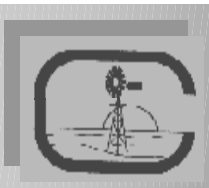

Nebraska Center for Rural Health Research

Assessment of Potential Uses of and Needs for Telehealth Services in Rural Nebraska

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The Nebraska Center for Rural Health Research, formed in 1990, is organized as a multi-campus Center located within the Department of Preventive and Societal Medicine, University of Nebraska Medical Center (UNMC). Other campuses participating in current Center activities include the University of Nebraska - Omaha (UNO) and the University of Nebraska - Lincoln (UNL).

The broad mission of the Center is to conduct research and analysis related to improving health care delivery in rural areas. The Center focuses on special populations among rural residents, including the elderly, children, minorities, mentally ill, under and uninsured, and new immigrants whose needs for assistance are unique.

Specific projects include analysis of national policies, studies of market-driven change in rural areas, studies of use of services by the elderly, and studies of access to, and utilization of health services by minority populations.

Comments/questions should be directed to:

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EXECUTIVE SUMMARY

Telehealth, in general, refers to the use of any form of information or telecommunications technology in the administration of health services. It includes services ranging from continuing medical education, to video consultations with patients, and to remote surgery. The term telemedicine pertains to a subset of telehealth and refers to the use of a wide array of technologies to deliver an array of medical services to persons at some distance from a provider.

The purpose of this assessment is to provide analysis to the Nebraska Information Technology Commission (NITC) regarding potential uses of information technology by individuals and institutions delivering health care services in rural Nebraska. Data were collected from existing sources to create maps that display resources in Nebraska, including health care providers and information technology. Physicians and hospital administrators were surveyed and the results form much of the basis for the recommendations included in the report. Two focus groups were conducted, which provided a more detailed, enriched understanding of the reactions of health care providers and others to the use of telehealth.

Recommendations

1. Initial applications of telehealth must be responsive to the provider's needs.
2. Any new program should aim to include interactive video.
3. Health professionals currently using telehealth services should be champions of those applications.
4. There should be formal training for everyone involved in telehealth consultations.
5. Advocates for telehealth must continue to press for changes in reimbursement policies.
6. Programs in telehealth should incorporate broad-based community participation by including applications of interest to community groups.
7. Fast and reliable broadband interconnectivity needs to be available.

Current Telehealth Use in Nebraska

There are three networks providing the capacity for telehealth that are not engaged in extensive use of telemedicine:

- The High Plains Rural Health Network that includes areas of western Nebraska;
- The Heartland Health Alliance Telehealth System connects seven sites and provides programming available to all 32 members;
- The University of Nebraska Medical Center and Nebraska Health System network with sites in O'Neill, Kearney, Scottsbluff, and Grand Island.

The Mid-Nebraska Telemedicine Network (MNTN), based at good Samaritan Health Systems in Kearney, includes sites in 10 small hospitals in rural Nebraska. That network has been the recipient of federal grant funding enabling them to use the system actively for patient encounters.

Telehealth services are conducted through a variety of communications medium. The extensiveness and speed of service is a function of the type of medium employed. Table 4 from the report summaries the current availability of various medium in Nebraska.

Table 4: Overview of technology infrastructure and communications standards

Medium (Highway)	Communications Standard (Car)	Availability	Speed
POTS	Modem	Everywhere	56 kbps
	ISDN	Limited	128 kbps
	DSL	Limited	8 mbps
T1	Various	Widely available	1.5 mbps
T3	Various	Somewhat available*	43 mbps
Cable	DOCSIS	Very limited	10mbps
Fiber Optic*	ATM	Limited‡	622 mbps
Satellite	?	Everywhere	400 kbps, downstream

Note: Some of the mediums and communication standards are only applicable for local infrastructure (POTS, DSL, modem)
*459 of the 476 telephone switches in Nebraska are connected by fiber cable and in many cases are equipped with DS-3 equipment being used for public network traffic (Hahn, 2001)
‡While Fiber optic cable may be more widely available, ATM capability is limited

Reimbursement of Telehealth Services

The future of telehealth services is heavily dependent on decisions made by insurers regarding payment for those services. The leading single source of payment, Medicare, will be changing its payment policies, effective October 1, 2001. After that date Medicare will pay for telehealth services, defined as professional consultations, office visits, and office psychiatry services, delivered to beneficiaries in any non-metropolitan county. The Nebraska Medicaid program also provides payment for services delivered using telehealth. Private insurers each adopt their own policies, but often follow the lead of the Medicare program.

Results of the Surveys

Surveys were returned from 339 respondents, including physicians that might refer patients (122), physicians that accept referrals (152), hospital administrators in the small rural hospitals (49) and hospital administrators in large hospitals likely to be the consulting site (15). Tables 8, 10, 11 and 12 from the text provide summaries of results describing availability, use, and types of services.

Table 8: Type of Telemedicine Technologies Available, by Hospital Type

	Referring (N=19)	Consulting (N=10)	Total (N=29)
Two-way Interactive Video	57.9%	70.0%	62.1%
Store-and-forward	42.1%	40.0%	41.4%
Audiographic (shared screen images with real-time audio)	26.3%	20.0%	24.1%
Telemetry (transmission of physiologic data)	21.1%	20.0%	20.7%
Other	15.8%	30.0%	20.7%

Note: Percentages add up to more than 100 as more than one response was allowed.

Table 10: Most Common Types of Technology Used According to Physicians Users of Telemedicine

	MNTN physicians[§] (N= 39*)		Other Users (N= 51*)		Total Users (N= 90*)		As percentage of *All* physicians (N=274)
Interactive video	29	74%	21	41%	50	56%	18.2%
Store-and-forward image/text transmission	4	10%	18	35%	22	24%	8.0%
Shared computer screen images with audio	10	26%	10	20%	20	22%	7.3%
Telemetry	5	13%	2	4%	7	8%	2.6%
Other	2	5%	12	24%	14	16%	5.1%

Note: Percentages add up to more than 100 as more than one response was allowed.

* Not all respondents answered this question

[§] MNTN physicians are those affiliated with the MNTN network and are considered to be users of telemedicine.

Table 11: Most Common Types of Telemedicine Services, by Hospital Type

	Referring (N=18)	Consulting (N=11)	Total (N=29)
Medical (professional) education	55.6%	18.2%	41.4%
Teleradiology	38.9%	36.4%	37.9%
Routine clinical consultation and second opinion	38.9%	36.4%	37.9%
Management of chronic diseases and conditions	38.9%	18.2%	31.0%
Medical follow-up	33.3%	18.2%	27.6%
Surgical follow-up	16.7%	9.1%	13.8%
Emergency consultation and triage	22.2%	0.0%	13.8%
Medical administration	5.6%	18.2%	10.3%
Supervision of mid-level providers	5.6%	0.0%	3.4%
Preceptorship of students and residents	0.0%	0.0%	0.0%
Telepathology	0.0%	0.0%	0.0%
Other	5.6%	27.3%	13.8%

Note: Percentages add up to more than 100 as more than one response was allowed.

Table 12: Most Common Types of Telemedicine Services, by Physician Type

	MNTN physicians (N= 40*)		Other Users (N= 71*)		Total Users (N= 111*)		As percentage of *All* physicians
Continuing medical education (CME)	19	48%	50	70%	69	62	25%
Follow-up	24	60%	7	10%	31	28	11%
Diagnosis	11	28%	12	17%	23	21	8%
Second Opinion	12	30%	8	11%	20	18	7%
Chronic disease management	12	30%	7	10%	19	17	7%
Emergency	4	10%	11	16%	15	14	6%
Administrative	2	5%	6	9%	8	7	3%
Other	7	18%	12	17%	19	17	7%

Note: Percentages add up to more than 100 as more than one response was allowed.
* Not all respondents answered this question

Most of the physicians agreed that telemedicine can be effective in several practice areas:

- preventive services;
- chronic condition management;
- post-surgical follow-up;
- home health care; and
- improvement of continuity of care.

Over 68% of the physicians not identified as current users said they would use interactive video if it was available in their offices. Almost all of the physicians stated that they would be interested in participating in grand rounds or continuing medical education via telemedicine.

Seventy percent of the consulting physicians who used telemedicine responded that current reimbursement for their levels of participation were not adequate. The majority of non-user consulting physicians agreed that compensation would have to be on-par with in-person consults before they would start to use telemedicine services.

Focus Group Results

The most common use of telemedicine services mentioned by the group of telemedicine users was for mental health. Both focus groups stated that there was a lack of adequate mental health services in rural Nebraska and that telemedicine could be an important aid in providing services to those currently unable to obtain them due to distance limitations. The balance of the discussion of benefits is summarized by this list:

- joint participation by physicians and patients in consultative sessions;
- continuing medical education for the health care professionals;
- patient care remains in the local community; and
- patients are more likely to make and keep appointments for care.

There was general agreement that a telemedicine link would provide benefits to the entire community in general. Video-conferencing would allow greater access to community health education. For example, schools could be hooked up to public health programs such as anti-smoking campaigns. A video-conferencing system could be used by the greater community for endeavors such as distance learning at both the high school and college level.

The physicians and medical experts who are currently using telemedicine services all believed that telemedicine improved the continuity of care of rural patients. Many in the group believed that telemedicine "enriches the entire experience" as it benefits both the patients and the physicians. It was agreed by both groups that telemedicine is here to stay and its use by physicians will continue to increase. Both focus groups concluded that the current champions of telemedicine in Nebraska are needed to convey the potential benefits of its use to those not currently using the technology. Hearing about telemedicine from a peer was the most important method of spreading the word. It was recommended that newsletters be used to convey information about telemedicine to physicians in the state.

INTRODUCTION

Telehealth, in general, refers to the use of any form of information or telecommunications technology in the administration of health services. It includes services ranging from continuing medical education (CME), to video consultations with patients, and to remote surgery. Table 1 outlines the main types of telehealth applications, including examples of each type. The term telemedicine pertains to a subset of telehealth and refers to the use of a wide array of technologies to deliver an array of medical services to persons at some distance from a provider. Telehealth services link people in different, often remote, locations and in essence remove the barriers of distance. In a state where many residents live in rural areas, telehealth services can be very beneficial.

Table 1: Examples of Telehealth Applications

Category	Examples
Patient care	Radiology consultations/teleradiology; postsurgical monitoring; triage of emergency patients; follow up consultations, video consultation with patient in remote office; remote diagnostic testing
Professional education	CME programs; on-line information and educational resources; individual mentoring and instruction
Patient education and other services	On-line help services for patients with chronic health problems; distance support groups
Research	Aggregation of data from multiple sites; conducting and coordinating research at multiple sites
Public health	Access to care for disadvantaged groups; poison control centers; disease reporting; smoking cessation programs
Health care administration	Video conferences for managers, utilization and quality monitoring

Source: Adapted from Field, 1996

Telemedicine offers benefits to both providers and users of health care services. Many rural areas lack health care workers sufficient to meet all needs, and health care workers in rural areas lack proximate access to education, training, and ongoing support. Enabling patients to stay closer to home and decreasing travel times may increase patient satisfaction. Telemedicine increases the diagnostic resources available to rural communities and allows for better triage, stabilization, and follow-up care. Telehealth services allow health care providers to improve their skills and knowledge by giving them access to CME and by increasing their interactions with specialists/ consultants. Thus, telehealth services can reduce professional isolation of rural providers. Telehealth services can improve the access to care and the quality of local health care and thus, can improve the health status of rural populations.

The first telemedicine system in Nebraska was established in 1964, at the University of Nebraska Medical Center, where dedicated microwave was used to provide psychiatric services to a remote

rural site (Field, 1996). However, despite advances in technology its use across the country remains limited (Wells, 1996). One of the most important reasons why telemedicine has yet to reach its potential is that the possible users of telehealth (the full range, not just telemedicine) services were not given enough consideration in the design and implementation of many past programs. For telehealth programs to be successful they must be driven by the needs of the users rather than technology.

In designing new telehealth programs, the single most important area for analysis may be the attitudes of local providers (Grigsby, 1995). Thus, we must learn what physicians think about currently available resources and assess their attitudes towards adapting to new technologies in general and telehealth services in particular. To establish a sustainable telehealth/telemedicine network that will be used to its full potential we, "...must carefully determine the medical needs of the population in the region to be serviced and then select the appropriate technology to meet those needs." (Chin, 1998)

Information and telecommunication technologies can have a significant impact on the health status of rural Nebraskans. It is generally agreed that the active input of potential users of telehealth services should be an integral component in the planning and implementation process.

Purpose and Design of This Study

As stated in the June 1, 2000, proposal (see Appendix C): "The purpose of this assessment is to provide analysis to the Nebraska Information Technology Commission (NITC) regarding potential uses of information technology by individuals and institutions delivering health care services in rural Nebraska." Data about the distribution of medical and information technology resources were assembled, and a survey was conducted to assess current telemedicine usage, determine the attitudes of health care workers, and learn what telemedicine services are desired and will be used. As alternatives are suggested to implement new uses of telehealth in Nebraska, faculty at the Nebraska Center for Rural Health Research (NCRHR) will be available to provide consultation concerning measuring and assessing cost-effectiveness. This assessment is unable to include cost-effectiveness because to do so requires specific decisions about the technology being used, the potential number of visits, and payment for the services, all of which are policy decisions yet to be made for rural Nebraska.

The research design suggested in June has been followed, with minor adjustments, for this assessment. Maps are included that display health provider and information technology resources in Nebraska. Physicians and hospital administrators were surveyed and the results are reported in this document. Two focus groups were conducted (three were proposed, but resource and time constraints limited the project to two). Faculty at the NCRHR will continue to work with the NITC, as requested, in the areas of economic analysis and continuous assessment.

This report is organized in three parts. Part I provides background information about the distribution of health care resources in Nebraska, current uses of telehealth in the state, ways in which technology transmits information, and policies setting reimbursement for telemedicine. We have not included a review of the literature, including case studies of use of telemedicine in other locations, in the text of the report since doing so was not in the original scope of work.

However, we have appended an annotated bibliography of selected references. Part II of this report analyzes the information collected through surveys and focus groups. Part III provides a summary discussion and recommendations for the NITC to consider.

PART I: BACKGROUND INFORMATION

1. DISTRIBUTION OF PHYSICIANS IN THE STATE

Overlay maps were prepared that show the location of primary care providers, selected specialty physicians, hospitals, and long-term care facilities (see Appendix A). It is clear that there is a lack of specialist services in many parts of the state, particularly mental health services. For example, only 6 counties in the state have a mental health center, and psychiatrists practice in only 12 counties. Other specialties are similarly under-represented in the state. The number of counties in which oncologists, obstetricians and gynecologists, and radiologists practice is 10, 13, and 15 respectively. Examining the maps, it is clear that many of the residents of the state live at great distances from specialists.

2. CURRENT TELEHEALTH USE IN NEBRASKA

Using the broadest definition of telehealth, to include any transmission of information that affects the delivery of health care services, there is already widespread use of telehealth in Nebraska. Physicians calling other physicians for information about patient referrals are, in the general sense, using telehealth. Physician offices that use desk top computers to link to services related to patient care are also using telehealth.

There are several networks that serve various Nebraska providers with connections for interactive communications, including video capacity. The High Plains Rural Health Network (HPRHN) provides interactive video conferencing for use in specialty health care and CME to underserved areas in several states, including Nebraska. It has hub sites in five communities (including Hays, Kansas and Fort Collins, Colorado) serving seventeen rural sites. The Heartland Health Alliance includes 32 hospitals in Nebraska, some of which have interactive video and telehealth capabilities. The Heartland Health Alliance connects seven sites - Great Plains Regional Medical Center in North Platte; Tri-County Hospital in Lexington; Mary Lanning Hospital in Hastings; Community Hospital in Beatrice; Bryan LGH East and West in Lincoln; Children's Hospital in Omaha; and Memorial Hospital in Aurora.

The University of Nebraska Medical Center (UNMC) and Nebraska Health System (NHS) have a telehealth network that connects the University with most NHS clinics located in Omaha. The system currently is used to send grand rounds and other continuing education events to hospitals in Scottsbluff, Kearney, North Platte, Grand Island and O'Neill. The system is also hooked up to clinics in Shenandoah, Harlan, and Council Bluffs in Iowa. In addition, a collaborative effort between UNMC's Munroe-Meyer Institute and the State Departments of Health and Human Services and Department of Education is underway to complete a statewide telehealth program that would provide services to local Educational Service Units and service areas. The network will focus on support for resources for children with special health care needs. This network will provide services in at least five ways: 1) direct patient services (evaluations); 2) gap-filling personnel for local teams; 3) continuing education; 4) technical assistance; and 5) quality assurance monitoring of team services.

The largest telehealth program in Nebraska is the Mid-Nebraska Telemedicine Network (MNTN). Based at Good Samaritan Health Systems in Kearney, this network started offering telemedicine services in December, 1995. Good Samaritan Health Systems serves as the consulting site; the referring sites that currently make up the network include Basset, Benkelman, Broken Bow, Callaway, Cambridge, Cozad, Franklin, Gothenburg, Imperial and Ord in Nebraska and Norton and Phillipsburg in Kansas. The network provides telemedicine services for routine and emergency care and educational opportunities for health care providers.

Tables 2 and 3 presents a summary of the activities and encounters that the Mid-Nebraska Telemedicine Network has performed since its inception. Note that patient encounters have accounted for approximately 56% of all activity to date. Examining all telemedicine activities (i.e., excluding administrative meetings, educational programs, and demonstrations), teleradiology and mental health made up the majority of activity, accounting for over 70% of all encounters; other specialties used telemedicine at lower, roughly equal, levels. Of significance is the fact that teleradiology was much more frequently employed in the last 2 years by the users of the Network. While teleradiology made up only 15% of the Network's activity between 12/6/95 and 12/31/98, it accounted for 51% of the Network's activity since then.

Table 2: Summary of Activity for the Mid-Nebraska Telemedicine Network

	November 2000	12/6/95 -11/30/00
Patient Encounters	90	5,057
Teleradiology	73	2,913
Administrative Meetings	0	87
Educational Programs	13	468
Demonstrations	5	506
Total	181	9031

Note: These activities include both telemedicine (patient encounters and teleradiology) and telehealth activities.

Table 3: Telemedicine Activity by Specialty at the Mid-Nebraska Telemedicine Network (percentage of all telemedicine activity in parentheses)

	12/6/95-12/31/98	1/1/99-11/30/00	Total 12/6/95 - 11/30/00
Teleradiology	477 (15%)	2436 (51%)	2913 (37%)
Patient Encounters:			
Mental Health	1495 (47%)	1312 (27%)	2,807(35%)
Speech Pathology	80 (3%)	357 (7%)	437 (5%)
Dermatology	139 (4%)	144 (3%)	283 (4%)
Orthopedics	208 (7%)	41 (1%)	249 (3%)
Arthritis Education	173 (5%)	70 (1%)	243 (3%)
Medical Oncology	148 (5%)	64 (1%)	212 (3%)
Diabetic Instruction	125 (4%)	78 (2%)	203 (3%)
Cardiology	85 (3%)	107 (2%)	192 (2%)
Neurology	60 (2%)	81 (2%)	141 (2%)
Rheumatology	44 (1%)	46 (1%)	90 (1%)
All Other Specialties	138 (4%)	62 (1%)	200 (3%)
Total	3172 (100%)	4798 (100%)	7970 (100%)

3. TECHNOLOGY INFRASTRUCTURE

Telemedicine requires a communications infrastructure that can move large amounts of data quickly. If physicians are to buy into the concepts of telehealth and telemedicine, they must be assured that the necessary components are available to support their work. A fast and reliable technology infrastructure is an important facet in the development of a successful telemedicine system. Network speed (i.e., bandwidth) depends upon both the physical infrastructure, or medium (the highway), and the communications standard (the car).

There are three general mediums available to transport data in telemedicine system: telephone lines, fiber-optic cables, and satellite transmissions. Each is capable of transmitting data at various speeds depending upon the size and quality of the infrastructure and the characteristics of the communication standards employed. There are two connection points in the development of systems—communities and specific sites within communities. Both are needed before implementing successful programs in telehealth.

At the low end of the spectrum is the public Internet system. The speed of the system is primarily dependent on the type of connection to the local site as well as the amount of competing data traffic by other users within the network. Because of the availability of the network to almost any location, this type of technology can be used as a communication system whenever speed is not a high priority (email streaming video and data transfer).

Also at the low end of the spectrum are regular telephone lines (sometimes referred to as POTS: plain old telephone system). A modem linking a computer to a telephone line is how the majority of the world gets to the Internet, at speeds up to about 56kbps (kilobytes per second). Several individual lines can be linked together (multiplexed) to increase the total bandwidth of the connection. This requires specialized terminal equipment as well as a specialized network installation (Primary Rate Interface). In some locations it is possible to use Integrated Digital Network (ISDN) to achieve speeds up to 1.45 mbps. ISDN is a specialized technology for the packaging, compression, and transmission of data over the public switched network.

There are a number of technologies that have been developed to allow regular telephone lines to carry data at higher rates; Digital Subscriber Line (DSL) is one such technology. There are a variety of types of DSL (e.g., HDSL, ADSL, etc.) with widely varying speed claims. This is due, in part, to the continuing evolution of the technology. It is also due to the limitations of the various forms of DSL. For example, Asymmetric Digital Subscriber Line (ADSL) is called this because the bandwidth usage is much higher in one direction than the other—typical ADSL applications transmit 8 Mbps downstream and 768 Kbps upstream. Currently, 25% of all customers outside of the Omaha and Lincoln metropolitan areas are served in telephone exchanges where DSL is offered either as a service or a special order service, and that 25% is estimated to grow to over 50% within the next year (Hahn, 2001). DSL technology has been rapidly advancing. While distance from phone switches can still be a impediment to DSL connections, several companies have been using IDSL for customers five or ten miles from the telephone switch (Hahn, 2001). The capability to extend new information lines to remote locations is evolving rapidly. Given the pace of change, this report should be read as providing a point-in-time summary of what is available and in use in Nebraska. Costs to connect and use the

systems are also changing and vary according to the system used and availability of any targeted subsidies.

Another way to improve a road is to ensure that there is no other traffic on it. A "leased line" or "dedicated phone connection" can frequently be established to a location using existing telephone infrastructure. Since this line is used only to carry the leasor's communications, the carrier can assure a given level of quality. This is the basis of the T-1 and T-3 lines which are capable of providing bandwidth at speeds up to 1.5mbps (T-1) or 43mbps (T-3). T-1/T-3 splits the transmitted data into a number of individual channels, this is both the source of their high speed and the root of their limitation. If there aren't enough wires "vacant" in the telephone cable to support the needed number of channels, T-1/T-3 is not available without the addition of further electronic equipment from the telecommunications provider. Depending on what exactly is required, the investment may range from a minor to a significant amount[1]. Currently, all telephone companies have placed fiber optic cable in some portions of their rural infrastructure. Using asynchronous transfer mode (ATM), speeds up to 6222 mbps can be attained.[2]

The second most widely available communications medium to homes and businesses is cable television (CATV), approximately 63 million households in the U. S. The coaxial cable that is attached to a TV can be split off to a cable modem and attached to a network interface card (NIC) in the PC. While some vendors make extraordinary claims for network bandwidth, the realistic expectation for this technology is 10mbps (10,000 kbps) or less. Unfortunately, while CATV is seemingly everywhere, not all households with cable TV have the option of cable modem Internet access. In Nebraska, this capability is currently limited to Lincoln, Omaha, Harrison, Wilber, Imperial, and Grant. The other downside to this technology is that until very recently, the communications standards for cable modems had not been established - so the modems from two different manufacturers could not talk to each other. Relatively recently, the industry has adopted Digital Over Cable Service Interface Specification (DOCSIS) as the communications standard.

The final way to speed travel is to leave the roads altogether. Homes and businesses have been getting information via their television directly from satellites for years. Getting data into a PC directly from a satellite is not that much different. The chief limitation of today's consumer satellite technology is that it can only send data from the satellite to a receiver attached to the PC (downstream), and not the other way (upstream). The usual work-around is to establish a separate ISP connection to send data to the Internet, typically over an analog modem. This connection works in conjunction with the satellite feed—as information is requested via the modem line, the data is sent back via the satellite. Typical "downstream" speed is in the neighborhood of 400 kbps; "upstream" speed will follow the same limitations as described in all

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[1]It also depends whether one is referring to an inter-city facility or the local distribution infrastructure. With respect to inter-city connections, adding electronic equipment will support these high-speed connections. If such a case occurs in the local distribution infrastructure, there may be the need to lay down fiber-optic cable.

[2]Speeds faster than 622 mbps can now be attained without using ATM. Time Division Multiplex (TDM) is a type of digital bit stream that allows for greater speeds.

of the previous discussion. Table 4 provides an overview of technology infrastructure and communications standards.

Table 4: Overview of Technology Infrastructure and Communications Standards

Medium (Highway)	Communications Standard (Car)	Availability	Speed
POTS	Modem	Everywhere	56 kbps
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Cable	DOCSIS	Very limited	10mbps
Fiber Optic*	ATM	Limited‡	622 mbps
Satellite	?	Everywhere	400 kbps, downstream

Note: Some of the mediums and communication standards are only applicable for local infrastructure (POTS, DSL, modem).
*459 of the 476 telephone switches in Nebraska are connected by fiber optic cable and in many cases are equipped with DS-3 equipment being used for public network traffic (Hahn, 2001).
‡While fiber optic cable may be more widely available, ATM capability is limited.

Clearly, the speed of the connection will affect the efficiency of any telehealth system. For example, a file that contained a series of x-rays which would take 58 minutes to transmit at 56 kpbs would take less than 3 minutes at speeds greater than 1.54 mbps and less than 20 seconds at 10 mbps (The Main Street Economist, 2000). To achieve high quality video-conferencing transmission, speeds of at least 4 mbps may be necessary, although if both sides have the appropriate high-tech software, it could be achieved at speeds above 1.5 mbps (i.e., a T-1 line). Having an infrastructure in place that allows high speed communications access is an important consideration in the expansion of telemedicine services.

Information regarding the types of communication available in Nebraska was obtained from the Nebraska Department of Communications through the Telecommunications Infrastructure Needs Assessment (TINA). We classified the data as one of three levels (64 kbps, 1.5mbps-10 mpbs, 43 mpbs-100 mbps) and mapped the largest connection in a town or city (see Map A1 in Appendix A). It is clear from the map that many parts of Nebraska do not have high-speed connections in use, particularly the northern part of the state.[3] It must also be noted that although a town may have a high-speed connection, including access to fiber optic cable, there still may be an investment needed to hook up the town's hospital or health care facility to the high-speed connection.

[3]Note that while the map shows services in use, it does not indicate bandwidth availability. As discussed previously, every community in Nebraska with a telephone switching office has potential access to high speed bandwidth. There are several dozen small communities (population less than 30 people) where there is no telephone switch as their service comes from an adjacent larger community.

4. REIMBURSEMENT OF TELEHEALTH SERVICES

Reimbursement for telemedicine services, particularly in fee-for-service payment systems, has been viewed as a major barrier to the growth of telemedicine.

> Because so much medical care is provided to the elderly and paid by Medicare on a fee-for-service basis and because private payers follow Medicare's lead, fee-for service payment policies established by the Health Care Financing Administration, have been a dominant concern for telemedicine programs. (Field, 1996)

The major payers for health care services are third party insurers; commercial (including Blue Cross), Medicare, and Medicaid. Nearly 80% of Nebraskans are insured at least in part by private (commercial) carriers, another 13% by Medicare, 9% by Medicaid, and 6% by the military (the total exceeds 100% because persons can carry multiple types of insurance; approximately 9% of Nebraskans have no insurance) (Nebraska Center for Rural Health Research, 2000). Of course, the breakdown of payment to providers does not parallel precisely the distribution of types of insurance. In 1994-1995, Medicare paid for 65% of the inpatient hospitalizations in Nebraska associated with ambulatory care sensitive conditions, and 37% of all other discharges. Those numbers were higher in rural regions of the state: in the West Central region, 66.9% and 41.1%; in the Central region, 69.4% and 45.6%; and in the Northern region, 68.5% and 45.6% (Nebraska Center for Rural Health Research, 1996).

Medicare payment policies did not provide reimbursement for services delivered through telemedicine until the Balanced Budget Act of 1997 mandated payment for services delivered to Medicare beneficiaries in rural health professions shortage areas. The provisions of that legislation expire on October 1, 2001. On December 21, 2000, President Clinton signed the Medicare, Medicaid, and SCHIP Benefits Improvement and Protection Act of 2000 (BIPA), which establishes the following Medicare payment policies for telemedicine, effective October 1, 2001:

- payment will be made for telehealth services, meaning professional consultations, office visits, and office psychiatry services;
- services are furnished via telecommunications systems located in a health professional shortage area, a county not included in a Metropolitan Statistical Area, or a Federal telemedicine demonstration project;
- sites for receiving telemedicine services include: the office of a physician or practitioner, a critical access hospital, a rural health clinic, a Federally qualified health center, or a hospital;
- payment to the consulting physician or practitioner shall equal what would have been paid without the use of a telecommunications system;
- the originating site will be paid a facility fee of $20 initially, increased by the percentage increase in the Medical Expenditure Index after 2002; and
- an eligible individual need not be presented by a physician or practitioner.

As of early 1999, 15 state Medicaid programs reimbursed for services delivered using telemedicine: Arkansas, California, Georgia, Illinois, Iowa, Louisiana, Kansas, Montana, North

Dakota, Oklahoma, South Dakota, Texas, Virginia, West Virginia (Source: 3COM). Nebraska has since joined that list; the Nebraska Telehealth Act of 1999 required that contacts using telemedicine be reimbursed, as of July 1, 2000.

PART II: DATA COLLECTED FOR THIS ASSESSMENT

Data were collected from physicians, hospital administrators, and others either currently using telemedicine, or likely to do so in the future. The intent of this data collection activity was to determine desires to use telemedicine and to learn from early experiences. The persons surveyed and interviewed are more familiar with the term *telemedicine* than *telehealth*, so questions used only the former term, even though the uses described are more varied. The focus of the assessment was on physicians and hospitals, because these are likely to be the principal users of telemedicine, and because any innovation in rural health care is not likely to succeed without their support.

1. THE SURVEY

We conducted a survey to learn more about what telemedicine services are currently being used in Nebraska, what services are needed, and what services will be used. The survey was developed by the Center for Health Services and Policy Research at the University of Colorado Health Sciences Center. The survey instruments were used, with minor modifications, by Health Tech Strategies, LLC, a firm that is conducting a similar assessment under contract with the Rural Wisconsin Health Cooperative and the U. S. Health Care Financing Administration. The Health Tech Strategies research team consists of national experts in this field including Neal Neuberger, Jay Sanders, M.D., Earl Ferguson, M.D., Ph.D., Bill Grigsby, Ph.D., Jim Grigsby, Ph.D., and Mary Ella Payne, R.N.

The survey was administered by mail and sent to both physicians and hospital administrators (generally chief executive officers, presidents, and chief operating officers). To be consistent with Health Tech Strategies' survey design, physicians were classified in one of the following ways, with each group receiving a different survey: 1) primary care physicians who were affiliated with the Mid-Nebraska Telemedicine Network; 2) specialist and subspecialist physicians who were affiliated with the Mid-Nebraska Telemedicine Network; 3) other primary care physicians in the state (who may or may not have used telehealth technology); and 4) other specialist and subspecialist physicians in the state (who may or may not have used telehealth technology). Surveys were sent to all of the physicians affiliated with the Mid-Nebraska Telemedicine Network (both referring and consulting) and to a random sample of one-third of the rest of the physicians in the state. (See Table 6 for a breakdown of the number of physicians in each classification that were sent surveys.)[4]

An administrator at each of the state's 97 non-federal acute care hospitals was sent a survey. Hospitals were classified as either referring sites (72 hospitals) or consulting sites (25 hospitals). Hospitals in urban areas (North Platte, Kearney, Scottsbluff, Norfolk, Hastings, Lincoln and Omaha) were classified as consulting sites.

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[4]For the remainder of this report, physicians affiliated with the Mid-Nebraska Telemedicine Network will be referred to as "MNTN physicians." The rest of the physicians in the state will be referred to as "other physicians."

The surveys were initially mailed on July 21, 2000. Following Dillman (1999), one week after the initial mailing, a follow-up postcard was sent asking those who had not yet sent in a survey to do so and thanking those who already had. In a third mailing, on August 22, surveys were re-sent to those who had not yet responded. This was followed up with phone calls and a final mailing on September 29, 2000, to those requesting new surveys. A copy of the survey instrument is appended.

2. RESULTS

2.1 Response Rates

Of the 620 surveys mailed, a total of 20 were removed from the sample. Twelve surveys were undeliverable and 8 of the intended recipients had retired. Hence, the remaining sample size was 600. A total of 339 surveys were returned by October 31, 2000, for a response rate of 57% (see Table 5). Response rates for physicians and hospital administrators among survey types ranged from 51% to 68%, while response rates in health service areas ranged from 43% to 61% (see Tables 6 and 7). Hence, there was proportionate representation from MNTN and other physicians, referring and consulting physicians, and from each health service area.

Table 5: Response Statistics

Total Surveys Mailed		620
Number Undeliverable/Moved	12	
Retired	8	
Total Number Removed		20
Sample Size		600
Number of Respondents		339
Response Rate		57%

Table 6: Responses by Survey Type

	Number of Respondents	Total Number in sample	Response Rate
Survey Type:			
Other Consulting Site Physicians	126	226	56%
Other Referring Site Physicians	107	210	51%
MNTN Consulting Site Physicians	26	42	62%
MNTN Referring Site Physicians	15	25	60%
Consulting Site Administrators	15	25	60%
Referring Site Administrators	49	72	68%

Table 7: Responses by Health Service Area

	Number of Respondents	Total Number in Sample	Response Rate
Health Service Area:			
Western	27	63	43%
Southwest	31	60	52%
Central	106	175	61%
Northern	59	109	54%
Southeast	62	102	61%
Eastern	53	91	58%

2.2 Current Use of Telemedicine in Nebraska

Nineteen out of the 48 referring hospitals (40%), and 10 out of the 15 consulting hospitals (67%) that returned their surveys indicated that they had some type of telemedicine technology available at their facilities. Thirty percent of the non-MNTN physician respondents stated that they had used telemedicine in the past (71 out of 233). Including the MNTN affiliated physicians, a total of 41% of the respondents are users of some form of telemedicine services.

Of those hospitals that claimed to have telemedicine *available,* the most common technologies were two-way interactive video (in over 60% of the hospitals) and store-and-forward systems (in over 40% of the hospitals) (see Table 8). Accordingly, the same technologies were also reported by hospital administrators as the most frequently *used*[5] (see Table 9). The physicians responded that interactive video was the most common technology used. Almost 56% of all users of telemedicine stated that they used that form of technology (see Table 10).

Table 8: Type of Telemedicine Technologies Available, by Hospital Type

	Referring (N=19)	Consulting (N=10)	Total (N=29)
Two-way Interactive Video	57.9%	70.0%	62.1%
Store-and-forward	42.1%	40.0%	41.4%
Audiographic (shared screen images with real-time audio)	26.3%	20.0%	24.1%
Telemetry (transmission of physiologic data)	21.1%	20.0%	20.7%
Other	15.8%	30.0%	20.7%

Note: Percentages add up to more than 100 as more than one response was allowed.

Table 9: Type of Telemedicine Technologies Most Frequently Used, by Hospital Type

	Referring (N=18*)	Consulting (N=10)	Total (N=29)
Two-way Interactive Video	50.0%	50.0%	50.0%
Store-and-forward	33.3%	30.0%	32.1%
Audiographic (shared screen images with real-time audio)	16.7%	0.0%	10.7%
Telemetry (transmission of physiologic data)	11.1%	10.0%	10.7%
Other	11.1%	20.0%	14.3%

*Note: Not all respondents answered all questions; percentages add up to more than 100 as more than one response was allowed.

[5]Note: When presenting results on the use of telemedicine in hospitals, only those hospitals that identified themselves as users of telemedicine were included.

Table 10: Most Common Types of Technology Used According to Physician Users of Telemedicine

	MNTN physicians (N= 39*)		Other Users (N= 51*)		Total Users (N= 90*)		As percentage of *All* physicians (N=274)
Interactive video	29	74%	21	41%	50	56%	18.2%
Store-and-forward image/text transmission	4	10%	18	35%	22	24%	8.0%
Shared computer screen images with audio	10	26%	10	20%	20	22%	7.3%
Telemetry	5	13%	2	4%	7	8%	2.6%
Other	2	5%	12	24%	14	16%	5.1%

Note: Percentages add up to more than 100 as more than one response was allowed.
* Not all respondents answered this question.

Store-and-forward systems are sometimes used for telemedicine consultation. In such systems, digital images (either still images or short video segments) may be acquired and sent along with text data (lab results, history, exam findings, etc.) via modem from one physician's computer to another. The data is reviewed by the receiving consultant, who sends a report of findings and impressions by fax or return E-mail. Unlike interactive video telemedicine systems, store-and-forward systems do not require both providers to be present at opposite ends of the video link at the same time. Although this type of technology is available in over 40% of the hospitals, only about 8% of all physicians and 24% of telehealth users stated that they commonly used it.

The respondents were asked questions about what types of telemedicine *services* they use. According to the hospital administrators, the most common services used were routine clinical consultation and second opinion, management of chronic diseases and conditions, medical follow-up, teleradiology, and medical education. Among the MNTN physicians, the most common use of telemedicine was for follow-up consultations, used by 60% of this group. Diagnosis, second opinion, and chronic disease management were ranked approximately equal to one another, with about 30% of those physician users claiming to use telemedicine for those services. Almost half of all the MNTN physicians stated that they used telemedicine for CME. Notably, 70% of the other physicians who used telemedicine used it for CME (see Tables 11 and 12).

Table 11: Most Common Types of Telemedicine Services, by Hospital Type

	Referring (N=18)	Consulting (N=11)	Total (N=29)
Medical (professional) education	55.6%	18.2%	41.4%
Teleradiology	38.9%	36.4%	37.9%
Routine clinical consultation and second opinion	38.9%	36.4%	37.9%
Management of chronic diseases and conditions	38.9%	18.2%	31.0%
Medical follow-up	33.3%	18.2%	27.6%
Surgical follow-up	16.7%	9.1%	13.8%
Emergency consultation and triage	22.2%	0.0%	13.8%
Medical administration	5.6%	18.2%	10.3%
Supervision of mid-level providers	5.6%	0.0%	3.4%
Preceptorship of students and residents	0.0%	0.0%	0.0%
Telepathology	0.0%	0.0%	0.0%
Other	5.6%	27.3%	13.8%

Note: Percentages add up to more than 100 as more than one response was allowed.

Table 12: Most Common Types of Telemedicine Services, by Physician Type

	MNTN physicians (N= 40*)		Other Users (N= 71*)		Total Users (N= 111*)		As percentage of *All* physicians
CME	19	48%	50	70%	69	62	25%
Follow-up	24	60%	7	10%	31	28	11%
Diagnosis	11	28%	12	17%	23	21	8%
Second Opinion	12	30%	8	11%	20	18	7%
Chronic disease management	12	30%	7	10%	19	17	7%
Emergency	4	10%	11	16%	15	14	6%
Administrative	2	5%	6	9%	8	7	3%
Other	7	18%	12	17%	19	17	7%

Note: Percentages add up to more than 100 as more than one response was allowed.
* Not all respondents answered this question

2.3 Sample Characteristics

A comparison of any potential differences between physicians who currently use telemedicine services and those who do not allows us to investigate whether any certain characteristics related to their practices affects who is a potential user. Among either the referring physicians or the consulting physicians there were no significant differences in practice characteristics between the users and non-users of telemedicine. While referring physician users had been practicing on average for less time than the non-user referring physicians, the opposite result was found for the consulting physicians making it difficult to infer any conclusions. On average, non-users had a higher percentage of Medicaid patients while users had a higher percentage of Medicare patients (see Table 13).

Table 13: Sample Characteristics, Physicians Users and Non-users of Telemedicine

	Referring		Consulting	
	User of Telemedicine*	Non-users	Users of Telemedicine*	Non-users
Average # of years practicing in present community	7.7	11.7	11.0	11.1
Average # of years practicing medicine	10.7	16.1	17.4	15.5
Average # of patients in practice	6,261	7,253	2,326	4,105
Percentage Medicare	38.5	34.3	36.2	29.6
Percentage Medicaid	19.2	19.6	13.2	19.7

*This includes all MNTN physicians and all other users of telehealth in the state

2.4 Knowledge of Telemedicine

Respondents stated that most of their knowledge of telemedicine had come from colleagues (see Table 14). This was true for all physicians in Nebraska who responded to the survey. Among MNTN physicians, the next most often stated sources of knowledge were presentations and formal training programs. When asked how knowledgeable physicians were about telemedicine, 90% of the other physician respondents stated that they were "not at all knowledgeable" (45%) or "somewhat knowledgeable" (45%). None of the MNTN group stated that they were "not at all knowledgeable," while 50% stated that they were "somewhat knowledgeable," and 50% stated that they were "knowledgeable (33%) or "very knowledgeable" (18%).

Table 14: Main Source of Telemedicine Knowledge

	MNTN physicians (N=41)		Other Physicians (N=224*)		Total (N=265)	
Colleagues	21	51%	84	38%	105	40%
Medical literature	6	15%	79	35%	85	32%
Presentations (e.g., grand rounds)	14	34%	63	28%	77	29%
Professional association meetings/conferences (national, international)	7	17%	60	27%	67	25%
Mass media	0	0%	47	21%	47	18%
Medical or postgraduate training	3	7%	33	15%	36	14%
Formal telemedicine training programs	14	34%	19	9%	33	12%
Electronic media (e.g., World Wide Web)	2	5%	37	17%	39	15%
Other	13	32%	25	11%	38	14%

*224 of the Other Physicians answered this question, hence that number was used to calculate the percentage

2.5 Physicians' Attitudes Toward Telemedicine

To learn more about physicians' general attitudes about telemedicine, a series of questions were included in the survey. Table 15 presents the results to some selected questions that were included. Not surprisingly, the users of telemedicine agreed more strongly than non-users when asked if they were quick to adopt new technologies. Over 68% of the non-user respondents stated that they did not know enough about telemedicine technologies to use telemedicine in their practice.

Regarding the effectiveness of telemedicine, most of the physicians (users and non-users) agreed that telemedicine can be effective in several practice areas:

- preventive services;
- chronic condition management;
- post-surgical follow-up;
- home health care; and
- improvement of continuity of care.

Over 68% of the non-users stated that they would use interactive video if it was available in their offices. Store-and-forward technologies are generally not preferred to interactive video. Over 71% of the users and 64% of the non-users would not prefer store-and-forward over interactive video consultations. Almost all the physicians stated that they would be interested in participating in grand rounds or CME via telemedicine (83% of the non-users, 95% of the users). Seventy-five percent of the non-user physicians (compared to 54% of the users) agreed that more research is needed on the effectiveness of telemedicine.

Table 15: Responses to Various Questions Regarding Attitudes Toward Telemedicine

	Users*				Non-users			
	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
Knowledge of telemedicine and technology								
I am generally one of the first among my colleagues to adopt promising new technologies.	20.8%	55.7%	20.8%	2.8%	13.5%	36.9%	39.0%	10.6%
I do not know enough about telemedicine technology and applications to use telemedicine in my practice.	9.3%	31.5%	28.7%	30.6%	43.7%	31.7%	16.2%	8.5%
Effectiveness of telemedicine								
Telemedicine might be effective for emergency care.	21.6%	36.3%	21.6%	20.6%	16.9%	24.6%	23.8%	34.6%
Telemedicine might be effective for preventive services.	25.7%	47.5%	22.8%	9.9%	19.7%	41.7%	24.4%	14.2%
Telemedicine might be effective for chronic condition management.	36.4%	55.1%	5.6%	2.8%	25.4%	50.0%	13.1%	11.5%
Telemedicine might be effective for post-surgical follow-up.	22.7%	49.5%	18.6%	9.3%	10.3%	45.2%	26.2%	18.3%
Telemedicine might be effective for acute, nonemergency care.	22.5%	42.2%	27.5%	7.8%	11.5%	34.6%	32.3%	21.5%
Telemedicine might be effective for home health care.	22.7%	51.5%	18.6%	7.2%	13.6%	53.4%	20.3%	12.7%
Telemedicine could improve continuity of care.	21.5%	61.7%	14.0%	2.8%	14.3%	47.4%	29.3%	9.0%
Uses of telemedicine								
If interactive video were available in my office, I would use it.	25.0%	52.9%	15.4%	6.7%	17.3%	50.4%	15.8%	16.5%
I would be interested in participating in grand rounds or CME via telemedicine.	49.5%	45.0%	3.7%	1.8%	31.9%	51.4%	8.7%	8.0%
More research is needed on the effectiveness of telemedicine before I would refer more patients for teleconsultation.	15.4%	38.5%	39.4%	6.7%	30.1%	45.1%	20.3%	4.5%
I prefer standard charting to an electronic medical record.	17.3%	32.7%	29.8%	20.2%	19.1%	32.8%	35.9%	12.2%
In general, I would prefer store-and-forward over real time interactive video consultation.	2.6%	26.9%	52.6%	17.9%	10.3%	25.9%	37.9%	25.9%
Liability issues								
I am concerned about possible liability issues associated with the use of telemedicine.	19.4%	42.6%	26.9%	11.1%	25.0%	41.2%	26.5%	7.4%
Using telemedicine would increase my risk of being sued for malpractice.	8.4%	31.8%	48.6%	11.2%	9.5%	41.3%	37.3%	11.9%

*Users include MNTN physicians as well as other physicians who indicated they had used telemedicine in the past.

2.5 Reimbursement Issues

The physicians were asked several questions relating to reimbursement of telemedicine services. Examining the results, it is clear, that adequate reimbursement for telemedicine services is an important issue. Seventy percent of the consulting physicians who use telemedicine responded that current reimbursement for their level of participation was not adequate. The majority of non-user consulting physicians (62% of all responses and 82% of those who did not choose the "unknown" response) agreed that compensation would have to be on a par with in-person consults before starting to use telemedicine services. When the user consulting physicians were asked a similar question relating to expanding their current use of telemedicine, 55% agreed that compensation would have to be on a par with in-person visits.

Table 16: Responses to Questions Relating to Reimbursement

	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree	Unknown
Assuming that I must be present for teleconsultation, the current Medicare reimbursement rate for telemedicine is adequate for my level of participation.[1]	5.4%	7.1%	15.2%	13.4%	58.9%
As long as my participation is required in a teleconsult, telemedicine would have to be reimbursed on a par with in-person patient visits before I would be willing to refer more patients for teleconsultation.[1]	19.1%	46.1%	12.2%	1.7%	20.9%
I would have to be compensated on a par with in-person patient visits before I agree to use telemedicine.[2]	26.2%	35.9%	11.7%	1.9%	24.3%
The current Medicare reimbursement rate for telemedicine consults is adequate for my level of participation.[3]	0.0%	30.0%	35.0%	35.0%	0.0%
I would have to be compensated on a par with in-person patient visits before I would expand my use of telemedicine.[3]	31.8%	22.7%	40.9%	4.5%	0.0%

[1]These questions were asked only of the referring physicians (users and non-users).
[2]This question was asked only of the non-user consulting physicians.
[3]These questions were asked only of the user consulting physicians.

2.6 Current Funding for Telemedicine

Survey results showed that the main source of funding for telemedicine services was the federal government, as shown in Tables 17 and 18. Though the federal government was the largest source of funding, many different sources were stated overall.

Table 17: Main Funding Sources for Telemedicine

	Referring (N=16)	Consulting (N=9)	Total (N=25)
State grant	6.3%	0.0%	4.0%
State contract	6.3%	0.0%	4.0%
Federal government	31.3%	44.4%	36.0%
Insurance contract	6.3%	11.1%	8.0%
Corporate sponsorship	0.0%	0.0%	0.0%
Private/nongovernment organization	18.8%	22.2%	20.0%
Fees from clinical teleconsultation	0.0%	22.2%	8.0%
Revenue from educational use of TM system	0.0%	11.1%	4.0%
Support from parent organization	6.3%	44.4%	20.0%
Other	50.0%	33.3%	44.0%

Table 18: Stated Funding Sources

State Grant (N=1)
- Not sure - one time grant several years ago.

State Contract (N=1)
- UNMC

Federal Government (N=7)
- TIIAP (N=2)
- Indian Health Service (N=1)
- Medicare (N=1)
- REA (N=1)
- Applied for top grant (N=1)
- Department of Veterans Affairs (N=1)

Insurance Contract (N=1)
- Unknown as of yet.

Private/nongovernment Organization (N=2)
- Brain Injury Association of Nebraska - Through grant from the state. (N=1)
- Our own entity. (N=1)

Other (N=11)
- Self-funded (N=3)
- Grant obtained by host site (N=1)
- Hospital operations (N=1)
- Is used minimally, unknown (N=1)
- Poudre Valley Health Care System - Ft. Collins, CO (N=1)
- Radiology transmission (N=1)
- Rapid City Regional Hospital pays line charges when they send education programs (N=1)
- Fees (N=1)
- Private grants (N=1)

2.7 Ways to Increase Telemedicine Services

Hospital administrators were queried about interventions that they believed would increase telemedicine use. The two most important interventions conveyed were Medicare and Medicaid reimbursement, with 69% and 65% of the respondents, respectively, stating that reimbursements were very important (see Table 19). In general, issues related to financing stood out as the most important. Improving the convenience of using interactive video, providing CME, and expanding the offering of clinical applications also ranked of high importance.

Table 19: Interventions to Increase Telemedicine Utilization (Referring and Consulting Site Administrators)

	Very Important	Somewhat Important	Not Important
Medicare reimbursement	69%	15%	15%
Medicaid reimbursement	65%	19%	15%
Reimbursement for specialist providers	54%	35%	12%
Improving convenience of medical practice using interactive video	52%	36%	12%
Payment of facility fee for use of telemedicine	50%	39%	12%
Universal Services or other telecommunications subsidies	50%	23%	27%
CME for local providers	48%	28%	24%
Secure grant funding	48%	44%	8%
Reimbursement for referring providers	46%	42%	12%
Expand clinical applications/specialties offered	40%	48%	12%
Expand number of sites in network	32%	36%	32%
Offer telemedicine training for specialists	32%	56%	12%
Resolution of interstate licensure problems	30%	57%	13%
Establishment of standards for telemedicine equipment interoperability	20%	60%	20%
Telemedicine malpractice coverage for providers	16%	64%	20%

3. FOCUS GROUPS

To obtain a more detailed assessment, two focus group meetings were held–one with a group of health care workers who were currently using telemedicine services regularly as part of the Mid-Nebraska Telemedicine Network and one with a group of health care workers who were not currently using telemedicine services regularly. Each meeting was attended by physicians, hospital administrators, and, in the user group, nurse coordinators. This section summarizes the main points of discussion of both meetings.

3.1 Uses of Telemedicine

The most common use of telemedicine service mentioned by the group of telemedicine users was for mental health. Both focus groups stated that there was a lack of adequate mental health services in rural Nebraska and that telemedicine could be an important aid in providing services to those currently unable to obtain them due to distance limitations. In the treatment of mental health, all participants agreed that telemedicine could provide an essential service. The physicians in the user group had used telemedicine regularly for video consultations with specialists at the hub site for their patients. In addition, focus group participants stated that there are several patient support groups using the system including an arthritis support group, a cancer coping group, and a fibromyalgia support group.

3.2 The Benefits of Telemedicine

The main benefit for the referring physician that was discussed in the focus groups was that "everyone hears the same story." Communication is increased and the probability of

misunderstanding is decreased as the referring physician and the patient hear the diagnosis and recommended treatment directly from the specialist at the same time. Hence, the information given to the referring physician is reinforced and the treatment plan can commence immediately. In addition, several physicians or other relevant medical professionals can all see the patient at the same time—an opportunity which is rare in rural areas.

All of the health care professionals who were currently using telemedicine were of the opinion that physicians, patients (and their families), and hospitals could benefit from using the services. Patients benefit by being able to stay in their own community and close to home. It was also believed that emergency room and physician visits were reduced overall with the use of telemedicine services. Using telemedicine for specialist consultation can help referring physicians continue to treat their patients while ensuring that patients receive the best care possible. The patient continues to receive care in the local community, which ensures continuity of care for the patient and generates revenue for the community. This is especially true in the field of oncology, where the referring physician completes the assessment and then makes a diagnosis and treatment determination with the help of the oncologist. Local primary care physicians can use telehealth to discuss specific problems with particular specialists, including options in diagnosis and treatment. Nursing staff generate similar uses of the telehealth systems, resulting in improvements in diabetes education and wound care.

The physician users of telemedicine believe that it is a great aid in the delivery of CME. Weekly video conferences between physicians in the Mid-Nebraska Telemedicine Network were mentioned as one of the favorite uses of telemedicine; specially requested workshops delivered via telemedicine technology were also seen as beneficial. Referring physicians found that joining a patient for a video consultation with a consulting physician was a form of CME, giving the referring physician a chance to learn from the consulting physician, an opportunity not available in the past.

There are distinct benefits to the patients using telemedicine services. The convenience of using telemedicine rather than traveling to offices of specialists at remote sites can increase the likelihood of patients scheduling and keeping appointments. The reduction in travel time and distance can have a major impact on appearing during bad weather. A benefit of telemedicine not often mentioned in the literature that was discussed during the focus groups is that patients can talk to full teams of providers in a single visit.

The benefits of telemedicine can be summarized as follows:

- joint participation by physicians and patients in consultative sessions;
- CME for the health care professionals;
- patient care remains in the local community; and
- patients are more likely to make and keep appointments for care.

3.3 The Nurse Coordinator and Training in Telemedicine

Telemedicine users agreed that a qualified nurse coordinator was the key to a properly functioning telemedicine system. Physicians often rely on nurse coordinators to determine what can and cannot be done via telemedicine. Nurses have several options available for training in

telemedicine, including a general telemedicine educational class, a chemotherapy course, an arrhythmia course, and a trauma course. Lectures are held at the consulting site and nurses and other health care providers can participate from the referring sites. Occasionally, there are national and local workshops and other meetings. In addition, there is a list-serve available for nurse coordinators which allows them to keep current on telemedicine use and to discuss any potential problems or issues with others in the field.

3.4 Obstacles to the Expansion of Telemedicine

Responses to questions about potential obstacles or hindrances that may limit the potential expansion of telemedicine centered around technical issues. This was true of both focus groups. The most significant obstacle mentioned was the presence of high line charges. Although line charges have fallen substantially in recent years, it was stated that $500 to $600 per month, which is the current average cost, was too expensive for the smaller hospitals in the state. Paying for line charges is difficult, since at present that expense is not reimbursable by the rules of most insurance companies, Medicare, and Medicaid. Until regulations are written and payment initiated, we cannot determine if the new $25 facility fee in Medicare might apply toward these expenses. Nor can we predict what the costs may be in the future, although for small rural institutions the threshold to be considered “expensive” is quite low.

For the current users of telemedicine services, technical problems were a source of frustration. Having to wait or reschedule appointments due to faulty connections was a concern for all involved—patients, consulting physicians, and referring physicians. Participants in our focus group discussions believed that with ISDN, lines failed connections occur approximately 10% of the time, and with T1 lines, only rarely. The non-user group suggested that connection to fiber optic lines would be beneficial for hospitals and for telemedicine services generally. The system must also work properly for telemedicine to catch on with new users. It was pointed out that a clear picture and the synchronization of the audio and video were important considerations in satisfactory use of telehealth systems.

Members of both focus groups were queried about their thoughts on liability issues. It was more of a concern for the consultants than for the referring physicians. The referring physicians agreed that liability may actually be decreased since the opinion of a specialist was sought and obtained.

3.5 Disadvantages of Telemedicine

One of the main concerns of physicians is the potential for emotional detachment when the physician and the patient are not face-to-face, particularly when the consulting physician is dispensing unpleasant news. However, since many of these patients would not have been able to travel to consult with a specialist, a telemedicine consultation, even with this disadvantage, is often their only alternative.

It was speculated that patients with proximate access to specialists, even if only one week a month to a rotating clinic, are likely to perceive telemedicine as a sub-optimal means of getting consultation. This scenario was presented by some participants in the focus groups, in whose communities there are frequent rotating specialty clinics.

3.6 Reimbursement Issues

To date, those who are part of the Mid-Nebraska Telemedicine Network have been supported by grant funds. Participating hospitals have not been collecting fees from the patients who have been using the system. The grants will last for only a limited time, so hospitals are now starting to track and collect patient insurance data.

3.7 Community at Large

There was general agreement that a telemedicine link would provide benefits to the community in general. Video-conferencing would allow greater access to community health education. For example, schools could be hooked up to public health programs such as anti-smoking campaigns. A video-conferencing system could be used by the greater community for endeavors such as distance learning at both the high school and college level.[6] In O'Neill, the hospital's video-conferencing system has been used by the banking association and social services. Having such systems hooked up to local schools can provide access to larger rooms for communications to the larger community. In Kearney, the family advocacy network has been using similar systems in interviewing abused children. One trained interviewer can be in the room and others can be situated at remote sites. This allows for more accurate information as the child may be more willing to talk to just one trained interviewer. There are clearly many uses for video-conferencing systems that would benefit the community as a whole.

3.8 The Future of Telemedicine and Steps Required to Increase Use

Those who currently use telemedicine are very enthusiastic about its benefits. Current users agree that it would be useful for non-users to see the system in use. One of the referring physicians commented that he was pessimistic about using telemedicine services at the outset and "needed to be impressed," which he was. Current users believe that quality and access have been improved and that this can be easily demonstrated. Patients are embracing the technology. It was noted that telemedicine does not take the place of face-to-face care but rather augments it.

Non-users stated that the first step should be using telehealth technologies for educational purposes. All focus group members believed that telemedicine is a tremendous method for rural physicians to gain access to seminars, grand rounds, and other CME activities. Both groups believed that having people start out by attending a weekly meeting would be a good way to get new users accustomed to the technology. It was suggested that there should be a consistent meeting time set up so that a routine could be established (for example, family practitioners meet the third Thursday of every month). The non-user group concurred that if a system was set up and used initially for meetings, medical consults would follow. This was consistent with the advice of the users.

The physicians and medical experts who are currently using telemedicine services all believed that telemedicine improved the continuity of care of rural patients. Many in the group believed

[6]Currently, approximately 85% of all the high schools in state and all of the colleges have 45 mbps video capabilities (Hahn, 2001).

that telemedicine “enriches the entire experience” as it benefits both the patients and the physicians. It was agreed by both groups that telemedicine is here to stay and its use by physicians will continue to increase. Both focus groups concluded that the current champions of telemedicine in Nebraska are needed to convey the potential benefits of its use to those not currently using the technology. Hearing about telemedicine from a peer was the most important method of spreading the word. It was recommended that newsletters be used to convey information about telemedicine to physicians in the state.

PART III: DISCUSSION AND RECOMMENDATIONS

1. DISCUSSION

To implement a successful telehealth program the intended users should have input to its development. The attitudes of physicians—both specialists and primary care providers—will be largely responsible for the success or failure of a telehealth program. In this report we have assembled, reviewed, and discussed the attitudes of physicians in Nebraska with respect to telemedicine (those telehealth applications most readily recognized by the health care delivery system). This included learning what telemedicine services have been used in the state and what is likely to be used if available. It is important to note that technology does not drive telemedicine. What has been referred to as the "Field of Dreams" approach—build it and they will come—has proven unsuccessful (Chin, 1998). The buy-in of physicians and other providers is essential if a telehealth program is to be successful. Only by understanding their needs and attitudes is that possible.

It is also important that an evaluation component is built-in and is an integral part of any telehealth program. Telemedicine evaluation, in its infancy, is difficult to evaluate because it is broad and large in scope (Yawn, 1999). Data collection and outcome measurement must be a part of the program. Telemedicine appears to have much potential in improving the health status of rural residents and thus there should be a clear policy commitment, including appropriate funding, to increase its use in years to come.

Telemedicine services have been employed on a limited basis in Nebraska for several years. Those using telemedicine services have found their experiences to be positive. Telemedicine benefits patients who were previously unable to access health care services and meets physician's needs in terms of several aspects of CME. Physicians who use telemedicine services may be in the best position to promote the technology to physicians who are not currently using it. Physicians respect their peers and would probably be most amenable to learning from them. The enthusiasm that telehealth users exhibited in the focus group would definitely help sell the program and alleviate some of the potential fears and misconceptions of those yet to embrace telehealth services.

2. RECOMMENDATIONS

2.1 Initial applications of telehealth must be responsive to the providers' needs.

Introductory telemedicine services should include CME and mental health applications. Many physicians in the state have begun to use telemedicine services in the form of CME. This is clearly an important function and service in a rural state and should be continued and enhanced. In addition, regular (perhaps weekly) seminars would provide important exposure to some of the capabilities of telemedicine. CME would provide a basis of familiarity with the technology and could be an important starting point in the introduction of a broader telemedicine program. Given the identified need for and effective use of mental health services via telemedicine applications this should be one of the primary implementations. The next uses should focus upon teleradiology and follow-up care.

2.2 Any new program should aim to include interactive video.

Interactive video was the most commonly used technology in the state. Although non-users expressed a preference for a store-and-forward system, users have had positive experience with interactive video and expressed a preference for that technology.

2.3 Health professionals currently using telehealth services should be champions of those applications.

Including the current users and champions of telemedicine in the state in planning for future programs would be beneficial. Current users could explain the benefits of using telemedicine. It is also important that non-users understand that telemedicine is a supplement to current health care.

2.4 There should be formal training for everyone involved in telehealth consultations.

Formal training in telemedicine is imperative in implementing a new program. This is of utmost importance for telemedicine nurse coordinators. An informed nurse coordinator is the key to running a successful telemedicine program. Physician assistants, or telemedicine clinical coordinators can also provide comparable essential services. Hence, training for these individuals must be supported. Staff training is a key to success–"a comprehensive promotion and training program in the use and application of information and communication technologies for health, including dissemination of experiences from existing telehealth projects, is a mandatory component of any telehealth project" (World Organization of Family Doctors, 1998).

2.5 Advocates for telehealth must continue to press for changes in reimbursement policies .

The issue of funding is clearly an important one. Funding is a concern with respect to both the implementation of a telemedicine program and its ongoing success. Currently, the users of telemedicine services in the state have relied on a variety of sources, mostly grants, to implement and maintain their programs. Ongoing funding is essential for the upkeep, maintenance, and upgrading of equipment when necessary. Line charges are an obstacle to many of the smaller providers in the state. In addition, much of the state does not have access to broadband Internet connections which is an important factor in the implementation of telemedicine service. Improving the technological infrastructure would have broader benefits in the state beyond improving telemedicine services. Reimbursement issues also must be solved with respect to telemedicine consults which are currently not covered by Medicare or most insurance programs.

2.6 Programs in telehealth should incorporate broad-based community participation by including applications of interest to community groups.

Considerable investments are needed to build telehealth systems. To secure a maximum return on those investments, and to be of service to the community, applications should be developed that address topics of concern to the community. For example, video-conferencing capacity could be used for community groups wanting to participate in state and/or regional activities. Links could be provided to national programming in health care. Health education programming and assistance in management of chronic conditions can be enhanced through telehealth.

2.7 Fast, and reliable broadband interconnectivity needs to be available.

For a telehealth system to catch on with new users it must work properly. An infrastructure that can move large amounts of video and data at quick speeds is required. The physicians using the system must be assured that fast and reliable technology is available to support their commitment to the use of such a system. Access must also be provided at an affordable cost that allows smaller hospitals access and removes one of the major impediments to a telehealth system.

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