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**POPULATION HEALTH AND OPTIMIZATION  
OF THE MILITARY HEALTH SYSTEM**

**BY**

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USAWC STRATEGY RESEARCH PROJECT

**Population Health and Optimization of the Military Health System**

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## ABSTRACT

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The military health system (MHS) is evolving at a rapid pace as a result of a variety of extraordinary pressures that are influencing the delivery of health care today. These pressures include the shortfall in health care funding in the Program Objective Memorandum (POM) for fiscal years 2002 through 2007. In addition, the Floyd D. Spence National Defense Authorization Act for fiscal year 2001 authorized an unprecedented expansion of benefits that exacerbates the funding shortfall. Lastly, the leaders of the MHS are fully aware that they have a requirement to remain accountable to Department of Defense, the line leadership and its beneficiaries. In order to be able to respond to pressures such as these, the Military Health System Optimization Team was created by the Assistant Secretary of Defense (Health Affairs). The team's mission is to develop a health services delivery system within an executable funding program. The team's focus is to reengineer the military health system from one that provides interventional care once a disease process has begun, to one that focuses on health promotion and disease prevention. The end result is improved health of the MHS population. The effort to improve population health will help to reduce demand on the system, thereby opening opportunities to recapture workload that had been shifted to contractors. The shift from purchased health care to health care provided within military treatment facilities will reduce the overall cost of operating the MHS.

As the concept of improving population health through the monitoring of health status becomes the focus of the military health care system, the importance of integrating and analyzing data on health status becomes critical. The rationale is that information systems that provide status on the health of the population allow for the MHS to move from interventional health care to prevention services. Individuals at high risk for adverse health outcomes can be identified and sought out for counseling, early-on treatment and disease management. Only with this early identification and management of health care can military treatment facility commanders make informed decisions concerning resource allocation in order to optimize the delivery of health care within their facilities.

The purpose of this paper is to provide a brief overview of the optimization plan for the MHS and to review the strengths and weaknesses of the information systems being used to determine population health status for optimization of the MHS.



## TABLE OF CONTENTS

|  |            |
|--|------------|
| <b>ABSTRACT.....</b>   | <b>III</b> |
| <b>TABLE OF CONTENTS.....</b>  | <b>V</b>   |
| <b>LIST OF ILLUSTRATIONS.....</b>  | <b>VII</b> |
| <b>POPULATION HEALTH AND OPTIMIZATION OF THE MILITARY HEALTH SYSTEM.....</b> | <b>1</b>   |
| EVOLUTION OF THE MILITARY HEALTH CARE SYSTEM.....                            | 2          |
| HISTORICAL INFLUENCES.....   | 3          |
| <b>POLITICAL.....</b>  | <b>3</b>   |
| <b>PUT PREVENTION INTO PRACTICE.....</b>                                     | <b>4</b>   |
| STRATEGIC IMPORTANCE OF POPULATION HEALTH.....                               | 5          |
| OPTIMIZATION PLAN FOR THE MHS.....   | 5          |
| INFORMATION SYSTEMS REVIEW.....  | 7          |
| <b>PREVENTIVE HEALTH CARE APPLICATION.....</b>                               | <b>7</b>   |
| <b>TOTAL ARMY INJURY AND HEALTH OUTCOMES DATABASE (TAIHOD).....</b>          | <b>8</b>   |
| <b>DEFENSE MEDICAL SURVEILLANCE SYSTEM (DMSS).....</b>                       | <b>9</b>   |
| <b>DEFENSE MEDICAL EPIDEMIOLOGY DATABASE (DMED).....</b>                     | <b>11</b>  |
| <b>COMPOSITE HEALTH CARE SYSTEM II (CHCS II).....</b>                        | <b>11</b>  |
| <b>POPULATION HEALTH OPERATIONAL TRACKING AND OPTIMIZATION (PHOTO)..</b>     | <b>12</b>  |
| THE CHALLENGES AHEAD.....  | 13         |
| <b>INFORMATION SYSTEM IMPLEMENTATION AND MAINTENANCE.....</b>                | <b>14</b>  |
| <b>EDUCATION.....</b>  | <b>15</b>  |
| CONCLUSIONS.....   | 16         |
| <b>ENDNOTES.....</b>   | <b>17</b>  |
| <b>BIBLIOGRAPHY.....</b>   | <b>23</b>  |



## LIST OF ILLUSTRATIONS

|   |   |
|---|---|
| FIGURE 1. SYSTEMATIC APPROACH TO HEALTH IMPROVEMENT ..... | 2 |
| FIGURE 2 SYSTEMATIC PROCESS FOR MHS OPTIMIZATION .....    | 6 |



## **POPULATION HEALTH AND OPTIMIZATION OF THE MILITARY HEALTH SYSTEM**

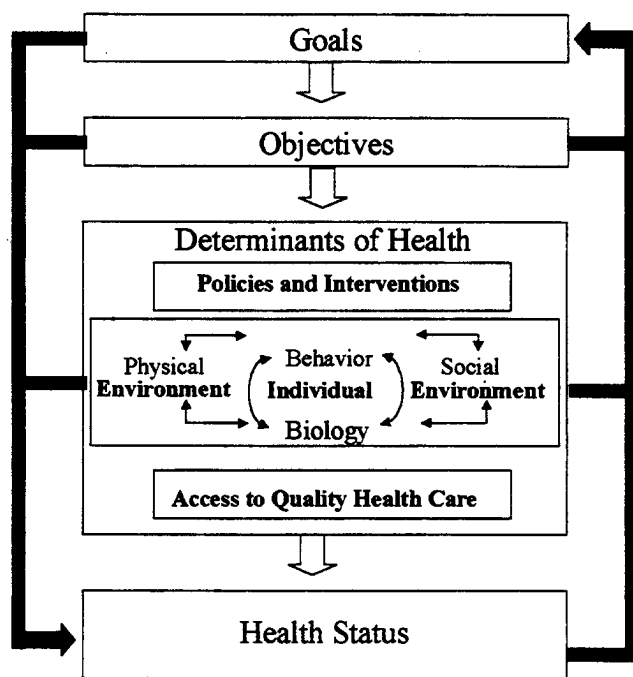
The military health system (MHS) is evolving at a rapid pace as a result of a variety of extraordinary pressures that are influencing the delivery of health care today. These pressures include a shortfall in health care funding in the Program Objective Memorandum (POM) for fiscal years 2002 through 2007.<sup>1</sup> In addition, the Floyd D. Spence National Defense Authorization Act for fiscal year 2001 authorized an unprecedented expansion of benefits that exacerbates the funding shortfall.<sup>2</sup> Lastly, the leaders of the MHS are fully aware that they have a requirement to remain "responsive and accountable to Department of Defense, line leadership, and its beneficiaries."<sup>3</sup> In order to be able to respond to pressures such as these, the Military Health System Optimization Team (MHSOT) was created by the Assistant Secretary of Defense (Health Affairs). The team's mission is to "develop a benchmark health services delivery system and an executable funding program."<sup>4</sup> The team's focus is to reengineer the military health system from one that provides interventional health care, to one that focuses on health promotion and disease prevention. The result is improved health of the MHS population. The effort to improve population health will help to reduce demand on the system, thereby opening opportunities to recapture workload that had been shifted to contractors. The shift from purchased health care to health care provided within military treatment facilities will reduce the overall cost of the operating the MHS.<sup>5</sup>

The concept of improving the health of a population through preventive services is not a new concept and is considered one of the basic concepts of demand management within managed health care. It is considered critical to controlling costs in today's health care market.<sup>6</sup> Peter R. Kongstevdt, MD, an authority in managed care, stated that "of all the activities involved in managing health care, the use of data in medical management continues to take on ever-increasing importance."<sup>7</sup> As the concept of improving population health through the monitoring of health status becomes the focus of the military health care system, the importance of integrating and analyzing data on health status becomes critical. The rationale is that information systems that provide status on the health of the population allow for the MHS to move from interventional health care to prevention services. Individuals at high risk for adverse health outcomes can be identified and sought out for counseling, early-on treatment and disease management.<sup>8</sup> Only with this early identification and management of health care can military treatment facility commanders make informed decisions concerning resource allocation in order to optimize the delivery of health care within their facilities.

The purpose of this paper is to provide a brief overview of the optimization plan for the MHS and to review the strengths and weaknesses of the information systems being used to determine population health status for optimization of the MHS.

EVOLUTION OF THE MILITARY HEALTH CARE SYSTEM

The evolution of the Military Health Care System closely parallels that of the civilian sector because many of its influences are the same as those affecting the rest of the nation. The Department of Health and Human Services has been at the forefront in bringing the issue of health improvement through health promotion and disease prevention. With the release of Healthy People in 1979, the Surgeon General encouraged a public health revolution with the emphasis on disease prevention.<sup>9</sup> Although this initial call to action was laudable in its effort to bring health promotion to the nation's attention, it did not establish any objectives by which improvement in the nation's health status could be measured. In 1990, the Surgeon General published Healthy People 2000. This report did provide objectives for health promotion through a national strategy for improving health over a ten year span. The objectives addressed "the prevention of major chronic illnesses, injuries and infectious diseases."<sup>10</sup> Last year, the Surgeon General raised the bar again with the release of Healthy People 2010. This report brought the concept of health improvement to the forefront of national issues, this time using a systematic approach. This approach is comprised of four key elements, all of which interact with each other; goals, objectives, determinants of health, and health status. The illustration in Figure 1 is from Healthy People 2010. This diagram illustrates the interaction of all four of the key elements. However, more importantly it illustrates that the determinants of health include individual behavior and biology as well as physical and social environments and that these determinants directly impact an individual's and the population's health status.<sup>11</sup> Therefore, preventive measures taken in these areas could make a tremendous impact on the health status of the population.



The concept of population health finds its origins in the first vestiges of public health administration in 1872 when the American Public Health Association was established.<sup>12</sup> Although population health concept has been in existence for at least a century, a universally accepted measurement of health status still does not exist today. Healthy People 2010 cites that "Health status can be measured by birth and death rates, life expectancy, quality of life, morbidity from specific diseases, risk factors, use of ambulatory care and inpatient care, accessibility of health personnel and facilities, financing of health care, health insurance coverage,

FIGURE 1. SYSTEMATIC APPROACH TO HEALTH IMPROVEMENT

and many other factors.<sup>13</sup> Because of the number of possible factors involved, and the complexity of the reasons for measurement, a variety of indicators have been developed to describe health status of populations in terms of outcome measurements. Some investigators measure population health status in terms of health-adjusted life years (HALYs), others in terms of health-adjusted life expectancy (HALE), with others reporting quality-adjusted life years (QALYs), and still others reporting in terms of disability-adjusted life years (DALYs).<sup>14</sup> These outcome measurements are integrated measures of population health that combine social and personal attributes such as "improved physical functioning, relief from pain and emotional distress, prevention of disability, social and role functioning, vitality and general health."<sup>15</sup> These measurements are primarily used by insurance payers as an incentive to hospitals and providers to provide the most cost effective care.<sup>16</sup> However, single descriptive statistics such as these do not delineate risk factor information for sub-populations. According to Healthy People 2010, individual behaviors combined with environmental factors are responsible for about 70 percent of premature deaths in the United States.<sup>17</sup> Since risk factors are such a huge determinant of mortality, having risk factor information on individuals within a population provides the critical link in determining resource allocation.<sup>18</sup>

## HISTORICAL INFLUENCES

### POLITICAL

Health care has probably been on the political agenda since 1798 when Congress established the U.S. Marine Hospital Service, which was the precursor of today's Public Health Service. In 1870, the Marine Hospital System was reorganized as the national hospital system and the Commissioned Corps of the Public Health Service was established.<sup>19</sup> Since that time the health care delivery system within the United States has undergone tremendous change and the pace of its change continues to accelerate as new technology is developed and as political and economic pressures continue to exert themselves on the system. In the recent past, the issue of health care was one of the burgeoning issues when President Clinton took office in 1992. The Clinton Health Care Plan recognized the spiraling cost of health care and the problem of access, particularly for those with low or no income.<sup>20</sup> Although his proposed legislation did not pass in Congress, the issues of cost and access remain concerns today both in the private sector and in the military health care system. As evidence of this, all one has to do is recall the most recent presidential race where health care funding was one of the major issues of the campaign.<sup>21, 22, 23, 24, 25</sup> In addition, on October 6, 2000, the Floyd D. Spence, National Defense Authorization Act for Fiscal Year 2001 was passed by Congress. Title VII of this Act authorized a tremendous expansion of health care benefits to Department of Defense beneficiaries. In addition to reducing costs for active duty family members through elimination of co-pays, establishment of TriCare Prime Remote and reduction in the catastrophic cap, it also expanded accessibility of services for retirees that are eligible for MEDICARE.

Effective April 1, 2001, MEDICARE eligible retirees have an enhanced pharmacy benefit and effective October 1, 2001, they become eligible for the TRICARE for Life program under which TRICARE will be the second payer to MEDICARE.<sup>26</sup> This expansion of benefits is expected to cost the Department of Defense much more than \$3.9 Billion supplemental funding promised by President Bush.<sup>27, 28, 29</sup> It is as a result of these conditions that the MHS must optimize its operations through prospective preventive health care and condition management of tertiary care in order to maintain access to the system and the high quality health care that its beneficiaries deserve.

## **PUT PREVENTION INTO PRACTICE**

In 1984, the U.S. Preventive Services Task Force (USPSTF) was commissioned by the Public Health Service to develop recommendations on the appropriate use of preventive interventions. The significance of these recommendations is that they were made based solely on scientific evidenced-based data. In 1989, the USPSTF published recommendations on 60 topic areas in preventive services in a publication called the Guide to Clinical Preventive Services. In 1996, the guide was updated and greatly expanded into a second edition. During the review process for the second edition, the USPSTF found the following five important considerations concerning preventive services that made a significant impact on the development of the MHS Optimization Plan:<sup>30</sup>

- "Interventions that address patient's personal health practices are vitally important.
- The clinician and the patient should share decision-making.
- Clinicians should be selective in ordering tests and providing preventive services
- Clinicians must take every opportunity to deliver preventive services, especially to persons with limited access to care.
- For some health problems, community-level interventions may be more effective than clinical preventive services."<sup>31</sup>

These guides have become invaluable to primary care providers in providing them with science based recommendations for preventive services.

In order to maximize the benefits of the work done by the USPSTF, the U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion launched the Put Prevention into Practice (PPIP) initiative in 1994. The premise of the initiative was that by reducing clinician, patient and office barriers, the overall effectiveness of preventive services delivery would improve. The hallmark publication of PPIP is the Clinician's Handbook of Preventive Services. This publication is intended to be a reference for clinical preventive guidelines and a guide to implementing preventive health care protocols.<sup>32</sup> The PPIP initiative was embraced by the MHS through the establishment of health promotion centers for each of the services. The Air Force established the Office for Prevention and Health Services Assessment (OPHSA). The Army redesignated the U.S. Army Environmental Hygiene Agency as the U.S. Army Center for Health Promotion and Preventive Medicine

(USACHPPM). The Navy Environmental Health Center (NEHC) was designated as the proponent for preventive medicine and health promotion for the naval services.<sup>33</sup> In addition, the PPIP initiative was one of the underpinnings in the development of the MHS Optimization Plan.<sup>34</sup>

#### STRATEGIC IMPORTANCE OF POPULATION HEALTH

Aside from the fact that population health is the priority for the medical community, it also has a significant strategic importance at both the national and Department of Defense levels. This is demonstrated in the United States National Security Strategy published in December 1999, which states that "Environmental and health problems can undermine the welfare of U.S. citizens, and compromise our national security.... History has shown that international epidemics, such as polio, tuberculosis and AIDS, can destroy human life on a scale as great as any war or terrorist act we have seen, and the resulting burden on health systems can undermine hard-won advances in economic and social development and contribute to the failure of fledgling democracies."<sup>35</sup> To emphasize this point, the senior leadership of the Department of Defense have repeatedly made the point that health is also an issue of medical readiness. Former Secretary of Defense William S. Cohen, in his Annual Report to the President and the Congress, January 2001 states that "The strategy of force health protection (FHP) continues to guide the Department's efforts to sustain and preserve the health of the force, during deployments and at home station."<sup>36</sup> In addition, former Secretary of the Army, Louis Caldera, made the point of the strategic concern health care has to our nation as a whole during his speech at the Fletcher Conference on "National Strategies and Capabilities for a Changing World". Former Secretary Caldera stated that "assuring our own economic security through our investments in public goods such as health care, infrastructure, education, and workforce development is also an important element of providing for our national security."<sup>37</sup> The Army Posture Statement Fiscal Year 2001 states that health care is one of the components that enhances the well-being of the Army. The well-being of the Army is one of the three strategic issues studied by the Army last year as an important component of readiness.<sup>38</sup> This was reiterated by General Shinsecki, Chief of Staff of the Army in his testimony to the Committee on Armed Services on 27 September 2000.<sup>39</sup>

#### OPTIMIZATION PLAN FOR THE MHS

The MHS has the tri-fold purpose of ensuring the medical readiness of the fighting force, responding to small-scale contingency operations, and medically supporting domestic preparedness against weapons of mass destruction.<sup>40</sup> In order to continue the ability to accomplish this role in an environment of insufficient resources and increasing mission, the Department of Defense had to optimize the MHS through greater efficiency. In doing so, the entire focus of the system had to change. The traditional focus on disease intervention had to shift to health sustainment through prevention. The

current focus of disease intervention often left the consumer with sub-optimal satisfaction due to problems associated with difficulty accessing the system and significant time lags in claims processing. When disease intervention was needed, the points of access used were not always the optimal use of the resources involved, particularly when the Emergency Room was used due to inaccessibility of a primary care provider. Treatment was often limited to the specific complaint for that visit, rather than treatment of the person as a whole, which resulted in many unplanned visits with a lack of continuity between visits. Overall, this led to less than optimal health status. The new focus on health through prevention will increase appropriate access through use of primary care manager that will know and manage the patient's health over time. This will result in improved population health through demand and case management using evidence-based clinical practice guidelines. Continuity of care for disease management outside the realm of primary care will be optimized through the primary care manager. Overall individual health status should improve along with increased satisfaction with the system. This will result in better use of resources through a decrease in workload at each medical treatment facility. The reduction in workload will allow for recapture of some of the workload that is currently being contracted to civilian health care providers. Bringing more health care back into MHS facilities will result in overall cost savings.<sup>41</sup>

The draft plan for optimization of the MHS was published 1 April 2000. Similar to the systematic approach used in Healthy People 2010, the military services adopted a systematic approach for implementation of the Optimization Plan. Figure 2 illustrates that seven-step process. Particular note

should be made that each step in the process involves input or access to some aspect of the information data management system. In Step 1, Enrollment Processing, includes not only initial entry into the population database, but also completion of the individual health assessment which feeds into Step 2, Demand Forecasting. Once the size of the population and demographics of the population are known along with their own personal health assessment, a forecast of predictable health care usage can be developed using modeling. In Step 3, the demand forecast is used to develop a Capacity Management Plan to maximize resources within the MHS. This is done using known provider productivity in

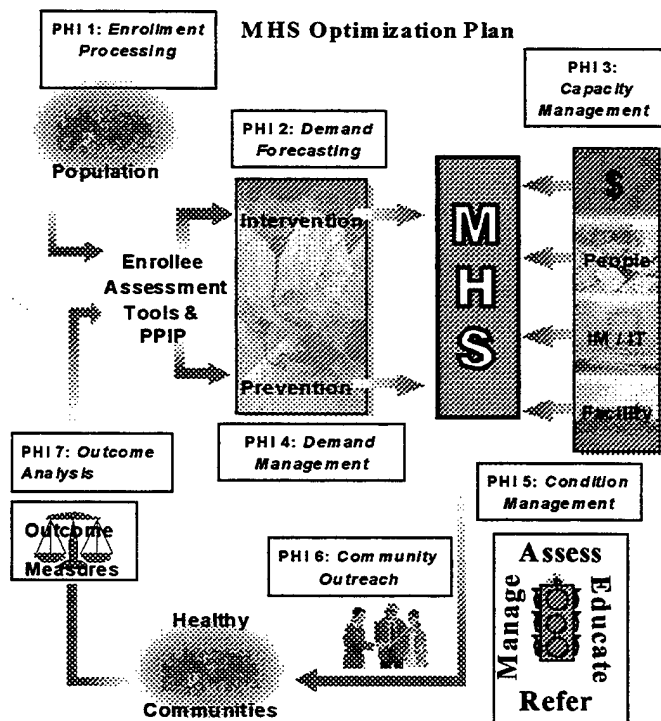


FIGURE 2 SYSTEMATIC PROCESS FOR MHS OPTIMIZATION

combination with the demand forecast. Step 4, Demand Management, refers to the collection of interventions designed to reduce unnecessary and preventable health care utilization through appropriate utilization and education. As such, demand management facilitates self-care, behavior modification, and utilization of health sustainment services such as immunizations and periodic wellness checkups. Step 5, Condition Management, is used for patients with ongoing disease processes in order to maximize each interaction with the health care system so as to minimize the resources consumed. In Step 6, Community Outreach, data, such as injuries incurred from not wearing bicycle helmets, can be used in the development of a community-wide education campaign and policy development for riding bicycles on military installations. Outcome Analysis, Step 7 of the plan, must then be accomplished through review of patient utilization data to determine best practices. As with most models, this final step then feeds back into the process loop to further enhance the system.<sup>42</sup>

The model in Figure 2 demonstrates the complexity of a population focused health care system. The tools required must contain information on the current health status of the individuals within the population and it must be able to analyze the decisions made at both the clinical and administrative levels in order to make good decisions concerning resource allocation. The more efficient the organization, the more likely that resources will be optimally used. Currently there are several obstacles to optimizing efficiency within the MHS that are being addressed through the optimization process. These include the following:

- a lack of tools to know patient baseline status
- a lack of a prevention tracking tool
- lack of an effective demand management process
- lack of clinical information on individual patients and the provider's panel
- insufficient clinical practice guidelines
- lack of clinical and administrative support personnel
- lack of medical record availability
- insufficient feedback on performance<sup>43</sup>

Many of these issues are addressed in the information systems that are coming on line in support of improving population health and the optimization plan.

#### INFORMATION SYSTEMS REVIEW

The MHS currently has a number of information systems that are being used to affect some aspect of health within the MHS. The following is a review of the information systems within the MHS that are being used as sources for improving population health.

#### PREVENTIVE HEALTH CARE APPLICATION

The Preventive Health Care Application (PHCA) began as an Air Force prototype project in February 1996. Its goals were twofold. First, it was to determine if automating clinical preventive services

would provide enough data necessary to assist clinicians and managers in the development of healthier communities. Its express purpose was to automate the requirements of the PPIP program. The second goal of PHCA was to determine if the Health Evaluation and Assessment Review (HEAR) 2.0, could be implemented at a point in the health care system where a patient's responses could be immediately reviewed and health care services provided almost immediately, if necessary. The Preventive Health Care Application integrates three different information systems that were currently in use in the MHS to provide population health data. It combines the information from the Health Evaluation and Assessment Review (HEAR) 2.0, the Composite Health Care System (CHCS) and the Immunization Tracking Module (ITM). The unique aspect of this information system is that it combined two commercial off-the-shelf (COTS) programs, the HEAR 2.0 and the ITM with a government off-the-shelf (GOTS) product the CHCS system. With the combination of these three information systems, users have been able to assess patients who are "at risk", develop a plan for implementation of their preventive services care and track the patient's progress over time.<sup>44</sup>

There are some limitations with the PHCA information system. One of the major limitations is that it does not contain the ability to do true ad hoc reporting. However, with the software product enhancement that was developed, users have more options on how to aggregate and display data. The enhancement also includes a function whereby managers can pull the entire TRICARE PRIME enrollment data from CHCS. It then matches preventive diagnostic procedures against the patients that had them performed to provide a denominator for trend analysis.<sup>45</sup> Another limitation of PHCA is that preventive services that are due are not automatically populated into the system or reported. In order to find this data a manual query must be run. As an initial, interim system, however, PHCA does provide data that can be useful for providers in determining preventive services requirements when used in concert with other tools such as the Guide to Clinical Preventive Services and the Clinician's Handbook of Preventive Services.

#### **TOTAL ARMY INJURY AND HEALTH OUTCOMES DATABASE (TAIHOD)**

The importance of the Total Army Injury and Health Outcomes Database (TAIHOD) should be recognized from the Armed Forces Epidemiological Board (AFEB), Injury Prevention and Control Work Group report in 1996 that cited "injuries as the leading cause of morbidity and mortality among military service members."<sup>46</sup> In addition, LTC Paul Amoroso, one of the developers of TAIHOD, cites that "Injuries are the most common source of lost person-years of productive life, lost time from work, and the most frequent cause of death in the U.S. among persons under the age of 45."<sup>47</sup> This database was originally developed to investigate injuries among women in the Army in support of the Defense Women's Health Research Program. However, today the TAIHOD is a research tool seeking to identify new risk factors or causes of injury that were previously unknown for both men and women in the Army. Originally, TAIHOD was developed as a relational database joining data sets from three general categories; demographics, outcomes and self-reported behavior. There were six data sources used. The Defense

Manpower Data Center (DMDC) was used for input of personnel data such as demographic variables, hazardous duty pay, service dates, reason for discharge, and whether or not the soldier was deployed during the Gulf War. The Individual Patient Data System (IPDS) provided information concerning hospitalizations such as diagnosis, injury type and bed days. The Army Safety Management Information System (ASMIS) reported lost-time injury data concerning aviation and ground accidents. The Army Disability system provided percentage of disability, line-of-duty relationship and functional disability code information.<sup>48</sup> The Army Casualty Information Processing System (ACIPS) provided cause, time, and place of death for active duty soldiers. The Health Risk Appraisal data set provided self-reported information on "health habits such as diet, exercise, tobacco and alcohol use, stress, job-satisfaction, risk-taking behavior and health care utilization."<sup>49</sup> Since its original development, three other data sources have been added to the database. Now outpatient data from the Ambulatory Data System (ADS), occupational toxin exposures and updated self-reported behaviors from the HEAR are included in the database.<sup>50</sup>

This database has some significant advantages in the area of population health. First, since it incorporates military data, it incorporates all hospitalizations whether or not the injury or illness is occupationally related and whether or not the individual was hospitalized in a military treatment facility. Also since the data is updated every six months, current trends in injuries can be investigated.<sup>51</sup> It also is able to study groups of soldiers within major occupational specialties and also to compare men and women within those specialties. For example, it was found that the male military occupational specialty with the highest hospitalization rates for both injury and musculoskeletal conditions was infantry (11B). However, for women, medics (91A) had the highest hospitalization rates for injury, while light wheel vehicle mechanics (63B) had the highest rates for musculoskeletal conditions.<sup>52</sup>

However, for the MHS as a whole, there are some obvious disadvantages. This system only addresses active duty army personnel. Therefore, it is not a tri-service database. Additionally, it does not include family member information which is an important part of the costs involved in providing health care in the MHS.

Although this system is retrospective in nature, its ability to identify trends can be used by commanders and others in positions to impact safety to implement procedures that can reduce or prevent the reoccurrence of these incidents in the future. For the population health of the active duty force, this system has substantial data that can make positive contributions toward improved health status within the Army.

#### **DEFENSE MEDICAL SURVEILLANCE SYSTEM (DMSS)**

The Defense Medical Surveillance System (DMSS) is an executive information decision support system. Unlike the TAHOD, its purpose is to monitor known causes of injury and illness and track rates and trends. The database contains information from numerous sources of data across Department of

Defense concerning diseases and medical events such as hospitalizations, ambulatory care, reportable diseases, HIV test results, health risk appraisals, and pre- and post-deployment questionnaires. It also contains longitudinal information on personnel and deployments.<sup>53</sup> The Defense Manpower Data Center (DMDC) provides information concerning demographics on all active duty and reserve personnel as well as deployment rosters for the Persian Gulf War and other major deployments since that time. Major deployments are defined as land-based troop movements outside the United States resulting from a Joint Chiefs of Staff/Unified Command Deployment Order for lengths of time of 30 days or greater. Military Entrance Processing Stations (MEPS) supply personnel data from recruits as they first enter on to active duty. This information plays a vital role in studying adverse health effects of various aspects of basic and initial training. The Executive Information Decision Support (EI/DS) system provides both inpatient and outpatient health care data with the exception of that given during deployments. The Patient Administration System and Biostatistics Activity (PASBA) provides health care delivery information for soldiers who were treated while on deployment status.<sup>54</sup> However, not all deployment information is available through this activity.<sup>55</sup> Information from Health assessment questionnaires both pre- and post deployment is provided from the Army Medical Surveillance Activity (AMSA). Ambulatory patient data is also gathered from the Standard Ambulatory Data Record – Deployment (SADR-DEPLOY) which is found in the Desert Care II database. All HIV test results are submitted directly from the testing laboratories. The Defense Enrollment Eligibility Reporting System provides immunization data. Serum specimens from both HIV testing and from operational deployments worldwide are stored in the Department of Defense Serum Respository (DoDSR). These specimens are available for Department of Defense investigational purposes. The demographic, occupational and medical information in the database is also included in the DMSS. In addition, all casualty data on active duty deaths from Directorate for Information, Operations and Reports (DIOR) is available through DMSS. Health Risk Appraisal information is gathered from the Center for Health Promotion and Preventive Medicine (CHPPM). Lastly, all Reportable Events information submitted from medical treatment facilities is included in the database.<sup>56</sup> The end result of the integration of all this data is a monthly report called the Medical Surveillance Monthly Report (MSMR). This report provides case report information and quarterly cumulative reports on reportable events. It is primarily distributed through medical channels.<sup>57</sup>

The true value of this information system is that it routinely and systematically integrates, analyzes, interprets and disseminates information on disease incidence and prevalence across the services.<sup>58</sup> However, the report is often limited to the medical community with little discussion of the data outside the preventive medicine community. With wider dissemination of both the capabilities of the system and the information provided in the MSMR, medical and safety personnel could do more with it in educating both medical and line personnel in procedures that would enhance the health of the MHS population.

## **DEFENSE MEDICAL EPIDEMIOLOGY DATABASE (DMED)**

The Defense Medical Epidemiology Database (DMED) is an information system that provides remote access to some of the data sets within DMSS. The data sets that are accessed through this system contain no privacy act data, and therefore, are available to a wide range of users within the military health system. There are four data sets that compromise DMED. They are as follows:

- DMDC for population data
- SIDR for inpatient data through CHCS
- SADR for outpatient data through ADS to CHCS
- Reportable events data supplied by medical treatment facilities throughout the MHS<sup>59</sup>

The limitations of DMED are that reportable event data is not available from all services on an equal basis and that only active duty population data is available. Reportable event data is available on Army personnel from 1995-2000. However, Air Force and Navy data is only available for the year 2000 due to the date of its transition to a tri-service information system.<sup>60</sup> It should also be noted, that this system is intended as a research database, not as a population health surveillance system.

The advantage of the system from a population health perspective, however, is that it allows for remote access to a database that can address concerns about possible local or national disease trends or rising health problems. Investigators noting trends this way could use the information to develop prevention efforts aimed at controlling or eliminating the problem.

## **COMPOSITE HEALTH CARE SYSTEM II (CHCS II)**

The Composite Health Care System II (CHCS II) is the replacement system for CHCS. When CHCS II is fielded, it will become the benchmark for population health management in the health care industry. It's important to understand that although the name would suggest that CHCS II is an upgrade to CHCS, it is much more than that. CHCS II is designed to support population health management across the MHS. As an integration of a host of previously unrelated systems, the intent for the system is to be a life-long record of all aspects of health care delivered to all beneficiaries. It encompasses all medical and dental care including all preventive care, and all illness and injury treatment. It was developed using the criteria cited by Gartner Group Research that must be met for a computerized patient care record. These criteria are:

- "Document all aspects of care and the health status of all individuals within the MHS.
- Facilitate timely, accurate and comprehensive communication between caregivers.
- Provide ready access to clinical knowledge bases and decision support.
- Guarantee the confidentiality and integrity of its information."<sup>61</sup>

Initial fielding of CHCS II is scheduled to begin in the latter part of this fiscal year in the TRICARE Region 11 (i.e., Northwest U.S.; including Madigan Army Medical Center and Fort Lewis, Washington). The plan is for the system to have multiple releases with increasing functionality. The benefits with this

type of development and fielding plan are twofold. First, it will allow for changing requirements over time, which is a critical element in the rapidly changing world of health care.<sup>62</sup> Secondly, it allows for incremental change with user input and, therefore, the ability to build support and loyalty to the system.

The end result of the system design is that the patient-provider encounter will be optimized through the use of clinical support staff and rapid availability of patient health care status. Reminders of overdue prevention services or counseling requirements are available to clinic staff for patient notification. The provider has the availability of patient health history with easy retrieval of problem list, medications, laboratory and radiology results, and consults. In addition, the provider is able to graphically review the patient's progress over time in areas such as blood pressure and body mass index. Also readily available are disease management templates and clinical guidelines based upon the U.S. Preventive Health Task Force recommendations. Due to the relational aspects of the systems involved, when data suggests the need for preventive services, such as a high cholesterol value as a result of a laboratory test, the wellness reminder section automatically updates with a reminder notice.<sup>63</sup>

From the perspective of force readiness, this system's design also enhances the line commander's ability to track unit readiness. CHCS II will provide a single portal for readiness information such as immunizations, vision and hearing exams, HIV testing, and dental readiness category as well as pre- and post deployment health assessments.<sup>64</sup>

From the leadership perspective, CHCS II provides a mechanism for monitoring population health through a variety of reporting mechanisms. Also, demand management can be assessed for effectiveness at optimizing the medical treatment facility or region. In addition, the clinical and administrative data sets are available for surveillance monitoring and research eliminating the need for separate systems such as DMSS and DMED.<sup>65</sup>

Due to the robustness and flexibility of CHCS II, it will likely become the basis for other large health maintenance organizations in their development of computerized patient record information systems.

## **POPULATION HEALTH OPERATIONAL TRACKING AND OPTIMIZATION (PHOTO)**

The Population Health Operational Tracking and Optimization (PHOTO) information system is a follow-on effort to the development of CHCS II. Although not completely developed yet, its purpose, taken directly from its name, is to optimize the MHS through data tracking to ensure optimal health of the population and optimal use of resources. From the population health perspective, PHOTO was developed to "promote the transition from episodic care to proactive management of the health of MHS beneficiaries."<sup>66</sup> It also contains a set of standardized measures developed from HEDIS® that will provide the ability to review resource usage and management across the MHS, from clinicians to commanders to corporate leadership.

The initial development package includes twenty-seven standardized performance measures across five focus areas. The focus areas are:

- "Customer Satisfaction
- Best Business Practice
- Best Clinical Practice
- Force Protection
- Population Health<sup>67</sup>

Separate metrics associated with each of these focus areas are the pivotal aspect of the information system. The definition and technical details of how the metric is calculated, along with the degree of completeness of the data and ranking in a tabular view, are also included to assist in understanding the report.<sup>68</sup>

At this time the standardized performance measures are not completely developed. With the first fielding in Region 11, only eleven of the initial twenty-seven measures will be completed. Upon completion of the Operational Assessment and initial fielding, the sixteen remaining metrics will be developed with completion estimated in June 2001.<sup>69</sup> The final plan is for development of sixty different metrics across the five focus areas including thirty-four separate HEDIS® measures.<sup>70</sup>

This information system has some significant positive attributes that will facilitate its adoption. It simplifies the process of getting feedback on performance of the MHS. Since PHOTO is a web-based design, use of the system is intuitive. With the ability to drill down to the primary care provider, feedback can be provided at the level where it can best be used to effect change. It also facilitates good business case decision making because it provides a complete look at the MHS with inclusion of contracted health care data, not just care provided within the military treatment facility. The metrics are standardized and have been tri-service validated. Upon development completion, this information system will provide the tool that commanders and all leaders throughout the MHS need to monitor performance and efficient use of their resources.<sup>71</sup>

#### THE CHALLENGES AHEAD

Despite the tremendous advances being made in automation system development such as CHCS II and PHOTO, the MHS leadership will face significant challenges in the years ahead. These systems are designed to provide the tools necessary for commanders to make critical decisions concerning operations within their health care facilities so that they can make optimal use of their resources. However, information alone will not alter the status quo in operational procedures. A fundamental change must occur in the way health care is provided. This change in process will require "intellectual, attitudinal and behavioral adjustment."<sup>72</sup>

In a recent report released by the Institute of Medicine titled Crossing the Quality Chasm, the importance of information technology in the redesign of our nation's health care system was emphasized as critical in ensuring "safe, effective, patient-centered, timely, efficient, and equitable"<sup>73</sup> health care. The report stresses that the nation's health care system must be redesigned because it is operating with

serious quality shortcomings. It also notes that the nation's health care system frequently "falls short in its ability to translate knowledge into practice, and to apply new technology safely and appropriately."<sup>74</sup> However, the report does note that information technology has the potential to improve the quality of health care and in doing so, improve the overall health of the population.<sup>75</sup> Since the MHS often mirrors the private health care sector because many of the same pressures influence the delivery of health care in both sectors, the call to action in the Institute of Medicine's report should be taken just as seriously in the MHS. The recommendations concerning the development and use of information technology should also be taken into consideration in the development of the new information systems within the MHS.

## **INFORMATION SYSTEM IMPLEMENTATION AND MAINTENANCE**

Implementation of the CHCS II and PHOTO are critical to optimization of the MHS. One of the significant concerns of the TRICARE Management Agency is attitudinal acceptance of these systems. Anecdotal evidence suggests that providers view these systems as additional demands on their time rather than time savers. Initially, there should be an expectation of an increase in the amount of time a provider will require to input data because of the learning curve. This initial negative time influence should level out after a short period of time. However, the additional requirements of prevention counseling and monitoring of other periodic preventive services is seen as a tremendous burden for each patient visit.

In addition to overcoming attitudinal change, leaders of the MHS will also have to monitor the tendency to spend more time with the automated system than with the patient. Since reports will reflect only that information documented in the information system, the tendency will be to focus on data input, possibly over patient interaction. The tendency to focus on automation information sources is already noticed within the military command structure. Evidence of this can be found during Pre-Command Courses for battalion and brigade level commanders. Here, repeated emphasis is made on the fact that email should be used as only one source of communication. Emphasis is placed on face-to-face interaction as the most important method of communication. The same must be emphasized to our health care providers in their provision of health care.

Following implementation, maintenance of the information systems will be crucial to success of the Optimization Plan. The current implementation schedule for fielding both CHCS II and PHOTO is a five year process. With the rapid pace of advancement in technology, five years from now when the final system installed, CHCS II and PHOTO can be expected to be archaic in comparison with the technology of the day. In order for continued success of the Optimization Plan, the leaders of the MHS will have to remain committed to allocation of significant resources for upgrade of the systems and for development of new systems. The current literature suggests that artificial intelligence created through neural networks will be available in the near future. These self-learning systems have the potential to enhance population health even further than current systems through the identification of subtle, non-linear patterns in data that will isolate causes of disease and injury not recognized before.<sup>76</sup> However, since today's information

systems are developed based upon relational databases, integration of neural networks will require development of completely new information systems at substantial cost to the MHS.

## EDUCATION

The leaders of the MHS recognized the significant change process that will be necessary to successfully implement the Optimization Plan and deployment of these new information systems. As a result, the TRICARE Management Agency developed an Education Plan. The purpose of the Education Plan is to "transform a traditional interventionist culture to one that focuses on disease prevention and the effective management of chronic illness."<sup>77</sup> Through education, it is hoped that the participants of the system will be co-opted into the change process and become active agents of change. The Education Plan focuses on four levels where this education process must occur.

- "Beneficiary Education
- Provider Staff Education
- Executive Leadership Education
- Optimization/Preventive Health Intervention Education"<sup>78</sup>

These four levels of education must focus on creating an understanding of the vision of the Optimization Plan and how that results in a healthier community and greater readiness to accomplish the mission of the Department of Defense. According to behavioral change theory, an understanding of the vision will motivate health care providers to improve business practices and create a more efficient work flow. Support tools such as CHCS II and PHOTO will reinforce the new business practices and result in enhanced primary care. Without full understanding and acceptance of the Optimization Plan vision, implementation will be impeded.<sup>79</sup>

Education and the need to motivate change in behavioral patterns goes beyond that of the information systems of the MHS though. No matter how much health care providers improve their business practices, unless individual patients are motivated to change in the aggregate, all the prevention counseling and services offered will not change the health of the population. One of the most significant change factors that must be addressed is the need for the patient to become an active participant in their own health. This is a paradigm shift from the role of the passive patient that is often seen in interventional, disease-oriented medicine. The new paradigm involves the patient as an active participant in disease prevention models. This shift will require motivation on the part of the individual to change health risk behaviors.<sup>80</sup> The question then becomes, what motivates an individual to change lifestyle behavioral patterns? Research has shown that motivation factors vary by individual and vary over the lifetime of the individual. How will the health care provider determine which approach to prevention will work best for each patient?<sup>81</sup> Although information systems have the capability to provide information concerning which patients are at risk for developing disease, they will not be able to provide the clues to the incentives that will motivate each individual patient.

## CONCLUSIONS

The MHS is in a state of rapid change due to a number of pressures that are being exerted on the system. As in any business process, the best business practice is to find a way to optimize the use of the system's resources. In the military health care system, optimization of the system requires efficient use of internal resources and shift in process from interventional care to one that provides prevention services. By preventing episodic health care events, or at least treating them early on in the disease process, less demand for services will occur. When the demand on the system is decreased, the opportunity to recapture patient care that had been shifted to contracted health care can occur. With a reduction in contractor caseload, a reduction in the cost of operating the system will result. In order to decrease demand, the MHS must have the ability to identify the members that are at greatest risk of consuming high cost services. Preventive services, early-on intervention and disease management are the keys to decreasing demand. Predictive modeling allows us to determine which individuals within the MHS are at greatest risk for adverse health outcomes. Each of the information systems described has the ability to some degree to identify individuals who are at high risk based upon past occurrences or current health status. The development of both CHCS II and PHOTO demonstrates the commitment on the part of MHS leaders to making this transition to improving population health through preventive services. The future of the MHS lies in increased force readiness and a more efficient health care system that has its focus improving the health of its population. The information systems being developed today put the MHS on the path to accomplish this mission. However, there are significant challenges ahead. Health care providers, staff and beneficiaries across the MHS must be educated about the Optimization Plan and the leadership of the MHS must be committed to maintaining the systems. In addition, the leadership of the MHS must be vigilant in ensuring that the drive for data does not compromise patient interaction and the patient-provider relationship.

As the MHS progresses through this process of change, the lessons learned possess great potential for transfer to the private health care sector. Although most private health care systems do not have the same incentive for maximizing the health of the population they serve, the purchasers of health care do. Studies such as the recently released report by the Institute of Medicine titled Crossing the Quality Chasm suggest that it will not be long before purchasers of health care demand the same optimization within the health care systems that they support.<sup>82</sup> Therefore, it would seem imperative that all health care agencies begin their own look at improving population health and optimization of their own system.

WORD COUNT = 7445

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