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REVIEW ARTICLE

Development and Implementation of the DHAPP Military eHealth Information Network System

Mary Kratz[1,*], Anne Thomas[1], Ricardo Hora[2], Delphis Vera[2], Mickey Lutz[3] and Mark D. Johnson[1]

[1]*Department of Defense HIV/AIDS Prevention Program, Naval Health Research Center, San Diego, CA, USA;* [2]*Biomedical Informatics Department, Naval Medical Research Unit No. 6, Lima, Peru;* [3]*Vista LifeSciences, Parker, CO, USA*

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Abstract: ***Background*:** As the Joint United Nations Programme on HIV/AIDS, the Global Fund, and the US President's Emergency Plan for AIDS Relief focus on reaching 90-90-90 goals, military health systems are scaling up to meet the data demands of these ambitious objectives.

***Methods*:** Since 2008, the US Department of Defense HIV/AIDS Prevention Program (DHAPP) has been working with military partners in 14 countries on implementation and adoption of a Military eHealth Information Network (MeHIN). Each country implementation plan followed a structured process using international eHealth standards. DHAPP worked with the private sector to develop a commercial-off-the-shelf (COTS) electronic medical record (EMR) for the collection of data, including patient demographic information, clinical notes for general medical care, HIV encounters, voluntary medical male circumcision, and tuberculosis screening information.

***Results*:** The COTS software approach provided a zero-dollar software license and focused on sharing a single version of the EMR across countries, so that all countries could benefit from software enhancements and new features over time. DHAPP also worked with the public sector to modify open source disease surveillance tools and open access of HIV training materials. Important lessons highlight challenges to eHealth implementation, including a paucity of technology infrastructure, military leadership rotations, and the need for basic computer skills building.

***Conclusion*:** While not simple, eHealth systems can be built and maintained with requisite security, flexibility, and reporting capabilities that provide critical information to improve the health of individuals and organizations.

Keywords: Capacity building, country impact, data management, eHealth, EMR/EHR, electronic medical records, health data, health information systems, health systems strengthening, HIV, information and communication technology, military, monitoring and evaluation.

1. INTRODUCTION

Effectively confronting the HIV epidemic in military settings has required employing innovative strategic information responses, including support of electronic health information systems known as eHealth. The US Department of Defense (DoD) HIV/AIDS Prevention Program (DHAPP) supports militaries not only through direct delivery of HIV prevention, care, and treatment services, but also in provision of eHealth systems to improve the collection, analysis, and use of data.

The World Health Organization (WHO) provides global leadership for eHealth, defining it as "the use of information and communication technologies for health" [1]. Aligned with WHO eHealth guidance, the DHAPP Military eHealth Information Network (MeHIN) effort builds and supports the informatics skills of partner militaries in order to prevent and control HIV/AIDS through effective data management. The primary challenge eHealth systems address is how to transition data from paper registers and hand tallies to usable electronic information that provides actionable data.

Electronic medical records (EMRs) initially emerged in the 1990s as an outcome of health sector financial regulation in the United States and Europe, coupled with the increasing capabilities of information and communication technology (ICT). Clinical data sets were recognized as offering promise beyond financial information for clinical decision support and the standardization of clinical care records [2-6]. In 2005, the World Health Assembly (WHA) passed a resolution, "stressing that eHealth is the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research" [7]. In response to the WHA resolution, WHO established the Health Metrics Network to provide a framework for health systems strengthening of member states at the national level [8]. In 2008, the International Telecommunication Union (ITU) at the United Nations published *Implementing eHealth in Developing Countries: Guidance and Principles*, for countries' Minis-

*Address correspondence to this author at the Department of Defense HIV/AIDS Prevention Program, Naval Health Research Center, 140 Sylvester Road, San Diego, CA 92106, USA; Tel: +1(619) 806-4218;
E-mail: kratz.mary@gmail.com

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tries of Health and the telecommunication sector to successfully prepare eHealth deployment strategies [9]. In 2012, WHO and ITU published the *National eHealth Strategy Toolkit* to provide guidance for the implementation of eHealth strategies [10].

In 2008, DHAPP developed an eHealth platform to provide essential data tools tailored to military environments. Following standards set forth by the International Organization for Standardization, International Electrotechnical Commission, and ITU, DHAPP supported building an electronic data processing platform. The Reference Model for Open Distributed Processing [11], which specifies that common standards be used, was followed in assembling the software platform.

Originally installed in 2009, the eHealth software application suite, coupled with a technology platform customized for low-resource environments, demonstrated that use of an EMR system could improve HIV data quality and facilitate monitoring and reporting. Over time, survey data were collected from EMR system users, tallied, and used to identify possible gains in clinic workflow efficiency and data quality. Progressive analysis of monthly medical personnel interview response transcripts suggested a high degree of confidence in the electronic system, satisfaction with computer technology selections, accuracy of data entry, quality of care, patient safety, and workflow efficiency. Summative evaluation findings indicated that the ICT intervention could replace the manual, paper-based system. Ultimately, this formed the basis of DHAPP's current eHealth implementation approach, which includes computer equipment, data management utilities, network connectivity, and software for patient-level data collection and reporting, plus medical skill-building reference tools.

2. METHODS AND APPROACH

Security, cost, durability, scalability, mobility, and sustainability were important considerations in the development of the DHAPP eHealth platform. Bringing together the best of both private and public sector methods, the fundamental design criteria were to provide a complete eHealth package for military healthcare providers. The DHAPP eHealth technical platform uses a service-oriented architecture [12], with web services provided by standard Internet technology. This standards-based approach enabled the use of low-cost, license-free software components. A service-oriented approach allows the replacement of existing software modules with newer, more powerful components as they become available, without affecting the entire system. The value of this approach is not only in the designed modularity that enables *ad hoc* assembly of data collection, data analysis, and visualization tools across multiple healthcare organizations [13], but also in the use of standard application program interfaces to facilitate system integration and interoperability.

To address concerns regarding data security, the DHAPP eHealth platform uses standard security protocols, including Public Key Infrastructure authentication, role-based access control, and encryption for data in transit from user device to and from the local military's medical database. Role-based access control functionality is aligned with US National Institute of Standards and Technology methods [14], which allow partner militaries to customize the eHealth platform using local military medical roles and associated data access privileges. DHAPP provides a detailed review of the security system to partner militaries during deployment to ensure all local regulatory requirements are addressed through technology configuration and security policy.

Driven by a low total cost of ownership, DHAPP eHealth goals include reduction of access barriers for partner military personnel to computer user devices, increased access to electronic software tools, and easier use of electronic health data. The costs of electronic systems may be justified through an analysis of the costs associated with paper-based versus electronic systems. The budget required to support paper-based systems includes printers, toner, paper, and the shipping of paper materials, as well as the cost of communicating information collected in paper-based systems. Much of these costs can readily be shifted to the budget required for computer equipment, software, and network connectivity.

Electronic communication tools provide additional cost savings associated with personnel time required to transit medical personnel to clinic facilities. Use of electronic tools, such as e-mail and Voice over Internet Protocol, enables communications that can support clinical case management, virtual grand rounds, and medical consultations for remote medical clinics. Electronic communication tools not only save personnel time, but also the costs associated with personnel and hard copy information transit [15].

As a framework for the EMR and eHealth platform, DHAPP used the US Institute of Medicine [16] EMR definition, which includes health information and data collection, results management, order management, decision support, electronic communication and connectivity, patient support, administrative processes and reporting, and population health reporting.

Health information and data collection are provided via EMR software. Customizable software modules include patient demographic information, HIV testing services, general medicine, HIV care, voluntary medical male circumcision (VMMC), tuberculosis (TB) screening, general medical care, laboratory results, and patient scheduling. The preferred data collection approach is to use computer devices at the point of care. This requires increased access to computer user devices (desktop, laptop, tablet computers) for military medical personnel. DHAPP provides support to partner militaries for computer equipment, including user devices, in order to enable access by military care providers to a computer that can be used for collection of patient data at the point of service.

The EMR software results management utility aligns with clinic workflow for HIV care, general medicine, VMMC, and TB screening. General medical workflow management tools are incorporated to assist clinic personnel with results management of clinic appointments, pharmacy prescriptions, and laboratory tests.

The EMR order management utility contains well-defined workflows for HIV care, general medicine, VMMC, and TB encounters. Software menu options allow the care provider to select medication order entry. Care providers

may also use text boxes to enter specific orders for physical examination, a clinical note, referrals, and HIV and other counseling encounters.

Doknosis software (http://doknosis.org) is being piloted in two countries. Doknosis software, in combination with a country-specific eLibrary of HIV/AIDS materials, provides electronic software tools for clinical decision support. The software application guides care providers through the collection of relevant clinical data and links to medical reference sources, ultimately helping care providers to reach an appropriate diagnosis for a patient at the point of care.

A key component of decision support is basic medical competencies skills building for care providers. DHAPP provides electronic tools to military healthcare providers to engage in eLearning programs by enabling access to credible medical information resources and networks of subject matter experts. Partner militaries are introduced to the vast collections of trusted online customizable education media available through the Open Educational Resources Commons [17], which includes eLearning resources created through the investment by the US President's Emergency Plan for AIDS Relief in the Medical Education Partnership Initiative (MEPI) [18], as well as other donors. Intellectual property rights are important for sharing any eLearning content or other electronic media. Under the Creative Commons [19] Open Access Policy for eLearning materials, the cost barrier to medical journals and textbooks has been substantially lowered. This portion of the DHAPP eHealth platform is included in the Digital Health Space suite of software applications, which provides core HIV medical education materials and facilitates sharing and reuse of MEPI and other HIV-specific content by the military medical community.

Electronic communication and connectivity are also supported. Basic network communications and electrical infrastructure present a global challenge to all eHealth systems and presents a significant barrier for eHealth deployment, including the limited availability of network telecommunications to the remote military medical user. If not alleviated, systems may be discontinued over time due to lack of sustainable use. The DHAPP approach for electronic communication and network connectivity is to acknowledge and mitigate the intermittent electricity and limited Internet connectivity realities of low-resource settings. To overcome the limitations in resource-constrained environments, DHAPP and partner militaries work to develop a sustainable approach, often working with the country's Ministry of Telecommunications in addition to its Ministry of Defense. To address access challenges at remote sites, DHAPP's eHealth platform enables "occasionally connected" data services that allow clinics to function in both off-line and online modes of operation.

Addressing electricity limitations, low-wattage computer equipment is available that runs on batteries for approximately 10 hours. Universal power supplies are provided for critical equipment such as network routers and computer servers. For sites not on the power grid, solar power, combined with low-wattage, battery-operated computer equipment, enables system operations to run off-line. This off-line mode is also used for mobile military outreach campaigns to remote regions. A local wireless network is set up with coverage for the military medical base, allowing user computer devices to communicate in the local clinical environment. Data are collected at the point of service and either synchronized over a secure network connection to a central database, or provided off-line using secure data storage media and transited using the military supply chain and logistics.

Patient support currently focuses on providing HIV programs for Positive Health, Dignity and Prevention education and monitoring tools for both group and individual health education. HIV prevention counseling is a unique functional module that results in care providers assessing a patient's need for additional health services. Additionally, patient education materials, such as nutrition, pregnancy, and immunizations information, are provided through the eLibrary and eLearning software, which complement HIV prevention activities.

Administrative processes and reporting on the DHAPP eHealth platform are provided through both software tools and policy. Two electronic reporting techniques are available. First, the EMR software has parameter-driven embedded reports, which are available to military personnel with reporting access privileges. These embedded reports include flexible parameters for a variety of common data disaggregation, including age, gender, date of service, type of service, and location of service. Second, the EMR data may be exported in a standard file format, such as comma-separated values, for import into another data analysis or visualization tool.

Support for administrative policy and procedures are provided through training and adaptation of the *Military eHealth Information Network Implementation Guide*. DHAPP and US Naval Medical Research Unit No. 6 (NAMRU-6) Biomedical Informatics Department created the detailed MeHIN Implementation Guide for DHAPP military partners to address eHealth policy and procedures required for system deployment and adoption. During implementation training, the guide is adapted for the specific military and includes an executive summary for military leadership, the country-specific technical assessment report, a country-specific eHealth project charter, a standard data management plan (including country specific privacy policy in accordance with national guidelines for Personal Health Information), user training materials for software tools, system administrator training materials, a service level agreement (SLA) for support services, a routine clinic operations guide, a country-specific system adoption plan, and a data quality assessment tool.

Population health reports can be created using data exported from the EMR system in a standard file format (XML or CSV), which is easily imported into database, statistical, or other analysis tools such as OpenESSENCE [20]. The OpenESSENCE software provided by the Johns Hopkins University Applied Physics Laboratory (JHU/APL) provides advanced data analytics and a visualization data workbench specific to disease surveillance and population health. Other reports are embedded and are easily created for output. Since the EMR demographic module includes military-specific variables, the system is uniquely positioned to provide military leadership with routine public health information as well as force health readiness data.

2.1. eHealth Implementation

DHAPP desk officers, who manage and coordinate country military programs, engage the DHAPP Strategic Information team to support eHealth activities. First, the DHAPP Strategic Information team conducts an eHealth readiness assessment, which includes (1) an analysis of data requirements of existing paper-based systems, (2) user interviews to determine the degree to which the military medical community is prepared to adopt electronic data tools, (3) an evaluation of country telecommunications infrastructure and electrical power grid capacity, and (4) fulfillment of information technology legal and regulatory requirements. The DHAPP desk officer and partner military review the country-specific eHealth readiness assessment report. The country approach and feasibility is determined, including budget and long-term sustainability. An approach is chosen based on the partner military's goals. DHAPP has provided funding support to two implementation partners to date, using the U.S. Department of Defense Board Agency Announcement competitive bid process.

The DHAPP EMR developer, Vista LifeSciences, spent hundreds of hours onsite, observing, interviewing, and working with all levels of clinical care in Africa and the Caribbean. The result is a continuously evolving, easy-to-use, commercial-off-the-shelf EMR application that focuses on (1) improving the levels of data collection in clinics, (2) improving data management for clinic operations, (3) ensuring longitudinal, countrywide electronic medical record keeping, and (4) improving patient outcomes.

The DHAPP collaboration with NAMRU-6 and JHU/APL was initiated in 2012 to adapt the Suite for Automated Global Electronic bioSurveillance (SAGES), open source software developed by the DoD, for HIV/AIDS prevention information management in the Latin American region. NAMRU-6 developed open source software for the electronic collection of HIV/AIDS clinical information. JHU/APL customized a version of the SAGES software for data analysis and visualization of HIV data sets, called OpenESSENCE. The integrated software suite is capable of generating standard data export file formats, such as comma-separated values, to use with a variety of data analysis tools, including statistical software packages. This approach, based on the DoD Armed Forces Health Surveillance Center Global Emerging Infections Surveillance and Response System, is specific to electronic disease surveillance in low-resource countries [21].

Following the technical assessment and selection of implementing partner, a predeployment visit is scheduled to establish the eHealth project. A country-specific project charter and responsibility matrix is built, starting with the partner military identifying personnel to provide eHealth leadership from both medical and technology units. The predeployment team develops a country-specific work plan for all activities with all stakeholders. The team also introduces organizational and process change management at predeployment to the partner military leadership, using standard data management exercises that highlight the transition from paper based to electronic systems. The DHAPP implementing partner provides a small installation of its eHealth platform at a partner military facility, with initial hands-on training sessions. This initial predeployment installation allows the partner military to further explore the technology and adaptive changes required for an organization to support the eHealth system.

Partner militaries establish a medical data authority for their respective deployment, consisting of military officers with command authority to implement operational policy and procedures. The medical data authority identifies who is responsible for military medical data, establishes local eHealth policy, good electronic data management practices, and procedures for routine clinic operations. With DHAPP support, medical data authority training consists of a series of exercises that adapt the MeHIN Implementation Guide for the specific military. This guide includes information regarding responsible duty assignments and how to delegate technical tasks for system administration, data management, and routine clinic operations. The Medical Data Authority recommends military duty assignments for a Focal Point at each site where computers are installed. The site Focal Point provides local management for the day-to-day operations of the MeHIN system and is responsible for reporting of any system issues.

The subsequent full-deployment visit focuses on implementation of data collection and reporting functionality and includes delivery of equipment. The medical data authority implements local eHealth policy and procedures for clinic operations. The first tier of eHealth support services is established at partner military technology and medical units. An eHealth service level agreement (SLA) is defined to ensure timely resolution to technical and nontechnical issues, with minimal impact on clinical operations. The partner military's ICT system administrator is trained to provide technology support for computer equipment, network connectivity, and database administration. The DHAPP implementing partner provides second-tier support for a 1-year period of performance following full deployment to ensure a smooth transition from DHAPP support to partner military personnel. The MeHIN Implementation Guide continues to be customized, documenting eHealth best practices and allowing DHAPP partner militaries to formulate their own local policy and procedures based on local norms of operation. The Implementation Guide provides details of informatics method selections and is based on a technology-engineering reference model using industry standards [22, 23] (see Table **1**).

Adoption of eHealth systems requires organizational change, which has proved difficult for any organization [24] and requires continual, multifaceted support. Following full deployment, an adoption visit is scheduled within 6 months to provide technical assistance for the first software upgrades, additional training, firmware updates, and optimization of clinical workflow operations for the partner military eHealth environment. Policy and procedures for eHealth continue to be customized to the partner military operations. Multiple clinic workflow reviews are conducted to ensure the computers are placed appropriately, users have knowledge to perform data entry and generate reports, and military medical personnel understand all operational procedures. Additional focus of the adoption visit is on data quality and data use for analysis and reporting.

Table 1. Military ehealth information network implementation guide.

Section Title	Method	Reference
Section 1: Executive Summary	DHAPP documents and presentations	Intel World Ahead Program
Section 2: Technical Assessment	eHealth Strategy Development Framework	WHO/ITU National eHealth Strategy Toolkit
	eHealth Implementation Policy	WHO/ITU National eHealth Strategy Toolkit WHO Health Metrics Network
	MeHIN Project Scope Statement	Lean process management
Section 3: Data Management Plan		Institute for Social Research Data Management Plan Guide
Software Functionality	US Army Battlefield Medical Information System-Tactical	Military medical clinic processes
	DHAPP data dictionary and informatics standards	Health Level Seven International and the Object Management Group
	EMP	Vista LifeSciences
	SAGES/OpenESSENCE data analytics and visualization	JHU/APL
	eClinical forms	NAMRU-6 data collection tools
Engineering and Technology	Internet, 3G, 4G, 802.11	IEEE/ACM standards
	Windows Communication Foundation	Microsoft .NET Framework development tools (Vista LifeSciences)
	Web services using Apache, SOAP, JSON, JSON-RPC, REST, XML-RPC	W3C and SOA standards (NAMRU-6 and JHU/APL)
	Database management system	MySQL and MongoDB
	Smart synchronization between databases	Vista LifeSciences EMP
	Security	PKI, AES encryption
Section 4: User Training	Ease-of-use screen design	Vista LifeSciences EMP
	Medical data authority	Train the Trainer
Software Manuals	EMP	Vista LifeSciences
	e-Clinical forms	NAMRU-6
	OpenESSENCE Quick Start	JHU/APL
Section 5:	Standard support operating policy and procedures	DHAPP eHealth framework
Section 6: Policy and Procedures	MeHIN stakeholder roles and responsibilities	EDUCAUSE Data Stewardship guidelines
	RBAC	National Institute of Standards and Technology RBAC standard
Section 7: Adoption Plan	Kanban board	Lean process management
	Data Quality Assessment procedures	DHAPP adoption framework

ACM, Association for Computing Machinery; AES, Advanced Encryption Standard; DHAPP, Department of Defense HIV/AIDS Prevention Program; EMP, Electronic Medical Pathways; EMR, electronic medical record; IEEE, Institute of Electrical and Electronics Engineers; ITU, International Telecommunication Union; JHU/APL, Johns Hopkins University Applied Physics Lab; MeHIN, Military eHealth Information Network; NAMRU-6, US Naval Medical Research Unit No. 6; PKI, Public Key Infrastructure; RBAC, role based access control; REST, Representational State Transfer; SAGES, Suite for Automated Global Electronic bioSurveillance; SOA, service-oriented architecture; W3C, World Wide Web Consortium; WHO, World Health Organization.

Continuing focus on system adoption and use, DHAPP and its implementing partners provide three tiers of support: (1) onsite training to build local military skills; (2) phone, help desk, and e-mail support that provides remote expertise using virtual communication tools; and (3) online meetings to provide additional training to the military eHealth community, provide information on new products, and to share best practice guidance. DHAPP's objective is to create a sustainable EMR and technical environment that can be supported locally. Tier 2 support is provided as flexibly as possible, taking into consideration the challenges of different time zones and periodic lack of access to the Internet and telephone airtime. Partner militaries and DHAPP implementing partners are invited to participate in the DHAPP eHealth Virtual Venues to explore current eHealth capabilities, share best practices, and discuss future system improvements.

Local implementing partners are vital to successful implementation of eHealth solutions, both those focused on clinical services and on technology. These local partners fill the gap between providing the basic platform software and standards, and solving local technology and organizational challenges.

3. DISCUSSION

Our experience demonstrates that military medical organizations desire a secure electronic database for medical information, but assessing technology, design, software development, equipment procurement, and installation of eHealth solutions presents great challenges. Through technical assistance from DHAPP, a secure, standards-based technology platform can be provided that lowers the barriers to eHealth systems for military medical organizations.

Each organization differs in the time and process required to ensure a sustainable implementation. Adaptive changes required for organizations to adopt eHealth solutions need user acceptance provided through consistent leadership, computer skills capacity building, and creating a culture of data use. The full adoption of eHealth into military medical environments requires leadership who allow healthcare personnel to commit to operational details at the clinic and ICT levels. Persistent dedication of users is necessary for clinic operations to assimilate the eHealth system into their daily work environment. Military leadership is vital to support users during the transition to eHealth operations. The benefit to senior leadership is realized when timely access to patient care and treatment data is available for use to improve patient outcomes, administer military medical operations, and report to national authorities. This experience reveals that eHealth deployment timelines require 12-18 months before the benefits of data use is realized.

The cost of technology is decreasing, while the rate of data generation continues to increase. By using proven technology solutions readily available in global markets, DHAPP is able to rapidly deploy eHealth solutions with partner militaries in a cost-effective manner. Telecommunication costs vary considerably in each country; with some military health systems able to leverage international and national programs supported by the global broadband commission (http://www.broadbandcommission.org/) to subsidize network connectivity costs. However, the more significant cost is training of personnel and support staff required to provide ongoing system maintenance. Personnel with advanced ICT skills are often limited in low-resource settings, thus additional training is needed to ensure personnel with technology skills are in place at the local level. Partner militaries quickly realize that additional ICT certificate and/or degree training is required to adequately support their eHealth strategy. Feasible options to address these training needs should be pursued and made available.

While EMR systems continue to develop in response to increased data reporting requirements, it is crucial that simple, easy-to-use clinical modules do not compromise patient flow efficiency in clinical environments. This requires commitment on the part of software application developers. The inclusion of HIV care, TB, and antiretroviral (ART) modules in the EMR now permits rapid documentation of clinical indicators, such as date and result of CD4 count, HIV viral load, documentation of TB screening, documentation of ART for those who meet clinical indications based on CD4 count or for those with active TB, and cotrimoxazole prophylaxis. Ensuring the EMR provides adequate documentation while maintaining practical ease of use must remain a key priority. The integration of proprietary commercial-off-the-shelf medical record software products with open source public health surveillance tools is possible at the technology and data levels. However, the MeHIN experience reveals a universal concern shared by nearly all militaries regarding security of personal health information (PHI). As long as software performs its function PHI is maintained safely. The larger concern is that all software functions with appropriate security mechanisms be in place and maintained, such as authentication of authorized users. data encryption, firewall protection, etc.

Adoption of eHealth systems has been most successful when partner militaries have strong leadership supporting the move to EMR, knowledgeable clinical staff, support from military ICT, and program managers who collaborate well with clinical and technical implementing partners. When these partners join forces, we see highly functional systems being used that provide a cost-effective way to collect quality data, share medical information, ease reporting burdens, enable provider-to-provider communication, and share program data at all levels within the military hierarchy, leading to reduction in waiting times for patients, quality report generation, and highly motivated staff. eHealth is a rapidly growing area in one of the largest worldwide industries. DHAPP work continues to support military partners to sustain the electronic medical record, with a primary focus on building local military capacity to run the system and to enable budget for future years.

The military experience provides examples of the benefits and challenges of eHealth deployment and adoption. The importance of understanding and adapting ICT to suit the needs of various health settings requires building awareness, plus capabilities, for those who will be using an eHealth system. A military setting is one health setting with considerable potential to realize the benefits of eHealth due to the unique nature, size and capabilities of armed forces in any given country. However, to realize the potential of eHealth requires that military leaders are informed, aware, and have proper support to move forward. ***

AUTHOR CONTRIBUTIONS

Mary Kratz, Dr. Anne Thomas, Intel, and Vista LifeSciences were involved in the Military eHealth Information Network (MeHIN) design. Mary Kratz, Dr. Anne Thomas, Dr. Mark Johnson, Mickey Lutz, Dr. Ricardo Hora, and Delphis Vera were involved in manuscript preparation. Dr. Anne Thomas and Mary Kratz were involved in final manuscript editing.

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CONFLICT OF INTEREST

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Kratz, Mary; Thomas, Anne; Hora, Ricardo; Vera, Delphis; Lutz, Mickey; Johnson, Mark D.

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

Commanding Officer
Naval Health Research Center
140 Sylvester Rd
San Diego, CA 92106-3521

8. PERFORMING ORGANIZATION REPORT NUMBER

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

Commanding Officer
Naval Medical Research Center
503 Robert Grant Ave
Silver Spring, MD 20910-7500

Chief, Bureau of Medicine and Surgery
(MED 00), Navy Dept
7700 Arlington Blvd Ste 5113
Falls Church, VA 22042-5113

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14. ABSTRACT

Abstract: Background: As the Joint United Nations Programme on HIV/AIDS, the Global Fund, and the US President's Emergency Plan for AIDS Relief focus on reaching 90-90-90 goals, military health systems are scaling up to meet the data demands of these ambitious objectives.
Methods: Since 2008, the US Department of Defense HIV/AIDS Prevention Program (DHAPP) has been working with military partners in 14 countries on implementation and adoption of a Military eHealth Information Network (MeHIN). Each country implementation plan followed a structured process using international eHealth standards. DHAPP worked with the private sector to develop a commercial-off-the-shelf (COTS) electronic medical record (EMR) for the collection of data, including patient demographic information, clinical notes for general medical care, HIV encounters, voluntary medical male circumcision, and tuberculosis screening information.
Results: The COTS software approach provided a zero-dollar software license and focused on sharing a single version of the EMR across countries, so that all countries could benefit from software enhancements and new features over time. DHAPP also worked with the public sector to modify open source disease surveillance tools and open access of HIV training materials. Important lessons highlight challenges to eHealth implementation, including a paucity of technology infrastructure, military leadership rotations, and the need for basic computer skills building.
Conclusion: While not simple, eHealth systems can be built and maintained with requisite security, flexibility, and reporting capabilities that provide critical information to improve the health of individuals and organizations.

15. SUBJECT TERMS

Capacity building, country impact, data management, eHealth, EMR/EHR, electronic medical records, health data, health information systems, health systems strengthening, HIV, information and communication technology, military, monitoring and evaluation

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