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The Revolution in Military Medical Affairs

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During our lifetimes, science has learned more about how nature works than was learned in the previous 5000 years. A weekday edition of *The New York Times* contains more information than an individual was likely to encounter in a lifetime in the 18th century. Today's consumers wear more computing power on their wrists than existed in the entire world before 1961. Hyper-change conditions require us to examine rigorously the operating models of our functional and management systems, particularly the assumptions that underlie those models, in order to make rational decisions about adapting our systems to current realities.

This article examines the changing environment of military medicine and derives a new model to address changes that affect military families as well as the medical environment we can expect in future conflicts. In framing this discussion, it will be useful to examine how the United States came to have its currently structured military medical system, the assumptions on which it has existed, and how the national medical environment has changed to alter the basis for those assumptions.

Understanding Our Past

In his book *The Fifth Discipline*, Peter Senge describes the mental models that were at the heart of the extraordinary success of the "Big Three" US automakers as they built the automobile industry in this country. He also explains how the very assumptions that were the foundations of their success were the causes of their failure in the 1970s. Their model was built on five assumptions:

- They were in the business of making money, not cars.
- Cars are primarily status symbols and therefore styling is more important than quality.
- The American car market is isolated from the rest of the world.
- Workers have very little effect on productivity or quality.
- Everyone in the business needs to know only their fragmented piece of the business.

These five principles served the industry well for decades. Indeed, they were thought to be "a magic formula for success for all time, when all [the industry] had found was a particular set of conditions . . . that were good for a limited time." [1] The real problem with this model is that it had come to exist below the level of awareness; because it was not subject to challenge from within the industry, it remained unexamined. Because it remained unexamined, it remain unchanged. As the world changed outside the insular world of those business executives, a gap widened between the model and reality, leading to increasingly counterproductive behavior and decisions that turned out to be not in the best interests of either consumers or the industry itself. [2]

Our military medical departments have operated on several fundamental assumptions since the end of World War II. First, it has been generally accepted that all the health care needs of the active-duty population would be provided by military medical departments in military medical treatment facilities. Medical care, it was assumed, would be provided to casualties from their point of injury on the battlefield through a military medical treatment system until such time as the casualty was either returned to duty or released to the extended care of the Department of Veterans Affairs. Active and reserve medical forces have therefore been staffed, equipped, and trained in peacetime to perform the wartime mission.

Second, military medical forces, like combat forces, were sized to meet worst-case wartime scenarios with an acceptable level of risk. Cold War military planners constructed scenarios and built force packages to enable the nation to respond to threats to national security. Until recently, the annual Defense Planning Guidance assumed a worst-case scenario that included little or no warning before the outbreak of global, potentially nuclear war with the Soviet Union, which could have produced tens of thousands of casualties. Plans based on this scenario called for large active and reserve medical forces, many at a high state of readiness. The Army Medical Department alone had a Cold War peak requirement of 162 hospitals with a requirement for over 67,000 beds.[3] In the expectation that even this capacity would be insufficient, the services entered into arrangements with the Department of Veterans Affairs and civilian hospitals through the National Disaster Medical System to provide backup hospital capacity.[4] The active-duty force is expected to be young and relatively healthy; consequently we have become accustomed to a substantially greater military medical capacity in peacetime than is needed to care for the active-duty population.

The third assumption is that the Department of Defense would use its excess medical capacity to provide care to other categories of beneficiaries, specifically dependents of active-duty personnel, retirees, retiree dependents, and survivors.[5] Use of the excess capacity in this manner has two benefits. Excess capacity provides daily training opportunities for medical personnel to maintain clinical skills in ways they cannot when dealing with the young, active-duty population. The case mix, although not approximating case mixes in combat zones either in volume or types of injuries, nevertheless enables physicians, nurses, and technicians to maintain general clinical proficiency. This is important for combat readiness, but it also is an important aspect of recruitment and retention of clinicians. Excess capacity also provides a potentially cost-effective way to provide care to other beneficiaries, since the cost of delivering care to those beneficiaries does not include such fixed costs as acquisition and maintenance of facilities emplaced for wartime use.[6]

A fourth (implicit) assumption is that health care for non-active-duty beneficiaries would continue to be provided either in military medical facilities or in some form of government-funded health insurance program. The fifth assumption is that military health care delivery systems would be designed and organized consistent with the organizational forms, practice standards, and training requirements found in the civilian health care system. The preference for hospital-based specialty care in the civilian sector is replicated in the Military Health Care System. The final assumption is that each of the military services must have a separate medical department because of the uniqueness of the hazards to the health of their beneficiaries and of the environment in which care is provided. These six assumptions collectively have shaped and sustained the post-WWII military medical paradigm.

The question of who are we and what are we about has for a half century been answered by military medicine as "We are the providers of care." And because care provided in peacetime could be linked to a wartime requirement, wartime medical readiness and peacetime beneficiary health care became synonymous. In addition, the short time available to prepare for such a wartime threat meant that a significant minority of the medical force structure had to be in the active component. Active-duty medical forces therefore were organized, equipped, and trained to meet expected early deployment requirements, and reserve medical forces were configured to meet follow-on or expansion requirements. In order to maintain proficiency, retain medical professionals, and provide cost-effective health care, the Department of Defense used excess peacetime capacity to provide care to non-active-duty beneficiaries. This capacity was organized to mirror the delivery systems found in the best civilian systems in the country. Military medicine needed trained specialists and thousands of hospital beds for the wartime mission; as long as the capacity existed, it made sense to provide low-cost beneficiary health care to the non-active-duty population. Peacetime care equaled wartime readiness.

With the collapse of the Soviet Union, the assumptions that had served so well for over 50 years suddenly and unexpectedly disappeared. Wartime requirements of the post-Cold War environment are a fraction of the former requirements for hospital beds and specialty care; they generate no excess capacity to be used for other beneficial purposes. While weapons of mass destruction (WMD) might create extreme numbers of casualties warranting a larger force structure, the level of risk is considered to be such that we can meet wartime requirements with medical forces significantly smaller than their Cold War analog.

Moving to the Future

Changing conditions in three widely different realms have caused military medicine to undergo its first significant

adjustments in 50 years: in the geostrategic environment, in the practice of medicine in the United States in general, and in known and anticipated effects of new technology.

Changes in the Geostrategic Environment

The geostrategic environment of the 1990s and the early part of the 21st century is and will likely continue to be radically different from that of the last 50 years. While the end of the Cold War eliminated the threat of global war with the Soviet Union, it seems to have fostered the emergence of other challenges to peace. There is a lingering threat of regional instability, especially in those regions where traditional conflict is an acceptable means of settling disputes and defending national interests. Security threats have emerged that cannot be limited to conflicts between states within a given region; they include subnational and transnational interests, and religious, tribal, ethnic, historical, or territorial movements that are supplanting ideology-based state identities in some regions.[7] Other factors to be considered are the inequities in the distribution of wealth among peoples, the effects of population growth and a nation's ability to support its population, globalization of economies, and the influence of shrinking time and distance factors. Futurists and strategic planners in several disparate fields have noted the decline of the influence of nation-states and foresee wide-ranging implications to this decline.[8]

From a military perspective, the implications are both quantitative and qualitative. Cold War forces had to be prepared to fight and win a global war with the Soviet Union and its allies, and all other missions were assumed to be lesser included cases. Post-Cold War military requirements defined by the unstable international environment, on the other hand, are not smaller versions of Cold War requirements. These requirements are not lesser-included cases of the worst case; in many instances they only vaguely resemble the challenges of the last half century.

Changes in Medical Practice

The practice of medicine in general continues to evolve. Until about 100 years ago, medicine was largely a matter of self-treatment. People seldom sought the advice or help of a physician; when they did, treatment was almost always in the home. Hospitals were the refuge of the poor and dying. Conversely, industrial-age medicine has been typical of other industrial-age enterprises, characterized by specialization, the development of surgery and anesthesia, and centralization of treatment in large hospital-based bureaucracies. The hospitals have treated masses of patients using processes akin to assembly lines that are consistent with the organizational paradigms of the age.[9] The allopathic approach to health care, which became dominant in the United States in this century after the 1910 Flexner Report, encouraged state governments to establish physician licensure which allowed only certain types of physicians to practice. This approach accelerated a reductionist view of illness as disease caused by biochemical or physical factors, an outcome that gave us great tools but left health care unable to deal effectively with personal or psychological, nutritional, or environmental causes of illness.[10]

Health care in the 1990s is being demassified along with other industrial age enterprises. Economic decisions are causing home health care to replace nursing home care and outpatient birthing centers to replace for some multiple days in hospital labor and delivery wards. Same-day surgery in ambulatory surgery centers is replacing some inpatient surgery. The demand for nurse advice lines, physician assistants, and certified nurse practitioners exceeds supply as patients seek alternatives to physician treatment for minor illnesses.[11] Telemedicine brings the potential of high-quality health care service to chronically underserved areas. Renewed emphasis on preventive medicine seeks to change the orientation of medicine from treating illness to generating health. In the years ahead we may be able to use "DNA fingerprints" and generally enhanced biomedical knowledge to tailor therapies to each of us as biochemically unique individuals.

The period when hospital-based specialized treatment centers were the center of gravity for medical activity appears to be passing. Hospitals will continue to exist as key components of new systems that include integrated, decentralized, and diffused primary care and prevention, but the demand for their services could diminish rapidly. New kinds of specialists will emerge as the breadth and depth of knowledge develops and delivery of health care changes. The use of DNA and genetics promises to define and help to shape specialties such as "brilliant medics" (discussed below) and hospitalists--clinicians who specialize in integrating resources available in hospitals for patients.

Effects of Information Technology

Health care reform, the drive for cost containment, and the application of new technologies are the means to create the yet undefined information-age health care system of the 21st century. One can reasonably predict that it will respond much faster and more accurately to individual needs through decentralized, networked organizations. Viewed through this lens, one can see that the medical care system that most of us know is changing and in more fundamental ways than we could have ever imagined.

This new environment is not just a smaller, more segmented version of our parents' and grandparents' world, nor is it only computers, fax machines, pagers, and cellular telephones added to our own world. The emerging forms of medicine are not incrementally different from the world of the last hundred years; they differ in the basic assumptions that govern interactions among individuals, companies, institutions, governments, and societies. Shifts of this magnitude have occurred regularly in the course of human events but are seldom recognized until they have passed.[12] It is therefore incumbent upon leaders to project themselves into the future intellectually and shape the ways in which our systems will change. This is especially important for our armed services; after these fundamental changes have been completed, we must remain a quality force, capable of executing the missions required to further national interests. Those missions of the 21st century will not be limited to fighting and winning wars, but will include other important competencies for which military forces are uniquely suited. Indications are that those other important cases will not be lesser included versions of the worst-case scenario; military forces will likely be built around required traditional and anticipated capabilities rather than threats.

We have already begun to see the results of some of the efforts to achieve what is described as the Revolution in Military Affairs (RMA). Through sensors, satellites, unmanned aerial vehicles, and other means of acquiring and managing information, a regional commander in chief (CINC) can hope to have "perfect knowledge" of a region of interest.[13] With that knowledge, the CINC could attack enemy centers of gravity or alternatively invoke massive, simultaneous, systemic shock that could leave enemy forces incapable of coordinated action. Precision strike, force protection, dominant maneuver, information warfare, and focused sustainment are all expected to play significant roles in such an environment.[14] And although the Army's Force XXI initiatives with new and improving technologies intend to produce a digitized, modernized, product-improved version of today's Army, a true revolution will demand an entirely different type of force.

Most important to this discussion, significant changes in how the military plans and conducts operations will not occur without corresponding changes in military medical activities. For reasons that are quite different from those on which the Cold War medical system was based, the next military medical system will have to be larger than necessary to accomplish the wartime mission because it will be required to support three distinct and different kinds of activities: combat health support, health operations other than war, and definitive and rehabilitative care. The most dramatic changes will occur in combat health support, primarily because we can expect to engage in armed conflict that may be much different from our experiences of the past 50 years.

A Revolution in Combat Health Support

Medical presence available to combatants of 2015 will be significantly different from that experienced by combatants in conflicts as recent as the 1990-91 war against Iraq. The most dramatic difference may occur in the principle of mass in warfare, which suggests concentrating combat power at the decisive place and time in military operations in order to achieve decisive results.[15] Mass, properly applied, helps retain the initiative and makes it possible for outnumbered forces to achieve decisive results. One can make the case that mass on the 21st-century battlefield will most often be defined by fire, precision munitions, and control of communications, rather than by large formations of troops attempting to impose their will on an opponent. If this proves to be true, we can expect that the density of troops in a given space in combat will decrease. Moreover, the proliferation of weapons of mass destruction can accelerate a trend toward a progressively emptier battlefield.[16] Our own centers of gravity can become priority targets for weapons of mass destruction if they can be detected and if appropriate delivery systems are available to our adversaries.

Dispersed forces in this environment may converge to accomplish a mission, but they will in all probability disperse again and reconstitute in preparation for subsequent strikes. "If military forces follow the strategy of disengaged combat, the battle front may be hard to find The initial stages of combat might find two heavily armed opponents,

both dispersed, striking at each other from a distance, each attempting to secure an advantage by locating and striking key units and assets while simultaneously trying to stay out of harm's way from the massive and precise capabilities of the other." [17] Military forces may have to be designed and organized similar to distributed computer networks; characteristics can include unprecedented autonomy and independence of action--the ability to operate independent of central control while still following command guidelines. This implies dispersion, mobility, and the means to sustain such forces with agility and precision.

Such a future will have profound implications for military medicine. Our present concept of taking Deployable Medical Systems (DEPMEDS) versions of our fixed facilities--field hospitals, fleet hospitals, and air transportable hospitals--to the 21st-century theater of operations under a doctrine that pulls soldiers through five levels of care from the point of injury to tertiary care will not work in this battlespace. A large redundant system within a theater of operations designed to return the maximum number of soldiers to duty in the theater will be too large to survive the environment described above and too slow to achieve the mobility necessary to sustain an agile combat force. Such facilities would create lucrative targets in a very lethal battle space and could quickly become more of a liability than an asset for a regional commander. That inherited Cold War system also places impossible demands on the strategic mobility system, making it difficult for a CINC to even get the medical force to a theater soon enough to add value. It is a second wave, vertically integrated system in a world of distributed networks.

On a battlefield where the dominant characteristics are expected to be speed, agility, flexibility, and precision, combat health support must do the minimum necessary to keep a soldier alive until he or she can be evacuated to the United States for definitive treatment. The future medical force will still treat the soldier from the point of injury to definitive and rehabilitative care in the continental United States, but it will have three levels of care rather than the five levels of our recent experience.

. Level 1, acute care, will be characterized by enhanced first responders, including a more capable combat lifesaver and a team of "brilliant medics" with total situational awareness of the soldiers they are supporting. The brilliant medic will be integral to each troop unit, embracing its culture, values, ethic, and lifestyle in addition to its doctrine, tactics, and procedures. This individual will be trained specifically in the holistic art of military medicine, a master of multiple crafts of preventive medicine, health promotion, trauma resuscitation, orthopedics, family practice, and mental health. The brilliant medic will be a military-unique specialty that draws on the best that civilian medicine has to offer in these disciplines. On the battlefield these medics will know where each supported unit is located and be able to monitor key physiological functions of individual soldiers. They will be able to pull casualties rapidly and to perform a broad array of medical and surgical resuscitations as they do so. Their goal will be to save lives, stabilize, and evacuate, so they will have to know as well the multiple options for tactical and strategic evacuation. This brilliant medic will be able to identify the theater-level evacuation hub that can most quickly evacuate the patient out of theater, and will be able to call on theater tactical evacuation resources to transport acute patients to the appropriate hub. Patients who cannot be returned to duty quickly at the evacuation hub will be removed from the theater to the United States or some other location.

. Level 2, theater-level hospitalization, acknowledges that hospitals will not follow combatant formations around on the battlefield. Theater hospitalization will be limited to that required to receive patients evacuated from the brilliant medic nodes on the battlefield; it will continue to resuscitate if necessary, and will move designated patients out of theater as soon as possible. This level of care may include a facility with the capacity for lifesaving surgery, critical care, acute care, and a limited holding facility. Medical care will remain service-specific at the foxhole, the deckplate, and the flight line, where a well-developed understanding of service-specific culture, values, tactics, techniques, and procedures is necessary to provide the best possible care. Military medical forces in this concept above the level of division, wing, and ship can be joint.

. Level 3 will return evacuated patients to a medical system based in the continental United States where soldiers will receive definitive treatment until they can be returned to duty or transferred to the rehabilitative arm of military health care.

Implications of Changes in Combat Health Support

Disease and Non-battle Injuries

A system such as the one described above is designed to support a battlespace that has very low disease and non-battle injury rates. Improvements in these two categories depend on aggressive health promotion, preventive medicine, and wellness programs that are managed by the commander rather than by the medical community. To reach these objectives with forces that will continue to deploy to austere environments where the risk of disease is high, other changes are planned or anticipated. They include increased bio-immunity against biological, infectious, and perhaps chemical agents combined with command policies concerning food, sanitation, and alcohol consumption to reduce accidents and illnesses to relatively insignificant levels.

It is equally important that armed forces live in military communities that value all dimensions of health. Military communities must be good places to live; families will be healthy mentally and physically because they are part of caring communities that embrace them both in peacetime and during deployments. Soldiers themselves will have to be well paid, be knowledgeable about healthy behaviors, and have incentives to pursue healthy lifestyles. Soldiers also must have good nutrition and the means to pursue healthy eating habits. If the service member and family are to be treated as we treat world-class athletes, their brilliant medic teams will have to function like athletic trainers in peacetime, monitoring individualized nutrition and physical fitness plans.

Evacuation

The future system will require three different types of evacuation platforms: MEDEVAC, air and ground tactical short-haul capacity to clear the battlefield; TACEVAC, or evacuation to clear the brilliant medic nodes; and STRATEVAC, strategic evacuation out of theater. Each level of evacuation will need the ability to treat progressively more seriously wounded patients and will encounter a greater level of risk both in the care they provide and in their exposure to enemy capability.

Imagining the Future

Consider the following scenario derived from the foregoing concepts and assumptions.

Four soldiers of an armored task force are wounded by a precision-guided munition as their unit assembles in a hide position near an enemy headquarters. Two are seriously wounded, one with massive head injuries, the other with injuries to the abdomen. The third has a broken leg, the last a broken arm. Each soldier's personal status monitor signals a medical distress alert based on changes in vital signs. That information is relayed by satellite to the company commander, who determines the exact location of the injured soldiers using GPS and a computer-generated map. Brilliant medics are immediately dispatched by armored ambulance, using GPS moving map displays to get to the exact location while avoiding enemy formations and known areas of health-threatening chemical or biological contamination. Unit soldiers have already undertaken lifesaving measures and initial treatment to maintain airways, stop bleeding, start IV, immobilize fractures, and prevent hypothermia.

The brilliant medic makes a quick assessment upon arrival. The two soldiers with broken limbs are prepared for evacuation. Turning to the soldier with the wound to the abdomen, he places a "field surgical device, non-invasive," over the wound. The device, an advanced scanner, locates the sources of hemorrhage and uses focused energy to seal off bleeding vessels without cutting the skin or requiring anesthesia. Upon administration of artificial hemoglobin and physiologic volume expanders, this soldier stabilizes. The medic, now facing an unfamiliar head trauma with the last patient, is telementored through the stabilization via "hands-free downlink" from the Trauma Center of Excellence at Johns Hopkins University.

With four stable patients, the noncommissioned officer in charge of the medical team (NCOIC) pulses the evacuation hubs; Hub 5 is able to accept patients and has a stateside evacuation scheduled in six hours. Again using GPS-driven map displays that show local terrain with overlays of friendly and enemy positions, the casualties are moved a short distance to a secure landing zone, where the medical NCOIC calls for evacuation. The aircraft is a fixed-wing, vertical-takeoff-and-landing aircraft; its crew uses GPS to locate and retrieve the patients, and moves them to the

evacuation hub, providing additional care en route. Teleconsultation between the evacuation hub and headquarters located in the United States determines that Eisenhower Army Medical Center is best prepared to deal with these patients. All four patients are medically evacuated from the theater, with the two trauma patients in Life Support, Trauma, and Transport Systems modules that provide care throughout the flight.

Back at the point of injury, the company commander checks his status screen. He sees all four soldiers are stable and en route to Eisenhower Medical Center. He touches the "forward" icon on the screen, designates squadron, regiment, and Family Support Group as addressees and selects "send." Twelve hours have elapsed since the company was attacked.

What's Wrong with this Picture?

Although each of the technologies described in the scenario exist or are under development today, much remains to be done before we achieve this vision of combat health support. First, the concept assumes a very different kind of future battlefield, one dominated by a smaller, more lethal Army that can use technology to dominate across the spectrum of conflict. A longer view of history might challenge that assumption. Time and again, since the days of Hannibal, the army that wins the last battle wins the war. That decisive last battle has almost always gone to the side with the greater manpower reserves and the stronger economy.[18]

Adversaries may choose not to fight in ways that make them vulnerable to high-tech warfare. The prolonged campaign in Vietnam generated large numbers of casualties requiring a redundant and fixed medical infrastructure. Conflict in a 21st-century megacity could present comparable challenges and require very different kinds of medical forces for a long time. Armies have repeatedly been required to adopt lower-tech methods when faced with an asymmetrical enemy.[19] Thus, the battlefield of the future could plausibly be less densely populated and still generate casualties requiring significant medical infrastructure in the theater of operations.

There have always been and probably always will be a mix of combatants and noncombatants--refugees and prisoners of war--on and around battlefields. US forces will continue to be bound by the Geneva Conventions, which require medical treatment beyond our own combat casualties. Thus we may need some residual infrastructure in the operational area to treat civilians and enemy wounded.

That future scene of armed conflict may not be "sterile"; noncombatant military activities have historically produced far greater casualties through disease and non-battle injuries than those generated in combat. It is unlikely that even the best of healthy lifestyle and preventive medicine programs will eliminate the need to plan for continuing losses from such causes. And experience has shown that the requirement for different kinds of medical forces grows to match the length of the pre-conflict and post-conflict deployment phases of a crisis. During these phases, quick return to duty in the individual's official unit has been a significant morale factor for deployed combat forces and a key feature of unit cohesion.

The Army will likely continue to deploy to austere environments that require a sophisticated communications infrastructure in a world where over half the population has still never made a single telephone call.[20] One consequence of operating in an environment to which we must bring all the requirements of life is significant competition between medical and other requirements for the communication bandwidth available in the theater. Thus the communications infrastructure on which the scenario depends may not be available for medical purposes in many parts of the world.

Finally, a challenge all of the Army faces is increasing technological sophistication and the attendant requirements for well-educated recruits. This trend is emerging at a time when recruiting standards have recently been lowered from the previous standard of 95 percent of high school graduates to 90 percent in order to meet recruiting goals. The Army will increasingly compete with the Air Force and the Navy for its share of the high end of the talent pool of young Americans. Significant training challenges lie ahead for the services, all of which must operate progressively more complex materiel in an increasingly sophisticated conflict environment with potentially less capable technical support personnel.

Conclusion

Military medical officers have served the armed services and the nation well by emphasizing the assumptions that have sustained the military health care system since World War II. Those assumptions are that medical care will be provided to soldiers from the point of injury to facilities in the United States, that military medicine will be sized to meet the worst-case wartime scenario, that excess capacity will be used to provide beneficiary health care, that beneficiary health care in excess of that capacity will be provided in some sort of government paid system, that military health care would be consistent with the norms of the general US health care system, and that each service would maintain a separate medical system due to its own unique requirements. These assumptions, like those of the Big Three automakers cited earlier, have become so deeply embedded in our culture as to be exempt from examination. They have acquired the weight of values in each service, but they pertained only to the specific set of circumstances that we called the Cold War. The world that supported those assumptions has changed dramatically.

Health care, both military and civilian, is an exceedingly complex set of systems involving stakeholders, financing, access to beneficiaries, technological innovations, and evaluation of quality. In the military setting this is further complicated by the deployment mission in support of military readiness and the capacity of the system either to develop or buy health care providers and thereby control supply. The complexity of the system suggests that there is no "right" answer to what will change in the future and the rate at which we can expect those changes to occur. Whatever military medical system emerges from the transition will reflect compromises that deny ideal outcomes in key aspects.

It is clear that we have to change the way we think about our standing in the world, the role of military forces in advancing that standing, and the functions of military medicine in fulfilling the needs of both the Department of Defense and the nation. Failure to do so introduces the risk that the gap between our theoretical models and reality will continue to grow; the principles that previously guaranteed success could then become the source of failure in a future conflict. The model suggested here leaves some important questions unanswered. If we create forces to accomplish the combat mission, how do we create military medical forces to do other missions short of war? If our system does not generate excess capacity, how do we provide cost-effective beneficiary health care without violating trust? How do we recruit, train, and retain clinicians when the in-house capacity to do so is dramatically reduced? This new model for military medicine, based on assumed realities of a new operating environment for the US armed forces, seeks to open the discussion of how to remain faithful to essential health care values while adapting to a future that may seek to deny their legitimacy.

NOTES

1. Peter M. Senge, *The Fifth Discipline* (New York: Currency Doubleday, 1990), p. 176.
2. Ibid.
3. Department of the Army, DCSOPS briefing, 20 December 1994.
4. Neil Singer in Congressional Budget Office testimony, *Reforming the Military Health Care System*, 19 April 1994, p. 9.
5. *The Economics of Sizing the Military Medical Establishment*, A Report of the Comprehensive Study of the Military Medical System, April 1994, US Department of Defense, Office of Program Analysis and Evaluation, p. 1.
6. Congressional Budget Office study, *Options for Paying Military Physicians*, July 1990, pp. 6-7.
7. TRADOC Pamphlet 525-5, US Army Training and Doctrine Command, *Force XXI Operations* (Ft. Monroe, Va.: 1994), p. 2-1.
8. Walter B. Wriston, *The Twilight of Sovereignty* (New York: Scribner's Sons, 1992), p. 2.
9. Paul Starr, *The Social Transformation of American Medicine* (New York: Basic Books, 1982), pp. 30-59.

10. Ibid.
11. Eighty percent of primary care (minor illness) has been shown not to require the care of a physician. Physician assistants and certified nurse practitioners are trained in the treatment of those minor illnesses and provide high-quality, less expensive care than physicians. Nurses who staff advice lines are trained to facilitate self-directed care, and to direct an expert intervention when dictated by the medical condition. US Congress, Office of Technology Assessment, 1986 report, "Nurse Practitioners, Physician Assistants, and Certified Nurse Midwives: A Policy Analysis," accessible on-line at <http://www.ota.nap.edu/pdf/1986idx.htm>.
12. Peter F. Drucker, *The New Realities* (New York: Harper and Row, 1989), pp. 1-9.
13. Vice Admiral Owens' remarks, Industrial College of the Armed Forces, December 1994.
14. Jeffrey McKittrick, et al., "The Revolution in Military Affairs," US Air Force Battlefield of the Future website (www.cdsar.af.mil.chpt3.html).
15. Appendix A, "Principles of War," Army Field Manual (FM) 100-5, *Operations*, 1990 edition, p. 174.
16. Barry R Schneider, "Principles of War for the Battlefield of the Future," US Air Force Battlefield of the Future website (www.cdsar.af.mil.chp1.html), p. 3. Dispersing forces due to increased weapon lethality has been a historical trend that has seen a steady decrease from an average of 4790 troops per square kilometer in the Napoleonic Wars to just 2.34 troops per square kilometer in the 1991 Persian Gulf War.
17. Ibid., p. 5.
18. Lawrence H. Keeley, *War Before Civilization* (New York: Oxford Univ. Press), p. 14.
19. Ibid., p. 74.
20. Daniel Burstein and David Kline, *Road Warriors: Dreams and Nightmares Along the Information Highway* (New York: Penguin Books, 1995), p. 312.

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