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Innovations in the Delivery of Health Care Services to Rural Communities

Telemedicine and Limited-Service Hospitals

Over the last decade, changes in health care policy, demographics, and technology have presented new opportunities for delivering medical care in rural areas. Telemedicine and limited-service hospitals are two innovations currently used to strengthen the likelihood of continued health care in rural communities. Montana is one of the few States where both these options have been implemented, providing a unique environment for observing the effects of each on rural health care systems, communities, and individuals.

Health care policy and the presence of health care services in rural areas are important concerns in American society. The viability of many rural, agriculture-based communities depends on a number of factors, including the quality and level of health care services accessible by the population. Over the last decade, changes in health care policy, demographics, and technology have presented new opportunities for delivering medical care in rural areas.

Nationwide, two different approaches have been implemented to meet the challenge of providing health care in rural communities. Telemedicine is a rapidly growing technological application for delivery of services when distance separates the provider and the patient. And limited-service hospitals, known as Critical Access Hospitals (CAH), are designed to address the needs of distant rural communities where full-service hospitals are not financially viable. At first glance, these approaches seem quite different since one attempts to expand the range of services provided by a rural health care facility while the other effectively limits services. However, both are innovations that may strengthen the rural health care system, affect access to/quality of health care, and contain costs of delivering health care service.

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With every health care innovation comes the challenge of determining whether the benefits outweigh the costs, and whether public support is justified. From an economic perspective, the main considerations include how these changes in the delivery of health care services will affect health care *quality, access, and cost*. Both public sentiment and Federal directive hold that rural residents are entitled to some basic level of health care services (however that is defined), but what combination of services and delivery is most efficient, and how does that change as the demographic and geographic parameters change? To determine this, relevant costs and benefits must be identified and measured. Applying economic methods to the valuation of changes in rural health care systems may be a first step to understanding the effects of each option on rural communities, on the viability of existing health care facilities, and on consumers.

This article presents an overview of telemedicine technologies and Critical Access Hospitals that is key for evaluating the net benefits to rural residents. Anecdotal evidence on the impacts of limited-service hospitals and telemedicine technologies in rural Montana suggests that different situations require different health care solutions. Varying combinations of full-service hospitals, limited-service hospitals, telemedicine, and other options will make economic sense depending on economic and demographic conditions. The increased flexibility afforded by current legislative changes in health care regulations is a move in the right direction.

Changes in Rural Population, Hospital Closure, and Health Care Policy

Over 300 rural hospitals have closed since 1980, with closures peaking in the late 1980's (fig. 1). The health care literature commonly cites several reasons, including changes in the makeup of rural population, difficulty in retaining physicians, and the restructuring of Medicare reimbursement. Outmigration of younger residents from agriculture-based areas has resulted in rural population decline and a disproportionately large number of elderly people in rural areas (Rathge and Highman). Small and isolated community hospitals struggle to attract and keep physicians, compounding the challenge of keeping a low-volume facility open.

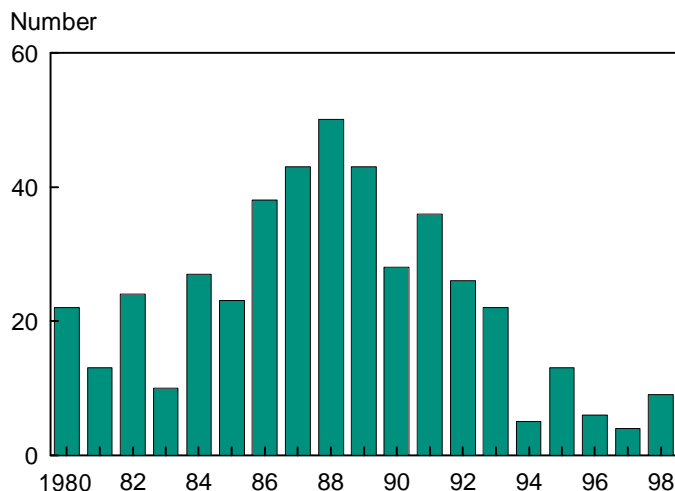
In 1983, Medicare reimbursement to hospitals shifted from a cost-based to a prospective payment system, so hospitals began to be paid a fixed amount depending on diagnosis rather than a reimbursement according to "reasonable cost" of providing care. Under the prospective payment system, smaller rural facilities commonly fail to cover costs on Medicare patients. This, in combination with the fact that rural hospitals serve a proportionately greater elderly and low-income population than their urban counterparts, has worsened the financial crisis for many rural hospitals.

The actual and potential loss of hospitals has left rural citizens with very different health care options than in years past. Two new delivery methods implemented to mitigate the scarcity of services are (1) new types of rural hospitals exhibiting a limited-service philosophy and (2) a more widespread use of telemedicine.

Figure 1

Rural hospital closures, 1980-98

After peaking in the late 1980's, hospital closures continued, though at a slower rate

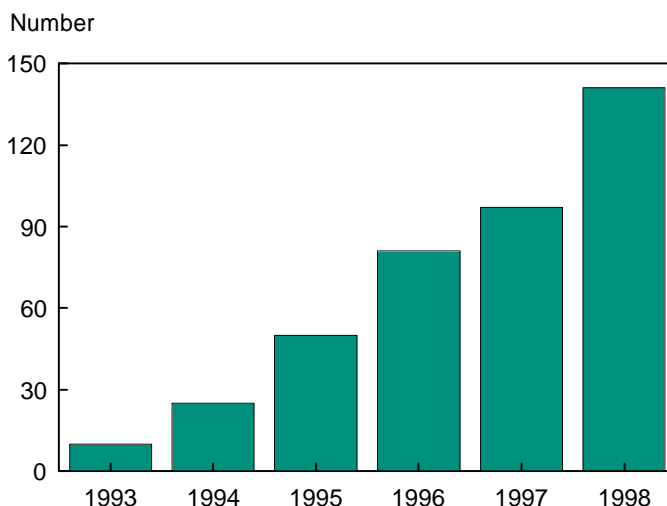


Source: American Hospital Association Statistical Profile, 1994 (1980-93); Office of the Inspector General (1988-95); Susan Reif, Sheps Center for Health Services Research, 1999 (1995-98).

Figure 2

Telemedicine programs reporting activity in the United States, 1993-98

The number of telemedicine programs nationwide has grown steadily in recent years



Source: Association of Telemedicine Providers, 1998 Report on U.S. Telemedicine, Portland, OR, 1999.

Telemedicine Offers New Options for Rural Health Care

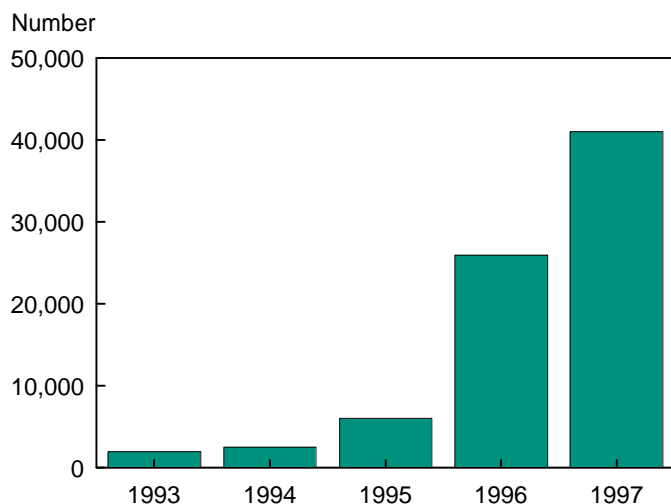
Telemedicine is the use of electronic information and communications technologies to provide and support health care when distance separates provider from patient. A telemedicine network connects distant "spoke" sites, often located in rural communities, both with one another and also with the "hub" site, which is usually a larger urban center. Distance-bridging tools include teleradiology (sending x-ray images via electronic means), the use of telephones to perform diagnostic tests (such as cardiac checkups), and interactive video consultation. Interactive video can bring distant sites into simultaneous communication, and can be used for conferences between patients and practitioners.

The dramatic rise in the number of telemedicine networks (fig. 2) suggests a perception that by joining forces with a larger hospital, a rural facility can increase its chances of survival. According to the Association of Telemedicine Service Providers (ATSP), the number of telemedicine consults has risen more than twentyfold in 5 years (fig. 3). (A consult refers to a specific patient-provider interaction, or a provider-provider interaction.) By 1998, ATSP had identified 141 active telemedicine programs in the United States. The most widely used specialty applications are mental health, dermatology, cardiology, orthopedics, and emergency room/triage services. Other uses of telemedicine include followup procedures for surgery patients, pediatrics, pathology, nutrition, primary care, and neurology, as well as radiology and clinical drug trials.

Figure 3

Telemedicine consults, 1993-97

Telemedicine is rapidly becoming a widely used treatment option



Source: Association of Telemedicine Providers, 1997 Report on U.S. Telemedicine, Portland, OR, 1998; *Telemedicine Today Magazine* Program Reviews, 1994, 1995, 1996.

Federal funding—including grants for equipment and research, subsidized long-distance telecom rates, and Medicare reimbursement policy—has nurtured the development of telemedicine. Federal agencies focused on rural development issues, such as the Rural Utilities Service and the Office of Rural Health Policy, have been active in funding telemedicine programs (fig. 4). Whether grant-initiated programs will be able to continue once outside support ceases is difficult to determine due to the fairly recent nature of these projects and lack of standardized data.

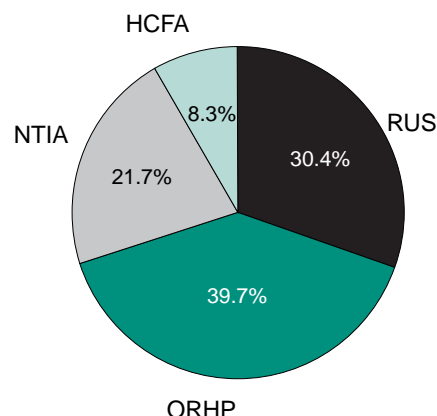
The Telecommunications Act of 1996 includes rural health care as one of its targets. In essence, the law encourages development and use of interactive video by providing subsidies to rural hospitals in the form of reduced long-distance rates. Connections between video sites are usually made via high-bandwidth telephone cable, so one of the highest variable costs faced by a telemedicine program is a charge equivalent to constant multiple long-distance telephone calls.

Reimbursement is another area where Federal health care policy could greatly affect the use of telemedicine. Teleradiology consults have been reimbursed by Medicare nearly since their inception. However, interactive video consultations are generally not reimbursed by Medicare, since present policy in many States requires a “face-to-face encounter between patient and provider.” In the past, this lack of physician reimbursement under the Federal insurance plan has discouraged practitioners from consulting by video.

Figure 4

Selected sources of Federal funding for telemedicine, 1993-96

At the Federal level, telemedicine funding comes from a variety of sources



Note: RUS = Rural Utilities Service; HCFA = Health Care Financing Administration; NTIA = National Telecommunications and Information Administration; ORHP = Office of Rural Health Policy.

Source: Federal Telemedicine Gateway web site, 1998.

Federal dollars have also been used to inventory, evaluate, and standardize telemedicine programs. One of the main oversight groups is the Joint Working Group on Telemedicine (JWGT), which has reported to Congress on the use of advanced telecommunications services for medical purposes, and inventoried programs and Federal spending for telemedicine. A web site, the Federal Telemedicine Gateway (<http://www.tmgateway.org/>), was established to convey this information. Additionally, in 1998, the U.S. Department of Health and Human Services established a new office directed specifically toward telemedicine activities. Responsibilities of the Office for the Advancement of Telehealth include policy and program development, assistance for health officials and grantees, and production of health education tools.

With telemedicine, opportunities exist for the rural hospital or clinic to expand its scope and quality of services, increase cost-effectiveness in providing existing services, and to enhance the collaboration with a larger hospital. Both the rural residents and the hospitals are potential beneficiaries from this technology, although the magnitude of these net benefits will vary by community.

Critical Access Hospitals: A Tactic for Preserving Health Care in Isolated Communities

Historically, one strategy to maintain acute health care services in rural communities with health care facilities at risk of closing has been the conversion of full-service hospitals to limited-service hospitals. These hospitals tend to be in remote sites, with services limited to short-stay inpatient care and emergency care. In matching the needs of

rural residents with financially viable health care, the limited-service facility shifts its emphasis from inpatient and surgical services to emergency, primary, and outpatient care.

The Critical Access Hospital (CAH) is the most recent form of the federally recognized limited-service model. The CAH program started as part of the 1997 Balanced Budget Act. Earlier precedents were the Rural Primary Care Hospital (RPCH)—authorized in New York, West Virginia, North Carolina, South Dakota, Kansas, Colorado, and California—and the Medical Assistance Facility (MAF), developed and implemented in Montana. While the CAH is a hybrid of both the RPCH and MAF models, it more closely parallels the structure of the MAF model.

The CAH allows for cost-based reimbursement by Medicare and is designed to provide inpatient care to ill or injured persons prior to transport to another hospital or to provide inpatient care for no longer than 96 hours. Only facilities located in a county with fewer than six residents per square mile or more than 35 road miles from the nearest hospital are eligible to be certified. A CAH is limited to 15 or fewer inpatient beds. Emergency room and inpatient services are provided by physicians, physician assistants, and nurse practitioners. CAH rules allow midlevel providers (physician assistants and nurse practitioners) to practice without a supervising physician onsite, while staffing requirements for registered nurses and emergency room coverage are also relaxed.

To participate in the CAH program, a State must submit a health plan. According to a September 1998 study, 43 States had expressed interest in the CAH program. Of these, 16 States had already submitted a State health plan, with most approved and the others awaiting approval by the Health Care Financing Administration (HCFA), which administers the Medicare program. At that time, 18 additional States were in the process of drafting State plans. Six States did not plan to participate in the CAH program due to lack of eligible or interested health care facilities, and one State did not participate in the study. Thirty RPCH's in four States have been designated as CAH's, and there is one newly licensed CAH. The 12 Montana MAF's are expected to convert in 1999 as well. State program directors estimate 200 to 300 possible additions to the CAH program (Reif and Ricketts).

Montana Health Care Transformed by Both Limited-Service Hospitals and Telemedicine

Montana provides a unique opportunity to observe the impacts of limited-service hospitals and the addition of telemedicine to the menu of health care services available to rural communities. In 1987, the Montana legislature created the Medical Assistance Facility (MAF) in response to the accelerated rate of rural hospital closure. It was

designed to serve remote communities with small health care facilities to ensure at least emergency and basic health care.

As of 1997, the MAF model had been implemented in 12 communities in Montana. Anecdotal evidence suggests that the MAF's helped maintain and improve access to local health care. Shreffler and others found that local decisionmakers viewed MAF conversion as a method of stabilizing or restoring the local health care services most needed or used by their community residents. As a whole, the issues most influential in the conversion decision were those that made the provision of basic health care services in these isolated communities more stable and sustainable. The flexibility of the MAF model, cost-based reimbursement, and relaxed staffing requirements all represented improved options for viability that full-service hospital licensure did not. Notably absent from the list of concerns over conversion was the fear of reduction in local services. In reality, these facilities had limited their services gradually over the years prior to conversion. Conversion to a MAF was viewed as a means to save and strengthen both the hospital's core—basic health care—and the community's viability, since the loss of reasonable access to health care often signals a decline in economic development (Cordes and others).

MAF's fulfilled the need and/or desire for local emergency coverage, and improved potential for recruiting and retaining primary care providers. Both aims are more realistic and affordable with the MAF model because it uses midlevel providers in addition to, and sometimes in place of, primary care physicians. This strongly suggests that any national program to maintain or improve access to rural health care should allow for primary, inpatient, and emergency coverage by midlevel providers. Ongoing research efforts seek to identify the effects of substituting midlevels for physicians, but when the choice is between a midlevel provider and no provider, as can be the case in remote hospitals, the midlevel wins every time.

Long-term care also factored in many community decisions to convert to a MAF, which can realize greater economies of scale by sharing personnel and expenses with local nursing homes, further stabilizing both entities. The implications for other CAH's are similar, given the high proportion of elderly in most rural areas nationwide and the desire to provide quality long-term care in rural communities.

In 1995, the U.S. Government Accounting Office studied the cost to Medicare for treating beneficiaries at MAF's versus full-service hospitals under the prospective payment system. Medicare costs at MAF's were on average lower than if the patients had been treated at a full-service rural hospital and substantially lower than if they had been treated at urban hospitals. These costs reflected a variety of primary and emergency care, as well as inpatient and outpatient procedures.

Data and Methods

Data for Montana telemedicine were collected in cooperation with Eastern Montana Telemedicine Network (EMTN) based in Billings. Uses of the system ranged from mental health and medical consults to continuing education for hospital employees and meetings scheduled by community groups. Data were collected from each of the seven outlying hospitals in the system between 1993 and 1998, and contained between 3 and 6 years of data for each of the sites for a total of 33 consult years. The number of consults in a year ranged from only 2 in one small community to 382 at a well-established mental health facility. The participating hospitals varied widely in both size of population served and distance from Billings.

For each use of the interactive video system, information recorded included length, time, and date of the telemedicine consult; location of each participant; and general category of use. Over the life of the EMTN, mental health has been the most common use of the system. For this reason, mental health services, consisting mainly of consultations between patients in outlying areas and psychiatrists in Billings, were used to determine rate of use. Per capita use is the total number of uses as a percentage of the eligible population, or the number of the hospital's service area population who were likely to need mental health care. In mental health needs assessment, statistics such as age, income, sex, and marital status can be used to predict the number of residents in a given area who may need mental health care. Per capita use of the telemedicine system was regressed upon a nonlinear specification of the use rate as a function of distance from Billings and length of program. The expected sign on both the distance and program year variable was positive.

Use of the Eastern Montana Telemedicine Network

The Eastern Montana Telemedicine Network (EMTN) has been operating for nearly 6 years and provides interactive video connections to seven communities throughout eastern Montana. The spoke sites are connected to one another and to the hub site in Billings by a dedicated fiber-optic cable and are equipped with interactive video and audio capability. Like many telemedicine programs, the EMTN was initially established with funds obtained via Federal grant. However, since expiration of the original 3-year grant, the network has been operated principally by non-profit Deaconess Hospital.

Using data that track each use of interactive video on EMTN, a study estimated the cost savings to patients who used the network as a substitute for traveling to the nearest mental health site (Heggen). The averted cost estimates reflect actual travel expenses that were saved as well as the opportunity cost of the patients' time (see "Data and Methods"). Averted costs per year ranged from \$268 at one spoke site to \$51,283 at another. However, this should be viewed as the lower end of possible bene-

fits, since it only takes into account the value of this telemedicine consult to the individual. A complete accounting of the benefits from a telemedicine network would need to reflect other uses in addition to interactive video for mental health consults, as well as the benefits to a community if local health care services are maintained or enhanced.

The same study also explained variations in per capita use of the network at each of the telemedicine sites. Many factors could affect the rate at which a community uses telemedicine resources, including distance to alternative care and the number of years a site has been in operation. Both of these factors were tested. Telemedicine becomes a more attractive treatment method as the distance to alternative care increases. As a program gains the confidence of local users, use of the system should increase. The analysis bore out both hypotheses. Elasticity measures, which compare the percentage change in one variable to the percentage change in another, indicate that a 10-percent increase in either distance or longevity of the telemedicine program resulted in a comparable 10-percent increase in the per capita use rate. These increases in per capita use rates may be attributed to both a shift by present users toward local treatment (versus care sought in Billings), as well as an increase in the total number of patients who have decided to seek care (in response to lower time and travel cost).

Conclusions

The benefits of changing the delivery methods of rural health care vary with the size and location of a community, distance from alternative health care services, attributes of existing area health care services, and community demographics. The combination of services that makes economic sense for one community may not be cost-effective or deliver the same level of benefits to a second community. Rural health care policy must adjust to needs of different communities; current changes to the Federal legislation that allow Medicare reimbursement for patients using limited-service hospitals and telemedicine are a start.

MAF's in Montana appear to have increased access to and reduced the cost of emergency and primary care in frontier rural communities. However, research on MAF's has not attempted to address possible differences in the quality of care. Research is urgently needed on methods to measure changes in quality and whether limited-service hospitals affect quality. This research should also include a more indepth analysis of factors that demonstrate the need for improved access to rural health care. What should determine "critical access"—mileage from health care, demographic indicators such as percentage of elderly, level of use, or some other measure?

To determine which combination of services (for example, full-service hospital, limited-service hospital, and/or telemedicine) makes sense for rural communities, analysis must determine the value of health care innovations in the context of other health care options and interfaces. For example, whether telemedicine makes good economic sense for rural communities may be influenced by the degree of "cost sharing" with other telecommunications services.

Often, evaluations of telemedicine and limited-service hospitals are limited to their effects on the financial position of the facilities involved, along with demonstrating clinical effectiveness of procedures. While these are certainly important issues, this seems a very narrow view of determining the full value of these technological and institutional changes. It is important to remember that telemedicine or CAH's are not so much products in themselves as they are a method for delivering the product of health care. The value of telemedicine or limited-service facilities, especially in rural areas, should take into account how they affect the behavior of consumers (that is, whether they alter where and how often residents seek care) and their impacts on the overall health of rural communities.

For Further Reading . . .

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