are the expectations as far as time line goes to, you know, from soup to nuts when it comes to class?

Speaker 1 [00:20:00]
So ideally, we would like to see a large returned in 10 business days from the time of the patient visit. Now we understand that sometimes the patient will have multiple visits and so the final report may not be ready. But 10 days, and so we've put that into the new contract, we were able to get that through (intelligible), so now we have something to hold them accountable, to look. From the time that that sealer is faxed to us. The expectation is that it will be in the system in three days.

OK. OK. And then likewise, the provider is expected to review their result within three days. And if you send those to you, I can tell you like it's probably three business days or it may be 72 hours, or I can give you that that fine tuned language. OK, but three days to get it in, upload it and notify the provider and then the provider. We expect them to review that result. And market as revered within a three day period.

Speaker 3 [00:21:24]
OK. OK, so then I'll make this, so I have like maybe like one or two questions that if it's OK, if I can email you because I don't want to keep you too much longer, but my last question or our last question is based on what's been promised right now. Again, things will things could change. Timelines can shift. What is your expectation once MHC genesis is, quote, fully deployed, right? The legacy systems are gone. Like what is your expectation as far as the cars go?

Speaker 1 [00:22:00]
So. We will always work towards improving the system. But right now, the focus is on the ability to ingest the results. And so looking at if something's available in the HIV. How can we improve because I can't even say improve because we don't have a starting place, right? We haven't done this before. So 25, when the next contract kicks in and the the claws are in the HIV, what should be the standard for how long it takes to discover it, that we have a killer that's in the HIV? Right. And I truly believe that. There's a lot of smart people out there that can help us with this and that. We're going to get there, it may take time, right, but we will get there. And so it comes into the system, you know? It goes to the provider. It's associated to the referral. You know, the provider is able to market reviewed and do whatever follow up actions are needed. Mm hmm. If there was a second caller that came in, that becomes the next question. We're not searching for the second sailor. So if they saw the dermatologists and they said, yes, we've diagnosed you with this and we're doing biopsies and they say, OK, we got the report back and it was melanoma that comes to the provider. And he has that result. You know, that person's going to continue to probably see the dermatologist for some time. We're not searching, though, for those additional class. Well, is there a way to make it easier for that provider? And we want to be sensitive to the fact, too, that if the if the beneficiary is under the care of the specialist, do I need to see every now? Maybe not, right? I'm in a sensitive if I have a. A sensitive duty, I'm on the presidential support team, I work with nuclear weapons. We say that, yeah, we do need to see every now. And so how do we help with that as well, right?

Speaker 3 [00:24:52]
How to get like a more like a passive reporting? Nothing. And that's going to be that's also one of the things that we're looking at, too, because we're going to be looking at it not only from a, you know, a cost, a cost benefit kind of scenario, but we're also going to look at the software side of things because we would like to know like how feasible is it to build in any kind of middle way or some kind of software that will help kind of connect those pieces.

Speaker 1 [00:25:26]
With a focus on Genesis or both legacy and Genesis, knowing that Genesis will be, you know, over on the East Coast? You know, we should be mostly deployed for the colonists region by like twenty four.

Speaker 3 [00:25:41]
So our so since we could only focus on the Kona's. We're going to we're really going to look into or try to look into the ambitious genesis side of it. We understand we might be we might be handicapped a little bit because the legacy is still out there and we may not be able to get, you know, again, it's not going to be fully deployed until 2024. So we're not going to be able to get those definitive answers. So again, to answer your question. The genesis side of things where you really want to lean into unless our analysis says, you know, if we had the legacy system still in place, that's actually more cost effective than doing all of this. And I don't know if you could be if

do you have a point of contact that could actually. Or do you know of any way that we can speak to, to talk to us about the software side of Genesis and how that interoperability works?

Speaker 2 [00:26:39]
Yes, I would recommend. I don't know. Robin, if. David Cody might be at least there P.O.S. for referral management interoperate, but it's likely that it's they're going to need to reach out to other individuals and maybe answer some of your questions. Yeah. Maybe Dave Cody's the right person, at least to give them somebody to start with.

Speaker 1 [00:27:15]
Yeah, we could do that. And then just for my awareness, I'm not sure how well versed your team is on interoperability. But, you know, we do have some of the requirements in the TOM manual that discuss, here's the data elements that we need to exchange for referrals. However, we don't have anything specific to a sealer. When we talk about interoperability.

Speaker 3 [00:27:48]
OK.

Speaker 1 [00:27:49]
Yeah. All right. OK.

Speaker 3 [00:27:51]
Well, that's all that's all the questions I have right now. I do have a couple that I would like to if I, if it's OK, if I can email to you, that I just didn't it now. But trust me, I think we got the important part, which is the process that I knew that was going to be the biggest one. Thank you all for. For just making this time for us. I really appreciate it. Yeah, this was a super helpful.

Speaker 4 [00:28:18]
Hi, this is five with BFC support, I just wanted to remind you, Mr. Cody actually retired his last day was Tuesday. So your point of contact is going to be Ramona, and I can add her email to the chat.

Speaker 3 [00:28:32]
Thank you so much. Yup. Perfect. OK, so Lieutenant Volstead, if you don't have any other questions, I think I'm good to go. I don't have anything else to add, I just thank you for your time. It's very helpful. You guys have been wonderful.

Speaker 1 [00:28:50]
So thank you. Thank you.

Speaker 3 [00:28:52]
Absolutely. Well, have a nice holiday weekend. I will. I will email you if I have any other questions.

Speaker 1 [00:28:58]
All right. Thank you.

Speaker 3 [00:29:00]
Thank you.

C. SURVEY EMAIL

From: LT Ross Vollstedt <bulkmail@nps.edu>
Sent: Wednesday, February 9, 2022 10:22 AM
To:
Subject: Survey concerning Medical Records ...from LT Ross Vollstedt

Greetings Fellow NPS Military Members:

As a component of our thesis for the Network Operations and Technology Program, we are conducting a brief survey (< 1 minute) to gain a better understanding of service members' concerns regarding Department of Defense (DOD) medical records.

Several years ago, the DOD created the Defense Health Agency (DHA), a consolidation of Navy, Army, and Air Force medical, including all hospitals and clinics, into a single defense agency. As part of the consolidation effort, a major information technology program has been undertaken to create a comprehensive Electronic Health Record (EHR) for all service members. This initiative, called the Military Health System, Genesis (MHS Genesis), is currently in place in several hospitals and clinics, with more to come in the next few years.

We have created this brief survey to gain the feedback from current service members regarding the attributes of an EHR that mean the most to you.

Your responses will not be attributable to you personally; all we are asking is your service and pay grade.

The survey will constitute your ranking of four attributes of a medical record, from one (Most important) to four (Less important). There is also an "other" block where you may indicate another attribute not included in the ones provided.

We are looking for maximum participation from the student body across all services.

The survey should take you less than a minute.

Thank you for your participation. The deadline for providing your input is Friday, February 25th.

The link to the survey is:
https://navalpostgradfedramp.gov1.qualtrics.com/jfe/form/SV_cD4KDRZ3dDH56eO

D. CLEAR AND LEGIBLE REPORTS INTERVIEW QUESTIONS

1. What is the staff make-up of your healthcare business office?
    a. how many GS employees?
    b. how many contracted employees?
    c. how many military personnel?

2. What is the pay grade of all members of the Healthcare Business department?
    a. GS?
    b. Military?
    c. Contracted?

3. How many staff members of the Healthcare Business department process CLRs?
    Again:
    a. how many GS employees?
    b. how many contracted employees?
    c. how many military personnel?

4. Do referral managers also process CLRs? (If yes, ask for the paygrade)

5. On average, how many CLR's do you process in a day? (baseline for an application)

6. How many hours a week does your office work specifically on CLRs? (total number of employees working towards this goal x their pay schedule will give a cost to processing a CLR)

7. How much time does it take to process each CLR (on average)? (useful for making a baseline application and applying a cost to each CLR also giving relevance to the money lost when a CLR is not found)

8. What is your local policy as far as the timeline goes for getting CLRs back from network providers? (Gives us a baseline for the ability to process via an application)

9. What percentage of CLRs make it to the beneficiary's electronic health record? Specifically, as it relates to active duty members? (Specific to DHA)

10. Is a fax machine the only method for receiving CLRs? (represents the cost of maintaining a fax machine and fax-line)

11. How much does it cost to operate the legacy systems relating to CLRs? (Specific to the CIO)

Survey Wordcloud

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LIST OF REFERENCES

Akram, T., Ali, M., Haider, M. J., Hussain, S. H., & Hussain, S. T. (2018). Kurt Lewin's change model: A critical review of the role of leadership and employee involvement in organizational change. *Journal of Innovation & Knowledge 3*(3), 123–127. https://www.sciencedirect.com/science/article/pii/S2444569X16300087

Antonucci, J. (2010, September 17). The last word: Five ways to improve access to care. *FPM*.*5*(48). https://www.aafp.org/fpm/2010/0900/p48.html

Atwal, P., Hogin, E., Mertz, K., Mostashari, F., & Williams, C. (2020, July 24). Health Information Exchange. Health.IT.gov. https://www.healthit.gov/topic/health-it-and-health-information-exchange-basics/health-information-exchange

Blumenthal, D. T. (2010). The "Meaningful Use" regulation for electronic health records. *The New England Journal of Medicine*, 363, 501–504. https://www.nejm.org/doi/full/10.1056/nejmp1006114

Center for Disease Control. (2021, January 9). *Health Insurance Portability and Accountability Act of 1996 (HIPAA)*:CDC https://www.cdc.gov/phlp/publications/topic/hipaa.html

Chief of Naval Operations. (2021, November 15). *CCDA guidance to commanders. NAVADMIN 256/21*. Department of the Navy. https://www.mynavyhr.navy.mil/Portals/55/Messages/NAVADMIN/NAV2021/NAV21256.txt?ver=Q_mQzM8a2pP7Hz9323KJdw%3D%3D

Creswell, J. W., & Creswell, J. D. (2018). The use theory.*Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.,pp. 40–70). Sage.

Defense Health Agency. (2020, October, 20). *Defense Health Agency Interim Procedures Memorandum 18–001.* [Memorandum]. DHA. https://health.mil/Reference-Center/Policies?query=18-001&&refVector=000000000100000&refSrc=137

Defense Manpower Data Management. (2020). Defense self-service logon (dsl) frequently asked questions (FAQs). DMDC.mil: https://myaccess.dmdc.osd.mil/identitymanagement/content/1251/load.do

Department of Defense. (2020, July 13). *DOD healthcare management system modernization* MHS Genesis.Health.mil. https://www.health.mil/factsheets

Department of Defense. (2013, September 18). *The Department of Defense strategy for implementing the joint information environment.* DODCIO.Defense.gov. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fdodcio.defense.gov%2FPortals%2F0%2FDocuments%2FJIE%2F2013-09-13_DOD_Strategy_for_Implmenting_JIE_(NDAA_931)_Final_Document.pdf&clen=932665&chunk=true

Department of the Navy. (2020, October 20). *Manual of the medical department* (MANMED P-117).: https://www.med.navy.mil/Directives/MANMED/

Department of the Undersecretary of Defense for health Affairs. (2021, October, 22). *Office of the Assistant Secretary of Defense for Health Affairs*. Health.mil: https://www.health.mil/About-MHS/OASDHA

EHealth Exchange. (2022, March 15). *eHealth exchange: The largest healthcare information network in the country*. eHealth Exchange. https://ehealthexchange.org

Epic Systems Corporation. (2022, January 12).*Revenue cycle: Deeply engage with patients, maximize revenue, protect your payments.* Epic.com: https://www.epic.com/software#RevenueCycle

Forbes Technology Council . (2019, November 21). *14 Tech industry 'Best Practices' your business would be better off avoiding.* Forbes.com : https://www.forbes.com/sites/forbestechcouncil/2019/11/21/14-tech-industry-best-practices-your-business-would-be-better-off-avoiding/?sh=7b479b86a036

Gartner. (2021, August 7). *Healthcare digital transformation*. Gartner.com : https://www.gartner.com/en/industries/healthcare-providers-digital-transformation

Gay, J. E., & Turso, D. L. (2008). *Integration and interoperability: An analysis to identify the attributes for system of systems.* [Thesis: Naval Postgraduate School].NPS Archive http://hdl.handle.net/10945/3907

Government Accountability Office (2021, September 20) *DOD has made progress in implementing a new system, but challenges persist* (GAO-21-571). Government Accountability Office. https://www.gao.gov/products/gao-21-571

Healtheway. (2015, January 5). *Carequality principles of trust* .Healtheway. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fceq-project.s3.amazonaws.com%2Fwp-content%2Fuploads%2F2018%2F07%2F03133521%2FCarequality_Principles-of-Trust_Final_Carequality-template.pdf&clen=1595968&chunk=true

HealthIT.gov. (2022, March 15). *What is a patient portal.* HealthIT.gov: https://www.healthit.gov/faq/what-patient-portal

HealthNet Federal Services . (2021, April 12). *Patient encounters reports (clear and legible reports).* Tricare-West.com: https://www.tricare-west.com/content/hnfs/home/tw/prov/auth/clrs.html

Horton, A. (2021, December 3). *Vaccine holdouts in Navy, Marines hit 19,000 as deadline passes to comply with mandate.* Washingtonpost.com: https://www.washingtonpost.com/national-security/2021/12/03/vaccine-mandate-navy-marines/

IBM. (2022, March 15). *Defining the mobile application requirements.* IBM.com: https://www.ibm.com/docs/en/spm/7.0.11?topic=requirements-defining-mobile-application

Joint Base San Antonio. (2020, March 4). *Navy medicine unveils logos to support new command structure.* JBSA.mil: https://www.jbsa.mil/News/News/Article/2102018/navy-medicine-unveils-logos-to-support-new-command-structure/

Kichloo, A. A.-A. (2020, Aug 18). Telemedicine, the current COVID-19 pandemic and the future: a narrative review and perspectives moving forward in the USA. National Institute of Medicine: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7437610/

Konkel, F., & Kuldell, H. (2018, May 11). *Initial tests find defense department's mhs genesis 'not operationally suitable.* Proquest: https://search-proquest.com.libproxy.nps.edu/docview/2037698975/fulltext/AF534D7279CD41D5PQ/1?accountid=12702

Leidos Corporation . (2020, November 15). *Health improving care and reducing costs for health care organizations.* Leidos.com : https://www.leidos.com/company/our-business/health

Luft, H. S., & Morrison, E. M. (1990). Health maintenance organization environments in the 1980s and beyond. *Health Care Financing Review*, *12*(1) 81–90.

Marks, D. (2020, November 15). *Naval Medical Forces Pacific's comander tours NH Twentynine Palms*. Health.mil. https://www.health.mil/News/Articles/2020/11/12/Naval-Medical-Forces-Pacifics-commander-tours-NH-Twentynine-Palms

Martin, M. B. (2021, February 12). Exploratory case study of barriers and facilitators associated with the pilot implementation of a new electronic health record in the military. Military Medicine: https://academic.oup.com/milmed/advance-article/doi/10.1093/milmed/usab053/6134484?login=true

Mendez, B.H. (2019, October 28). *MHS Genesis: background and issues for Congress* (R45987). Congressional Research Service. https://crsreports.congress.gov/product/details?prodcode=R45987

Merriam-Webster. (2022, April 10). *Definition of interoperability.* Merriam-Webster.com: https://www.merriam-webster.com/dictionary/interoperability

Military Health Systems . (2021, October 1). *Electronic health record: MHS Genesis* Health.mil . https://www.health.mil/Military-Health-Topics/MHS-Transformation/MHS-GENESIS

MyChart. (2022, January 9). *MyChart: Looking for help?*. MyChart.com. https://www.mychart.com/Help

Naval Health Clinic Lemoore. (2020, June 9). *Referral managment standard operating procedures*. Referral Managment Standard Operating Procedures. Lemoore, CA, United States of America: Naval Health Clinic Lemoore.

Naval Health Clinic Lemoore (2020). *Enrollment and capacity report* . chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.esd.whs.mil%2FPortals%2F54%2FDocuments%2FDD%2Fissuances%2Fdodi%2F500075p.PDF&clen=572443&chunk=true

Navy Medicine. (2020, January 1). *Navy medicine: Mission and vision*. Navy Medicine. https://www.med.navy.mil/About-Us/Mission-and-Vision/

Office of Budget. (2019, December). *Highlights of the Department of the Navy budget 2019.* secnav.navy.mil https://www.secnav.navy.mil/fmc/fmb/Documents/19pres/Highlights_book.pdf

Office of Personnel Management . (2015, June 15). *Cybersecurity resource center: Cybersecurity incidents*.OPM.GOV: https://www.opm.gov/cybersecurity/cybersecurity-incidents/

Office of the National Coordinator for Health Information Technology.(2014). *Hospitals' capability to electronically query patient health information from outside their organization and system.* HealthIT.gov. https://www.healthit.gov/data/quickstats/hospital-capability-electronically-query

Office of the National Coordinator for Health Information Techonology. (2015, December 16). *Health it policy committee: Recommendations to the national coordinator for health it*. HealthIT.gov. https://www.healthit.gov/topic/federal-advisory-committees/health-it-policy-committee-recommendations-national-coordinator

Office of the Undersecretary of Defense for Acquisitions and Sustainment. (2020). Business systems requirements and acquisitions.(DODI 5000.75) Department of Defense. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.esd.whs.mil%2FPortals%2F54%2FDocuments%2FDD%2Fissuances%2Fdodi%2F500075p.PDF&clen=572443&chunk=true

Oswell, M. (2020, October 26). *FEHRM expands joint HIE expanding MHS Genesis's recach.* Health.mil: https://www.health.mil/News/Articles/2020/10/26/FEHRM-expands-joint-HIE-expanding-MHS-GENESISs-reach

Qualtrics XM (2022). *Questionnaire for thesis on MHS GENESIS issues with interoperability.* [Qualtrics XM]. https://navalpostgradfedramp.gov1.qualtrics.com/reporting-dashboard/web/620e97db14815d000fcdd76f/pages/Page_27f4f54e-ebb1-429f-aafd-bb84b53385e5/view?surveyId=SV_cD4KDRZ3dDH56eO

Staff News Editor (2017, Novemember 6). Leidos partnership for defense health supports advancement of military health system through deployment of mhs genesis at madigan army medical center. *Journal of Engineering*, 2722. ProQuest: http://libproxy.nps.edu/login?url=https://www-proquest-com.libproxy.nps.edu/docview/1959044030?accountid=12702

Stutz, D. H. (2019, April 30). *How Covid-19 made the military medical community stronger.* health.mil: https://health.mil/News/Articles/2019/04/30/Navy-surgeon-general-addresses-transition-during-visit-to-the-pacific-northwest?type=All&page=15#pagingAnchor

Subramanian, M. (2010). Data communications and network management overview.*Network Management: Principles and Practice* (2nd ed., pp14).: Pearson.

The Sequoia Project . (2022, March 15). *The Sequoia project.* Sequoiaproject.org: https://sequoiaproject.org/about-us/

The Sequoia Project. (2015, April 6). *Carequality introduces trust principles for secure interoperability among U.S. data sharing networks*. sequoiaproject.org: https://sequoiaproject.org/carequality-introduces-trust-principles-for-secure-interoperability-among-u-s-data-sharing-networks/

The Sequoia Project. (2016, July 6). *MHS increases ability to electronically share health records with federal and private sector healthcare partners*. sequoiaproject.org: https://sequoiaproject.org/military-health-system-expands-use-ehealth-exchange-support-military-families-veterans/

Todd J. (2021, April 6). *Manpower& nec management*. Manpower United States Navy http://www.amdo.org/manpower.html

Veterans Administration. (2021, November 15). *Services provided by the senior veterans service alliance* veteransaidbenefit.org: https://www.veteransaidbenefit.org

Woody, E. M. (2020, July 23). *Mhs genesis implementation: Strategies in support of successful ehr conversion*. *Oxford Academic*. https://academic.oup.com/milmed/article/185/9-10/e1520/5875147

Zundel, K. (1996, Jan). Telemedicine: History, applications, and impact on librarianshipub. *National Library of Medicine 84*(1), 71–79. https://pubmed.ncbi.nlm.nih.gov/8938332/

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