Developing Telehealth in Rural America: The Wyoming Network for Telehealth
(Field Experience)

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Abstract—The Wyoming Network for Telehealth (WyNETTE) is a statewide network providing the infrastructure to support the delivery of health care to rural/frontier, underserved communities in the US state of Wyoming. The network connects 40 sites in the state through an ATM cloud to a collection point that connects the network to Internet 2. The primary focus of the network development is the delivery of behavioral health, although other applications are supported.

Keywords—telehealth, telemedicine, rural health.

I. INTRODUCTION

Wyoming is a large rural/frontier state that faces immense challenges in the delivery of health care to its population. With 544,270 people living in 97,100 square miles, Wyoming is currently the least populated state in the Union, having fewer people even than the District of Columbia [1]. Its mean elevation is 6,700 feet above sea level, ranking Wyoming second among the 50 states. The climate is relatively cold with a normal daily mean temperature of 45.6 degrees Fahrenheit, and Wyoming records the highest average wind speed (12.9 miles per hour) of all the states.

As in other rural/frontier states, Wyoming citizens continually face problems in accessing quality health care and health education. Distance, geography, inclement weather, frequently impassable roads, and rurality all present challenges. Population dispersion makes it difficult to achieve the economy of scale necessary to support adequate primary care, much less specialty care. Recent data showed Wyoming’s physicians-per-capita ratio of 180 physicians per 100,000 residents (well below the national ratio of 214), making it fortieth among the fifty states [2]. Of Wyoming’s twenty-three counties shown in Figure 1, twelve are currently designated as single-county Primary Care Health Professional Shortage Areas (HPSAs), while another six are partial Primary Care HPSAs. Twelve counties are designated Dental HPSAs [3].

Wyoming’s isolation and geographic expanse also create problems for health care providers with respect to the quality of their personal and professional lives. Doctors and other health professionals face difficulty in obtaining consultations, finding educational opportunities, and networking with peers. They also find it difficult to arrange coverage for personal and professional leave. Health care workers experience burnout and, in extreme cases, work-related traumatization [4]. Negative quality of life issues compound the shortage of health care providers, contributing to high turnover and increased error risk.

II. TELEHEALTH IN WYOMING

To help address these issues, Wyoming has undertaken creation of the Wyoming Network for Telehealth, or WyNETTE, project. The goal of this project is to develop a dedicated health care telecommunications system connecting hospitals, primary care clinics, community mental health centers, and substance abuse clinics in the state. The network provides 37 sites with high-speed connections not only to each other but to the world through the national Internet2 backbone. These sites, shown in Figure 1, include 14 hospitals (one of which, the Wyoming State Hospital in Evanston, is the state’s only inpatient psychiatric facility), 6 primary care clinics, and 16 community mental health and/or substance abuse centers, many of which provide both kinds of services. A network site at the University of Wyoming College of Health Sciences has also been established for testing and technical support.

Telehealth, defined as the “telecommunication technologies to support long-distance clinical health care, patient and professional health-related education, public health, and health administration,” is well known to have the potential to decrease the disparity between rural and urban healthcare access as well as the impact of healthcare provider shortages. This definition is slightly more inclusive than that of telemedicine, which is “the use of medical information exchanged from one site to another via electronic communications to improve patients' health status” according to the American Telemedicine Association.
For many areas in Wyoming, travel to a health care provider typically requires several hours commute, resulting in a disruption of routine, loss of work and income, and significant expense. Decreasing travel time and related costs is one advantage of using telehealth applications. Patients are able to access care closer to work and home, thus decreasing commute time and lost work days. In addition, telehealth allows access to care that could not otherwise be obtained, as general practices in rural communities are able to provide more specialized care for their clients who need resources not locally available.

The WyNETTE project has brought together providers, consumers, and technical specialists to develop advanced telecommunications capabilities that will enhance health care in the state, particularly in treatment for mental health and substance abuse. Furthermore, through connectivity to the national backbone, the state’s ability to share information and services with the neighboring states in which a significant portion of care is provided to Wyoming residents is significantly improved.

III. PROJECT DESIGN

WyNETTE is one of the projects being funded through the Federal Communication Commission’s Rural Health Care Pilot Program, an offshoot of the standard FCC Rural Health Care Program that provides support for telecommunications costs to rural health care organizations. The project has been conducted as a public-private partnership. The University of Wyoming’s Center for Rural Health Research and Education (CRHRE, pronounced “share”) is legally and financially responsible for conducting the activities in the project. The CRHRE is dedicated to developing interdisciplinary approaches to integrating technology with research and education to improve the health of rural populations. Other partners in the project represent a broad spectrum of health care organizations in the state, including hospitals, professional organizations, and the Wyoming Department of Health.

In 2007, the Wyoming Hospital Association provided funding to purchase videoconferencing units for 24 of the 26 hospitals in Wyoming, including all Critical Access Hospitals. At the same time, the Wyoming State Legislature provided funds to the Wyoming Department of Health’s Division of Mental Health and Substance Abuse to purchase videoconferencing units for 14 mental health and substance abuse centers in the state. Between these two projects, almost all hospitals, mental health clinics, and substance abuse centers in Wyoming currently have some videoconferencing capacity that can be used for telehealth. The primary motivation behind WyNETTE’s development was a desire to connect these existing videoconferencing systems into a coherent, statewide network for health care over distance.

Design and implementation of the network was contracted out through a competitive bid process to an organization.
capable of creating the network. The chosen design placed a Cisco router at each remote site, with connectivity through an ATM “cloud”1 to an aggregation point at the University of Wyoming (UW) in Laramie. In addition to simplifying the design, this approach eliminated the interruption of service at multiple sites when one line becomes inoperative as occurs with “hub-and-spoke” networks. The larger hospitals in the network are connected to UW through dual T-1 ATM lines. Connection to national wide-area networks (the commodity Internet as well as the Internet 2 and National LambdaRail research networks) are made through UW’s links, as shown in Figure 2, to the Front Range GIGAPop (FRGP), a larger aggregation point in Colorado managed by a consortium of universities, non-profits, and government agencies to which UW belongs.

The costs for designing, installing, and maintaining the network over a two-year period for the network sites in the state will total $916,194. Eighty-five percent of these costs, or $778,765, are being provided by the Rural Health Care Pilot Program. The remaining 15% of the costs ($137,429) are covered by combined support from the Wyoming Department of Health, the Wyoming State Office of Rural Health, the Wyoming Association of Mental Health and Substance Abuse Centers, and the for-profit hospitals participating in the network. There are additional costs for contract and project management – not allowed in the FCC program – that have been covered through other sources.

IV. TELEHEALTH AND RURAL CARE INTEGRATION

A 2005 Institute of Medicine report cited by Russell [5] concluded that the “only way to achieve true quality (and equality) in the health care system is to integrate primary care with mental health care and substance abuse service.” Studies of integrated care consistently report improvement in medical care, quality of care, and outcomes as well as cost savings or offsets in reduced travel and hospital admissions [6].

Such integration typically takes place through a “triangular model for medicine” [7] that extends the traditional practitioner-patient “dyad” to include a specialist or other collaborator(s) to support the primary care provider. This approach has been shown to be an effective strategy for improving the quality of care for individuals with common mental health disorders, who can make up as much of 25% of primary care patients [8].

While proximity to a specialist (even sharing office space) promotes this integration and improves access to mental health care [9], physical co-location is extremely rare in rural areas – such as Wyoming – because of the dearth of mental health providers. Wyoming suffers from many health care practitioner shortages, but nowhere is the problem so marked as in the area of mental health care. Like many other rural areas, the state struggles with widespread shortages and poor distribution of mental health professionals [10]. In fact, all twenty-three counties in the state are designated Mental Health HPSAs [11].

Many communities in the state have sufficiently large numbers of social workers and professional counselors; however, most lack access to psychiatrists and psychiatric nurse practitioners, the only mental health professionals who can prescribe the medications important to many patients’ treatment [12]. Data from the Wyoming Department of Health places the ratio of population to practicing psychiatrists in the state at 14,323:1, as compared to a national ratio of 8,962:1. Numbers of practitioners in other mental health specialties are small as well. The Department of Health data lists only 86 clinical psychologists and 10 psychiatric nurse practitioners active in the state.

As a result, much of the burden of care for mental health issues in rural populations has shifted to the primary care sector [13]. Primary care providers have a significant responsibility for the diagnosis and treatment of common mental disorders, possibly as much as 80% of the diagnoses and 50% of the treatment [14].

The use of telehealth applications to connect providers and patients across distance is particularly effective for improving the psychiatric well-being of rural populations. Several recent studies have also demonstrated that telehealth technology can facilitate collaborative care to patients without onsite

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1A “cloud” in this context is a commonly used term for a telecommunications carrier’s network. An endpoint makes a connection into the cloud at one point and out of the cloud at another; the carrier’s network handles the transmission between the two points using hardware that is unseen (inside the “cloud”) by its users.
specialists. Collaboration in this case may be accomplished in a variety of ways, including:

- **Direct intervention with the patient by a distant mental health specialist.** For example, when a patient presents to a primary care provider with clear symptoms of depression or other mental health issues, the primary care provider arranges a telehealth consultation with a mental health provider for counseling and, if required, medication. Not only does this provide better care for the patient and eliminate the need for his/her travel, it allows the primary care provider to avoid making decisions for which she/he may not be trained.

- **Consultation between a mental health provider and a distant primary care provider.** In many locations in Wyoming, the lack of local psychiatrists or advanced psychiatric nurse practitioners means that primary care providers are frequently the only source of prescriptive authority in a community. Non-prescribing mental health providers such as social workers or psychologists may recognize the need for medications to support their clients, and therefore must work with a primary care provider. However, if access to a trained primary care provider is not locally available, telehealth can support consultation between the two providers to provide the client with the appropriate care.

- **Education and training in diagnosis and care for mental health.** Supporting education among primary care providers in caring for mental health issues can alleviate many of the problems associated with lack of local practitioners. Since many primary care providers do not have access to such training either locally or through travel, telehealth can be used to deliver specialized, targeted training to those providers in their local offices, hospitals, or even their homes.

Additionally, telehealth supports rural health care providers’ participation in a variety of other professional and patient educational offerings. Network participants also access continuing educational offerings over the Internet to meet their individual needs. The network is also an excellent way to provide statewide meetings of professional and support groups.

V. **CURRENT STATUS**

WyNETTE is currently being used to deliver integrated primary care and mental health/substance abuse services, primarily through Internet-based videoconferencing. Several of the participating sites are highly active in telehealth services; two of the participating mental health centers (both of which include multiple sites) collectively reported nearly 400 hours of telehealth-related consults in the first months of the network operation. Other participants use the network regularly – but less frequently – to provide connections between clients at one site and a counselor at another.

Primary care usage is also increasing. For example, a solo practitioner in a rural community was able to consult with a wound-care specialist at one of the major hospitals about care for two nursing home residents, saving a nearly 300-mile round trip by ambulance that would have otherwise been necessary.

Other uses of the network include training, continuing education, and administration. One participating center reports over 200 meetings conducted among its multiple centers in the first months of the network’s operation. Several continuing medical education programs are also broadcast monthly to the participating sites; some of these are re-transmitted from locations outside the state, while others originate at education centers that conduct live education programming and simultaneously make it available through videoconferencing and streaming video.

At the same time, there are barriers to be overcome, primary among which is the lack of specialty providers connected to the network. One factor in this problem is practitioner licensing. Telehealth allows access to providers virtually anywhere, but most states still require that those providers be licensed to practice medicine in the state where the patient is being seen, rather than where the provider is located. The Wyoming Board of Medicine, however, has addressed this in a unique way. Practitioners residing outside the state can apply for expedited licensing that consists largely of a background check; approval, which normally takes less than two weeks, permits the practitioner to see patients up to twelve days in a calendar year. Should the practitioner desire to see patients in Wyoming more frequently, the Board conducts a more complete review and can grant a full license.

The other major barrier to the development of telehealth in the state is a lack of understanding as to its value. Some practitioners see telehealth as an added burden to already busy practices and are concerned over the cost of acquiring and maintaining the equipment. While the grants supporting the development of WyNETTE have provided support for telecommunications and for technical troubleshooting, these grants will end. There is interest in the state government in telehealth, and it is hoped that state funding, along with user fees, group purchases, and other revenue sources, will make the network sustainable in the long term.

VI. **CONCLUSION**

Establishing a dedicated telehealth network for the hospitals, mental health clinics, and substance abuse treatment centers in Wyoming provides a foundation for developing applications that can help providers in the state become more familiar with the available technology and, perhaps more importantly, become more comfortable with adopting and using it. Clearly, however, the network must be sustained over time in order for this to take place. We are exploring approaches to support the ongoing costs, which could be as much as $415,000 annually once the network is operational.

The creation of this network infrastructure has supported a significant increase in the availability of telehealth services in
the state, particularly in the areas of mental health care and substance abuse treatment. Several partners in the project have experience in developing and operating telehealth pilot projects in the state, and additional resources to support telehealth development are available through resource centers and Federal agencies with which all these organizations have affiliations. Through this project, we are convinced that the creation of this telehealth network for the state’s hospitals and mental health/substance abuse facilities will significantly improve our residents’ access to quality behavioral health care and other services.

REFERENCES


[14] Seaburn, DB (ibid.).