SPNA Review

Volume 1 | Issue 1 Article 4

5-1-2005

Economic Environment and Applications of Telemedicine

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ENVIRONMENT OF TELEMEDICINE

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Telemedicine is broadly defined as the transmission of electronic medical data across a distance among hospitals, clinicians, and/or patients. This definition is deliberately unlimited to what kind of information is transmitted, how the information is transmitted, or how the information is used once received (HCAB, 2003). Telemedicine has the potential of making a greater positive effect on the future of healthcare and medicine than any other modality. Fueled by advances in multiple technologies such as digital communications, full-motion/compressed video, and telecommunications, providers see an unprecedented opportunity to provide access to high-quality care, independent of distance or location.

INTRODUCTION AND BACKGROUND

Contrary to common expectation that believes telemedicine is a very recent innovation, it actually began in the United States in the late 1950's. In 1959, the University of Nebraska employed interactive television for telepsychiatry consultations by linking the Nebraska Psychiatric Institute in Omaha and Norfolk State Hospital, an isolated state mental facility 112 miles away. In another notable early telemedicine project titled STARPAHC (Space Technology Applied to Rural Papago Advanced Health Care), health care was delivered to residents of the Papago Indian Reservation (Telemedicine Information Exchange, 2004).

In the 1970s and 1980s, limited telemedicine projects were instituted in the United States and in Canada, although, with the exception of the 20-year old telemedicine program at Memorial University of Newfoundland, St. John's, none of the programs begun before 1986 has survived. The single most important

reason identified for the failure of these programs was "the inability to justify these programs on a cost-benefit basis."

In the 1990s, with both federal and state governments active in promoting development of the national information infrastructure, however, telemedicine has grown from relative obscurity to having a wider visibility in a very short time. As in the 1970s and 1980s, the driver of telemedicine remains primarily the federal government, with no less than 13 federal agencies providing grants for telemedicine program development. With the federal government providing funds for telemedicine programs, new suppliers such as manufacturers of video conferencing, imaging, computer, medical, and multimedia equipment have been attracted to the telemedicine market. These manufacturers, along with regional telecommunication companies (e.g. cable, cellular, Internet service providers, and satellite systems) have a financial interest in encouraging health care providers to shift to electronic communications. With telemedicine, health care providers can increase efficiency through better management of information and data, expand market share and provide access to more timely and convenient services.

TELEMEDICINE APPLICATIONS

Telemedicine has the potential of making a greater positive effect on the future of healthcare and medicine than any other modality. Fueled by advances in multiple technologies such as digital communications, full-motion/compressed video, and telecommunications, providers see an unprecedented opportunity to provide access to high-quality care, independent of distance or location.

Much of the existing telemedicine literature focuses on radiology, pathology and dermatology although many other specialties are being investigated. Building on the foundation of information technology, new applications have been and continue to be developed for use across the entire health care practices (iHealthBeat, 2003).

Although initially introduced as a means of providing care to homebound or rural patients, telemedicine is increasingly emerging as a convenient and economically promising alternative to on-site hospital care. Over the last decade, many hospitals have applied telemedicine technology to patient care services, offering long-distance monitoring of patients, image review and consultation, and even remotely-conducted surgeries. The implementation of support technologies such as Picture Archived Communication System (PACS) has also allowed telemedicine to emerge as a convenient and cost-effective alternative to on-site hospital care by easing integration into existing hospital information systems.

While the telemedicine market is still developing, the technology has already been found to improve patient care, shorten average length of stay, and

potentially reduce overall health care costs. Not only can physicians remotely monitor and diagnose patients, but they can also perform actual procedures from a distance, such as (HCAB, 2003):

1. Electronic transmission of x-rays, computed tomography (CT) scans, and other images for educational or diagnostic purposes (i.e., via image and slide equipment), including "store and forward" consultations.
2. Interactive videos and videoconferencing to facilitate teleconsulting, which uses television monitors and specially adapted equipment.
3. Physician examination and long-distance monitoring of patients via two-way monitors (i.e., home computer-compatible stethoscopes for high fidelity transmission of patient information to physicians).
4. Remote surgery (telesurgery) performed using robotics, specially-equipped computerized gloves, and video equipment (i.e., includes monitoring in intensive care unit, the "eICU").
5. Satellite feeds of conferences, classes, and other educational programs.

While telemedicine can be applied to many service lines, it is typically used within the following specialties:

Cardiology
Dermatology
Diabetes
Gastroenterology
Neurology
Oncology
Orthopedics
Pathology
Pediatrics
Prison Health
Psychiatry
Radiology
Surgery
Vascular Medicine

Although telemedicine is not a universal answer for all of our health care delivery needs, it can help minimize time and distance, extremely significant barriers to the delivery of health care, especially in non-metropolitan areas. It has provided physicians and other health care professionals with the technological equivalent of a stethoscope, an essential and fundamental piece of equipment for every practitioner.

Patient acceptance of telemedicine is high because it meets the needs of today's health care consumer. Today's health care consumers are characterized as more self-reliant and less subservient to medical establishment. They tend to do more self-diagnosis, self-monitoring, and thus more self-care. They are

empowered via information and have embraced technology already. A Finnish study found that 96% of patients who used telemedicine wanted to have their next visit in the telemedicine clinic. They cited reduction in travel time, cost, and total time spent for visit as contributing to their preference.

Critics suggest that telemedicine is grossly over-marketed, or in some areas of medicine under-appreciated or even misunderstood, it remains a viable, valuable and growing professional tool, today (Tanriverdi, 1999; Stumpf, 2002). Doubts may be resolved as:

1. existing and emerging technologies become less expensive and more widely implemented;
2. more and more health care applications are available, tested, and utilized;
3. our human experience and education teach us that telemedicine can be user friendly; and
4. results become available about the real benefits and challenges of implementing telemedicine (Table 1).
5.

Telemedicine is still in its infancy in many states, but beginning to make major strides. Improvements in communications technology and telemedicine equipment make it possible to provide this connectivity in a variety of settings. As health care providers and health plans become more knowledgeable about the vast potentials of telemedicine, they will not wait for others to take the lead in using it (Doolittle, 1998; HFA, 2001). Telemedicine is quickly expanding beyond hospitals to broader points of service in the public and private sectors, including home health, hospice, long-term care sites, correctional facilities, and schools.

Table 1. Benefits and Challenges of Telemedicine (Source: HCAB-2003)

Benefits	Challenges
▪ Decreases emergency room visits ▪ Helps curtail unnecessary hospital admissions ▪ Improves quality of patient care ▪ Increases access to medical care (for residents of rural communities or patients of small medical facilities) ▪ Potentially decreases overall hospital costs ▪ Reduces patients' avg. length of stay	• Acknowledging potential financial risks regarding the cost effectiveness • of telemedicine • Confronting liability and malpractice implications • Ensuring quality staff training • Financing the large capital investment required for telemedicine technology and equipment • Overcoming transmission limitations (such as quality and speed of transmission) • Protecting patient privacy

ECONOMIC IMPACT OF TELEMEDICINE

The U.S. health care delivery system like many industries is struggling with change and increased internal and external competition. Managed care, primarily responsible for this upheaval, stresses efficiency and reduces the need for specialists. In response, specialists, seeking new ways to utilize skills acquired over years of medical training and practice, are embracing telemedicine. By doing so they could prove to be an enormous asset to the nation. This supply of professionals can serve as a resource to address health care needs in underserved areas.

Commonly recognized types of economic impact of telemedicine applications are costs associated with patient time and productivity, transportation, capital, maintenance, communication, utilization of health care services, and staffing levels and productivity of health professionals. Introduction of telemedicine can prompt various cost tradeoffs. For example, changes in utilization of health care services may appear in different forms. By lowering barriers to access, telemedicine may increase near-term utilization of services and related health care costs. The initial increased cost of care for patients, who otherwise may have delayed care in the absence of telemedicine, may be offset by savings from reducing or eliminating downstream medical

costs for treating what would have been progressively worse conditions (Tanriverdi, 1999; TIE, 2000).

In early November 2004, the Utah Telehealth Network requested state funding to help double the size of its telemedicine services. The network's program managers requested an annual state commitment of $400,000, or 80% of the network's expected fiscal budget of $500,000. The funding would help bring the membership fee down to $6,000 per year, instead of the current $10,500 annual fee, which many rural hospitals and clinics outside the 22-member network cannot afford. The network currently receives funding from private and public grants, membership fees and $225,000 in ongoing contributions from the University of Utah. The network includes the University of Utah Health Sciences Center and serves 12 county health departments, seven rural hospitals, and two health clinics (Bonefield, 2004).

ECONOMIC OPPORTUNITIES

Telemedicine may transcend to more than a health care issue for many rural areas, into one of economic development. It is well known that rural hospitals are an economic anchor in their communities as employers, as well as means of attracting and maintaining businesses who want to ensure access to health care services for their employees. If local health care providers can offer appropriate services for consumers, allowing them to remain in their community for care, it might help these facilities remain open.

Recently, states such as Iowa, North Carolina and Connecticut have been investing in telecommunication infrastructures to expand opportunities for economic development. The Iowa Communications Network was initially limited to education but has rapidly grown to address the health care needs of its citizens (TIE, 2000; Bauer, 2002). A telemedicine pilot program launched three months ago by the Visiting Nurses Association in Cincinnati has helped avoid five hospital admissions for the program's 18 patients. The hospital stays would have totaled between $40,000 and $100,000.

The pilot supplements in-person visits with videophone visits for congestive heart failure patients. In the video visits, a nurse can take a patient's blood pressure remotely and collect other vital sign information. A nurse can make 12 to 15 telemedicine visits a day from the office, compared with only six field visits. The program will be expanded in the next two years to patients with diabetes, respiratory problems and those who need wound care. The equipment costs more than $20,000 for the central system and about $8,000 each for the home units. In Ohio, telemedicine services are neither directly covered by the state Medicaid programs, nor the private insurance plans, so it has been difficult for most health organizations to cover the costs. However, because Medicare pays home nursing agencies a flat rate based on each person's condition instead

of a per-visit fee, savings from telemedicine technology can increase profits for home nursing agencies (Bonfield, 2004).

Through redistribution of knowledge, expertise, consultation, and new patient markets "surplus" practitioners are created. They could organize themselves in a variety of ways (independent groups, professional associations, networks with hospitals or insurers) to expand their service areas. Major opportunities exist, first, within the states with sophisticated infrastructures for this technology. For example, Michigan, a primarily rural state has many medically underserved communities while, at the same time, most of its medical specialists and tertiary care centers are concentrated in a few metropolitan areas.

CASE IN POINT

Marquette General Health System, Marquette, Michigan adopted telehomecare services in 1995. According to Sally Davis, Telehealth Program Director of Upper Peninsula Telehealth Network "Telehomecare cannot replace required home health visits. But, it does allow us to augment our care by allowing us to visit with patients more often."

The Challenge:

Marquette General Health System manages 27 health care sites throughout Michigan's Upper Peninsula including six home health offices serving a wide variety of clientele, including acute care, specialist care, primary care, assisted living and rural health clinics. The company's patients are scattered throughout a large geographic portion of Michigan's Upper Peninsula. Distance, inclement weather and increasing in-home nurse visit costs were the three main challenges facing the organization.

The hospital is currently focusing on three home telehealth initiatives: diabetes, chronic obstructive pulmonary disease (COPD)/congestive heart failure (CHF), and stroke follow-up care. Efforts cover an eight county area that are managed by Marquette General Health System's and four partnering rural hospitals' home health offices.

Practical Solutions:

Marquette General Hospital's telemedicine vision is to fully incorporate these technologies into the routine business and practices for the provision of health care. The agency chose American TeleCare to help achieve its vision based on practicality and ease of use, quality, support and reliability of the devices. The program director stated that, "Out patients have a greater sense of security – they know they can easily connect with one of our professional staff quickly and securely."

Positive Outcomes:
Marquette General Health's own data proves its telemedicine program was successful in:

- Expanding its telemedicine offering from 7 sites in 1995 to 27 sites in 2002
- Increasing patient encounters during the same timeframe from 18 to 462
- Nearly doubling the number of telemedicine connections from 1999 to 2001
- Recruiting 137 new telemedicine patients in 2001
- Decreasing travel costs and risks
- Increasing patient confidence with the "closeness" of telemedicine care

ESTIMATES OF MARKET DEMAND

Market demand estimates must be qualified and preceded by identifying problems with currently available data. Since classifications for medical equipment do not separate telemedicine activities from other applications, there is no official and specific market data is available. Private research firms have estimated the annual market for telemedicine technologies (products and services) to be around $380 million in 2004 based on an estimated growth rate of 15%-20% per year (Bauer, 2002; USDC, 2004). There have been widely publicized claims of a telemedicine market in the billions of dollars, although the few private firms that have conducted actual research in this area discount such claims completely (USDC, 2004). A leading market research organization studying telemedicine is Feedback Research Services of Jacksonville, Oregon. In a 2000 interview, Feedback's research director summarized the difficulty with estimating the size of the telemedicine market: "Unfortunately, in telemedicine, there are a limited number of segments for which sales data can be obtained. This is partly due to the fact that many of the larger competitors (such as Kodak in radiology and VTEL in videoconferencing) generate a relatively small portion of total corporate revenues from telemedicine-based activities. Another problem is the number of privately held competitors involved in this market (some of which can be significant players)."

Conclusions that can be drawn from these descriptions, however, vary noticeably. A few market research firms have prepared marketing studies that estimate the market for their client's specific interests or type of equipment, but the typically small size of telemedicine manufacturers limits the number of firms having the resources to purchase or undertake such research. Available research does however point to several market-related drivers such as:

1. increasing emphasis on reducing cost and increasing quality of healthcare

2. increasing demand for homeland security and public health technologies
3. more clinical and econometric studies concluding that telehealth meets expectations
4. rapidly increasing demand for home healthcare
5. incremental changes in payer reimbursement policies and increased levels of Medicare and other third party reimbursement
6. increasing awareness by providers and consumers as a result of government investment in "demonstration projects"
7. increasing acceptance by medical professionals and institutions

Such technological and market drivers do inherently include economic barriers as discussed in the next section.

ECONOMIC BARRIERS

Telemedicine could improve access, boost health care quality, cut costs and contribute significantly to homeland security, but the sector is fraught with barriers influencing its further adoption, according to a new Commerce Department report (Sarkar, 2004). To alleviate hospitals' financial concerns, agencies such as the FCC have developed grant opportunities totaling up to $400 million for rural health providers to purchase high-speed broadband service (Stumpf, 2004). In addition, Congress has extended federal funding to a number of rural areas to promote telemedicine use. While some states restrict telemedicine to prevent health care professionals from practicing where they aren't licensed, 24 states allow out-of-state physicians to practice medicine in their jurisdiction online as long as doctors get a license in their state. Commerce Department concludes that about $380 million will be spent this year to support telemedicine services. That is a fraction of the estimated $80 billion that will be spent on all health care technology.

While the benefits of using telemedicine technologies seem to readily justify its utilization, there are also several challenges in this process (iHealthBeat, 2004). These barriers can seriously prevent healthcare professionals from performing to the utmost of their ability. These barriers include:

Requirements for multiple licenses and/or credentials. Licensure generally establishes a "scope of practice" designed to protect the public. There are two types of licensure an individual may be required to have. Restrictive licensure requires a practitioner to obtain a full license to deliver healthcare services across state lines. Reciprocity (limited licensure) provides practitioners with a limited interstate license, a simplified application process, and a reduced licensing fee. This means there would be a mutual exchange of privileges and also permits one state to recognize a license in good standing held in another jurisdiction.

Credentialing, on the other hand, establishes minimum standards of training and knowledge needed by a professional in order to provide specialty care. Each state's requirements may differ according to the state law.

Malpractice Liability. It is the greatest unknown barrier to telemedicine. The main question raised is "Which state law should be used?" Should it be the state where the practitioner resides and dispenses information or the state where consultation takes place with patient and/or physician?

Patient Privacy. The US Secretary of Health and Human Services, Tommy Thompson, established rules for electronic data interchange in June 2000. These rules only apply if the healthcare delivered by the practitioner includes a financial or administrative transaction (e.g. electronic submission of a claim from a healthcare provider to a payer).

REIMBURSEMENT TRENDS

The once touted "health care technology of the future," telemedicine's growth has been limited by physician, cost, reimbursement, and regulatory barriers nationwide.[10] Recent federal funding relief, however, is enabling hospitals in both the rural U.S. and international arenas to implement telemedicine programs, which have the potential to improve oncology care quality and access (iHealthBeat, 2004).

A growing number of short-staffed hospitals are using telemedicine to bridge specialist coverage gaps. For instance, Pennsylvania-based Lehigh Valley Hospital is currently developing a "tele-intensivist" program, which will enable an intensive care specialist to use multiple two-way monitoring devices to remotely examine and monitor patients who would not otherwise have access to specialist care. To improve ICU care coverage, Buffalo, N.Y.-based Kaleida Health announced plans in December to install an eICU that has been shown to reduce mortality by as much as 25% and lower costs by $2,150 per patient (Franczyk, 2003).

According to a new Commerce Department report on the state of the telemedicine industry, reimbursement and regulatory barriers at the state level further hinder hospitals' adoption of the technologies (Glanz, 2004). While California, Louisiana, and Texas prohibit insurers from discriminating between traditional medical services and telemedicine, Michigan's Medicaid program fails to compensate physicians for providing telemedicine services. As noted earlier, from a regulatory standpoint, 24 states permit out-of-state physicians to provide telemedicine services as long as the physicians maintain licensure in those states. Other states prohibit nonresident physicians from practicing telemedicine in their states under any circumstances in order to prevent patients from being lured out-of-state by "more attractive or lower cost services."

Telemedicine procedures are generally reimbursed at the same rates as in-person care, where the majority of telemedicine procedures are commercially

reimbursed. Telemedicine commercial and Medicare reimbursement is largely the same as it is for office-based procedures; most insurance companies do not require billing modifiers for such procedures, and most telemedicine providers bill for services as if they were provided in person. On the other hand, reimbursement for "e-visits"—physician consultations via e-mail—are still being determined.

The Balanced Budget Act of 1997 (BBA), which describes telemedicine services eligible for Medicare payment, became effective for purposes of coverage on January 1, 1999. Under the BBA Medicare rules required the presence of a Medicare participating tele-presenter to be eligible for reimbursement (BBA, 1997; Burgess, 2001).

Although the act severely limited the number and kinds of telemedicine services available to Medicare beneficiaries, it marked an important first step toward a substantial, unified approach to federal funding. BBA requirements of most concern to healthcare providers were:

Fee splitting. In defining how payment would be made for telemedicine services, the BBA required that 75% of the fees go to the consulting healthcare provider at the hub site and 25% of the fees go to the referring physician or healthcare provider at the spoke site. Furthermore, payment could not be used for phone lines or facility fees, and beneficiaries could not be billed for these expenses. Applicable Medicare deductible and coinsurance rules also applied. In addition, payment could not exceed the current fee schedule amount that would be paid to the consulting physician or healthcare provider even with the required fee sharing.

Presenter presence. The BBA also required that presenters be with the patient at the spoke site. A presenter could be a physician, physician assistant, nurse practitioner, clinical nurse specialist, certified nurse midwife, clinical psychologist, or a clinical social worker. Many rural communities found this requirement too restrictive in that often these highly skilled healthcare professionals simply were not available.

HPSA residence. Further limiting Medicare coverage for telemedicine was a requirement that Medicare beneficiaries be residents in a healthcare professional shortage area (HPSA). Although the definition of such areas is highly technical, HPSAs generally lack sufficient primary care providers and/or specialists. Many rural areas not designated as HPSAs had primary care resources but lacked appropriate specialists. These rural areas could have benefited from telemedicine, but such providers could not be reimbursed under the BBA.

This system of coverage for telemedicine was so limiting under the BBA that in the first 18 months of its implementation, Medicare paid only 301 teleconsultation claims--amounting to $20,000. Until finally, in December 2000, Congress passed an omnibus appropriations bill (H.R. 5661), which dramatically revised Medicare rules for reimbursement for telemedicine services (Wlazelek, 2004; Burgess, 2001).

LEGISLATIVE UPDATES

Several national laws over the past few years have been updated to accommodate for telemedicine. For example, the BBA of 1997 redefined "face-to-face" patient contact to include the delivery of care through interactive technologies (Antoniotti, 2003; 2004). On June 27, 2003, the U.S. Senate approved the Medicare Prescription Drug Benefit bill, which included a provision to expand telemedicine reimbursement. Specifically, the bill extended the parameters for facilities that can be eligible for telemedicine service reimbursements to include skilled nursing facilities, assisted-living facilities, board-and-care homes, county or community health clinics, community mental health centers, long-term care facilities, and facilities operated by Native Indian tribes (Wlazelek, 2004).

The Medicare Prescription Drug Benefit bill also encourages state legislatures to allow multi-state practitioner licensure across state lines, although the previous provisions that restrict Medicare's telemedicine reimbursement to non-metropolitan areas for live interactive video services are still in effect. The companion bill that also passed in the U.S. House of Representatives, however, did not contain a similar telemedicine provision. A House-Senate conference committee therefore will ultimately decide whether to include telemedicine provisions in the final Congressional bill to be submitted to the President.

Many insurance companies have started to reimburse for telemedicine procedures in response to Blue Cross and Blue Shield reimbursement policies. High reimbursement rates for telemedicine are largely due to the fact that telemedicine reduces costs by allowing patients to receive care at facilities closer to home or even at home. Over 100 commercial payers in the United States reimburse for at least one telemedicine procedure, including Blue Cross and Blue Shield in more than 20 states, HMO and PPO firms such as CIGNA, as well as local plans, health insurers, and self-insuring employers (Wlazelek, 2004).

In 2002, Medicare even started covering office visits and consultations in rural areas that were done remotely. For example, Medicare will reimburse a flat $20 fee to the originating site—where the patient is—and reimburse along typical guidelines at the "distant" care decision making site. California, Texas, Oklahoma, Louisiana, and Kentucky additionally all have laws mandating private-payer reimbursement for telemedicine services (Antoniotti, 2003; 2004).

Recent legislation further demonstrates an upward trend in payment. For example, in the June 28, 2002, Federal Register, CMS proposed further expansion of Medicare coverage for telemedicine. Under section 1834(m) of the Social Security Act, CMS was required to develop a process for adding or deleting telemedicine services annually (Medicare Telehealth Validation Act,

2003). This process was published in the December 31, 2002, Federal Register in revisions to payment policies under the 2003 physician fee schedule. Specifically, changes to the list of Medicare telemedicine services will be made in the future through the annual fee schedule rulemaking process (Sarkar, 2004; Mims, 2004).

Another encouraging sign of support for telemedicine was passage of the Health Care Safety Net Amendments of 2002, Public Law 107-251, 2002. One section of this public law permits the secretary of HHS to make grants to state professional licensing boards. The licensing boards may carry out programs under which boards of various states cooperate to develop and implement policies to reduce the legal barriers to telemedicine. Another section of the law establishes the telemedicine network and resource centers grants programs, to award grants for research and implementation of telemedicine, expand access, improve the quality of health care services, and to improve and expand the training of healthcare providers.

While 2003 was not very successful for telemedicine providers, federal support for telemedicine projects could increase by as much as 8% in 2004, according to the American Telemedicine Association, the trade group that promotes telemedicine deployment. Total government spending could reach $275 million in fiscal year 2004, according to ATA estimates. Much of this amount comes from the $160 million allocated to the Department of Defense telemedicine (Broder, 2003).

CONCLUSION

Telemedicine can improve access, increase health care quality, and reduce direct and indirect costs of medical care to providers, payers and patients. The cost-effectiveness of telemedicine can be increased with development of an efficient, affordable and interoperable telecommunication infrastructure throughout the world.

Any measure of telemedicine should also include the value of expenditures on telecommunications, human capital, and other resources consumed in the process of delivering healthcare over the barriers of time and distance. Regardless of research methodology and revenue forecasts, telemedicine is indeed growing, both in the United States and globally.

Not surprisingly, telemedicine growth—both development and utilization—is driven by healthcare inequity in the United States and abroad. The apparent disparity of healthcare access between urban and rural geographies drives communities to rebalance. In turn, competition among healthcare organizations for new patient populations makes telemedicine connection a very desirable option. With the aging domestic population and strained federal reimbursement, and it is no wonder that home telemedicine is growing in popularity in the United States.

Its value is enhanced through establishment of regulations to address interstate licensure and credentialing of care providers and legislation to ensure the security of personal health information. Payment for the entire range of telemedicine applications and access to high-quality health information for providers and patients can improve quality of life and reduce cost of transportation, and loss of productivity. Secure guarantees of authentication, access control, confidentiality and integrity of the information will increase the confidence of patients, referring and consulting entities. It is expected that many of these issues will be resolved in the next three to six years, as the nation struggles to meet critical health care needs of the public (Charles, 2000).

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