

## Project Report

# Telehealth in the Trenches: Reporting Back from the Frontlines in Rural America

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### ABSTRACT

Access to appropriate healthcare services continues to be a major challenge in rural America. Telehealth technologies offer an opportunity to bridge gaps in health services in rural and remote areas and possibly support rural economic development. Lack of access to healthcare services to a growing population may create barriers to recruitment of businesses and economic growth. Several rural-oriented programs have attempted to leverage these emerging distance technologies, but success has varied despite the application of considerable federal, state governmental, and private resources. Barriers to adoption and sustainability of rural telehealth embody several factors that must be considered when planning, developing, implementing, and evaluating a rural telehealth program. New Mexico, the fifth largest state in the United States, represents many of the issues related to the potential benefits and challenges in developing a telehealth system to serve its rural communities. The Center for Telehealth at the University of New Mexico Health Sciences Center has been supported in large part by state and federal funding. Through our experiences, successes, failures, and lessons learned, we have developed approaches to overcoming barriers to adoption and sustainment of telehealth applications, including the establishment of partnerships with economic development projects in the state. This article describes these experiences and identifies and provides strategies for planning, development, implementation, and sustainment of telehealth in a rural program.

### INTRODUCTION

**A**CCESS TO APPROPRIATE HEALTH CARE is a significant challenge in rural America. This is due to limits in local expertise and resources, economic infrastructure, and reimbursement, as well as difficulties in retention and recruitment

of health professionals, smaller population bases, isolation, and significant distances from needed expertise and service. At the same time, significant rapid advances in computer, information, and communication technologies as applied to health care, known as telehealth, offer an opportunity to improve access to health care

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in rural settings. Telehealth is not a new concept<sup>1-4</sup> and encompasses the use of electronic information, imaging, and communication technologies to provide and support health care when distance separates the participants.<sup>1-3</sup> However, despite the apparent benefits of telehealth integration into the delivery of health care in rural communities, there continues to be a delay in more general adoption and sustainability in many areas of rural America.<sup>5</sup>

This article reports on the experiences of a rural telehealth program in New Mexico, with its successes, failures, lessons learned, and approaches to ongoing future development to achieve more general adoption and sustainability. Many of these experiences are applicable to other rural telehealth programs and may be considered in strategic planning, implementation, and maintenance, particularly during times of high demand and need for health services. The New Mexico Telehealth Network (NMTN) was developed with support from the Health Resources and Services Administration. Its rural sites include the only state-supported mental health in-patient hospital, as a hub site for mental health services, a county-owned rural hospital, a larger for-profit remote hospital, a not-for-profit community health clinic, and a not-for-profit mental health center. None of the partners in the project was related administratively to each other. The University of New Mexico Health Sciences Center is the primary hub site. It has the only medical school in the state.

## METHODS

The resurgence of telehealth development in rural America in the 1990s was catalyzed by a new round of rural telemedicine federal grants.<sup>6</sup> The Center for Telehealth (CfTH) was supported by the Office of Rural Health Policy and later administered by their newly formed Office for the Advancement of Telehealth (OAT), which developed the NMTN.

The rural telehealth program developed in three definable phases: (1) pre-planning, (2) start-up, and (3) sustainability. The goal of the New Mexico telehealth program was to develop a set of models that could be used to help

guide the development of telehealth programs in rural locations. The staff included a project manager, clinical services manager, business manager, and technical manager. Feedback from rural site coordinators, rural health providers, and administrators was also provided.

## RESULTS

### *Pre-planning phase*

*Needs assessment.* One of the biggest challenges for the CfTH was the development of a comprehensive needs-assessment methodology based on the OAT model. Although a critical step, our early experiences were essential in determining the true needs and how they can be met. The OAT grant required a list of seven specialty clinical services to be developed between hub and spoke sites, including emergency medicine. These services were to be delivered in regularly scheduled telemedicine clinics. Initially, the spoke sites were often eager to participate, but their perceived need for telemedicine clinical services may have been overstated.

There was a perception that many rural patients were traveling long distances to receive care from the University of New Mexico Hospital (UNMH). Spoke site physicians and other healthcare providers were able to articulate these needs in many specialty areas. This did not prove to be the case. In most instances, we were not able to generate enough activity in a given specialty to hold monthly clinics. In several instances, we were unable to provide sustained consultations after the initial one or two encounters. Specialty services requested included: rheumatology, nephrology, fluoroscopy, speech, occupational and physical therapies, dermatology, oncology, pathology, gastroenterology, pain management, pediatric subspecialties, and adult psychiatry (pre-admission screening, outpatient counseling, pre-discharge planning, chemical dependency/substance abuse therapy, and family visitation and therapy). Of these areas, only fluoroscopy and adult psychiatry services were requested as ongoing clinics.

Two years into the project, we requested that all spoke sites in the network do a “retroactive” baseline study of referral data to determine clinical needs based on the number of referrals and patient visits to Albuquerque. Few of the patients traveling from the remote sites to Albuquerque were being sent to the hub site UNMH, although they were traveling to other facilities in the Albuquerque area for treatment. While spoke sites may indicate needs in specific areas, it is now obvious that perceived needs for using telehealth and actual referral patterns may differ significantly. Accordingly, we stipulate that baseline referral data be gathered prior to instituting any given specialty. Had this work been done prior to telemedicine system installation, we may have made different decisions regarding selection of spoke sites and clinical applications.

We are working with established active university rural outreach programs to the specific services to be provided or augmented via the telemedicine network. Hence, we would identify the need and an established outreach program with willing providers who are already in place. Moreover, we have continued an extensive planning process that includes participation of the proposed spoke sites and University of New Mexico Health Sciences Center (HSC) programs. We have developed telehealth site and telehealth application selection criteria with associated assessment tools (see Figs 1 and 2, the Appendix, and Table 1). These tools assist in determining likelihood of successful development and establish implementation priorities at a particular site. Figure 1 depicts the model followed to evaluate and develop a potential telehealth application. Figure 2 is the algorithm followed in evaluating and developing a specific telehealth site. As shown in the Appendix, we ask a series of critical questions in determining the potential site’s likelihood of success in development and sustainability of a telehealth program. We ask participating sites for comprehensive referral baseline data and establish evaluation tools during the planning process. As shown in Table 1, we then score the potential programs in considering successful deployment, and rank programs to determine how best to direct and prioritize the use of limited resources. Al-

though not formally validated, the tools have proven to be useful in applying a consistent, organized approach for strategic planning, program development, and expansion. They can also provide measures against which to judge success in sustaining a specific telehealth application or site once the decision has been made to proceed with implementation. Further, the ultimate outcomes of the programs and the sustainability will eventually determine the validity of these tools and the decision-making process.

*Organizational issues.* The CfTH has been placed organizationally within the School of Medicine at the University of New Mexico HSC. CfTH is a stand-alone program separate from other clinical departments. The administrative office is located off-campus in a residential area close to the HSC, while the telemedicine and a teleradiology suite are distributed within the UNMH and the HSC. The program does not have “high profile,” highly visibility. Due to the physical separation between the administrative and clinical locations, there is little spontaneous interaction with most clinical departments. It may be advantageous to be in closer proximity to the clinical departments.

Spoke sites in the NMTN are independent autonomous entities without any obligations to the University of New Mexico and the CfTH other than their signed Memorandum of Understanding to participate in the project. It has been challenging to “lead” the network in an effective manner. Often, rural sites did not respond to requests for information and/or action, or provided only nominal support. Rural sites did not have the time or resources needed to comply with the demands of the project.

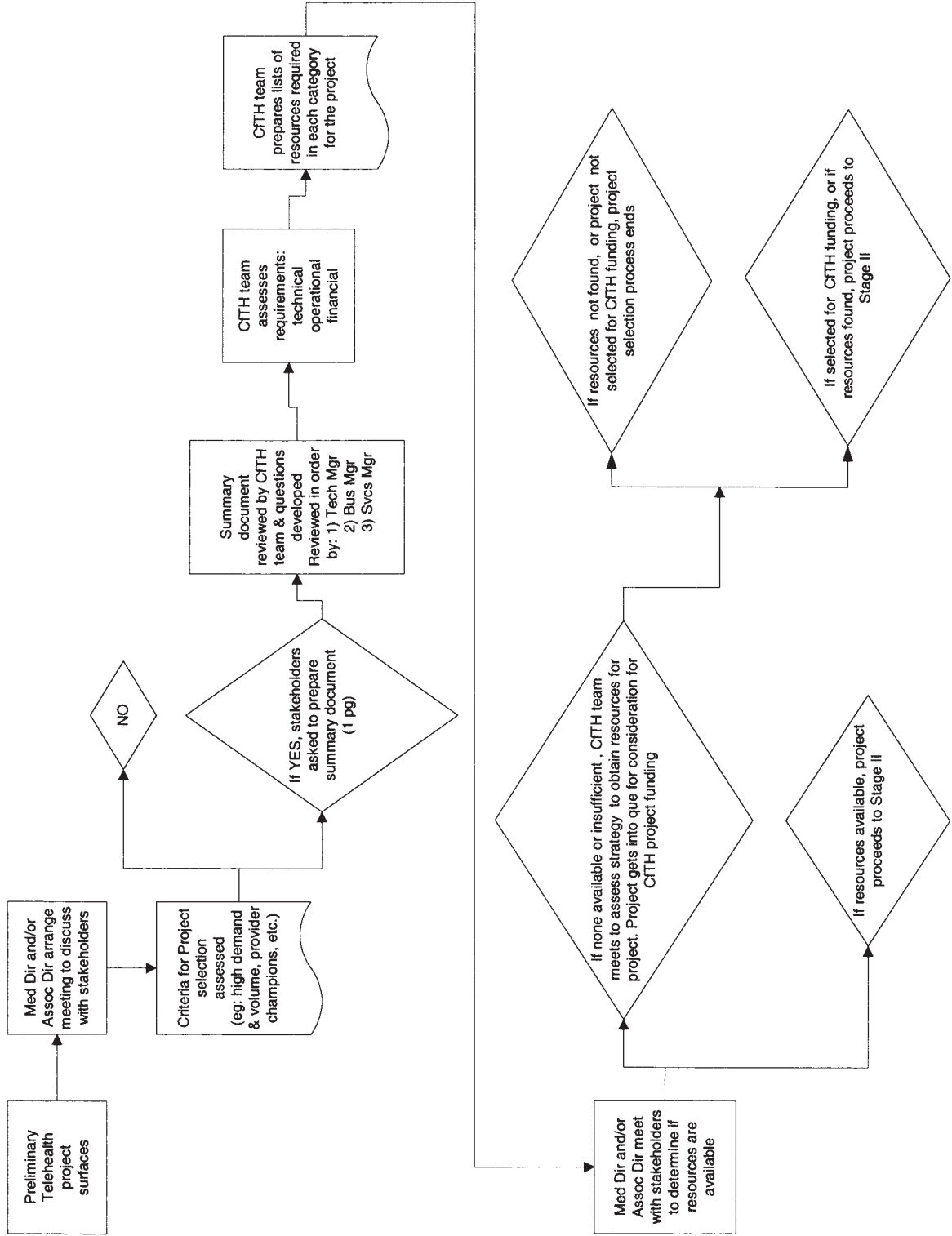
*Purchasing equipment/telecommunication services.* There are two categories to consider in determining which equipment/telecommunications services are best for program needs: general systems requirements and requirements based upon a needs assessment.

General system requirements:

1. The system must be standards based and should integrate easily into any existing infrastructure. Since technology is chang-

CENTER FOR TELEHEALTH  
PROJECT DEVELOPMENT PROCESS

STAGE I



CENTER FOR TELEHEALTH  
PROJECT DEVELOPMENT PROCESS  
STAGE II

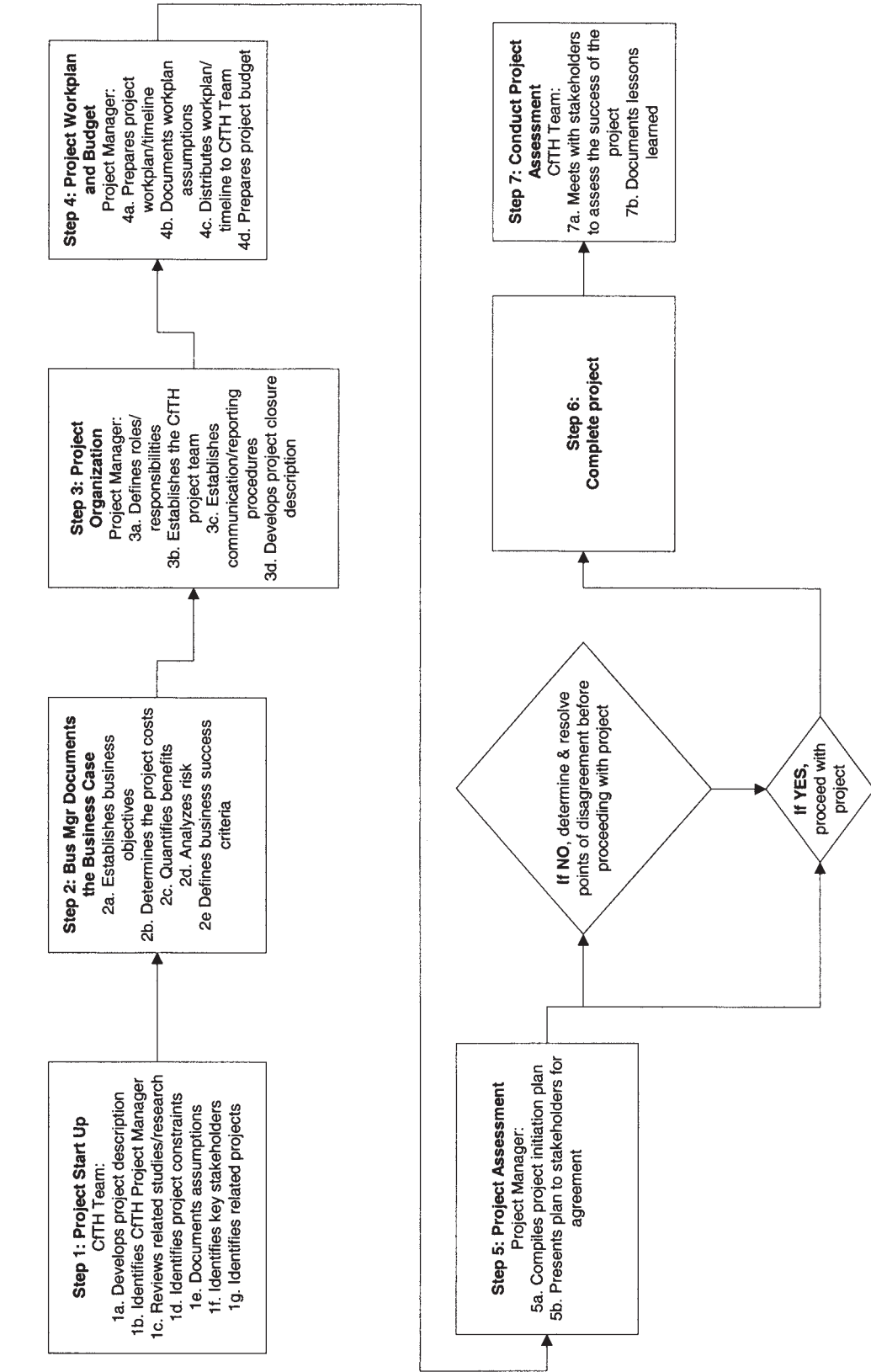
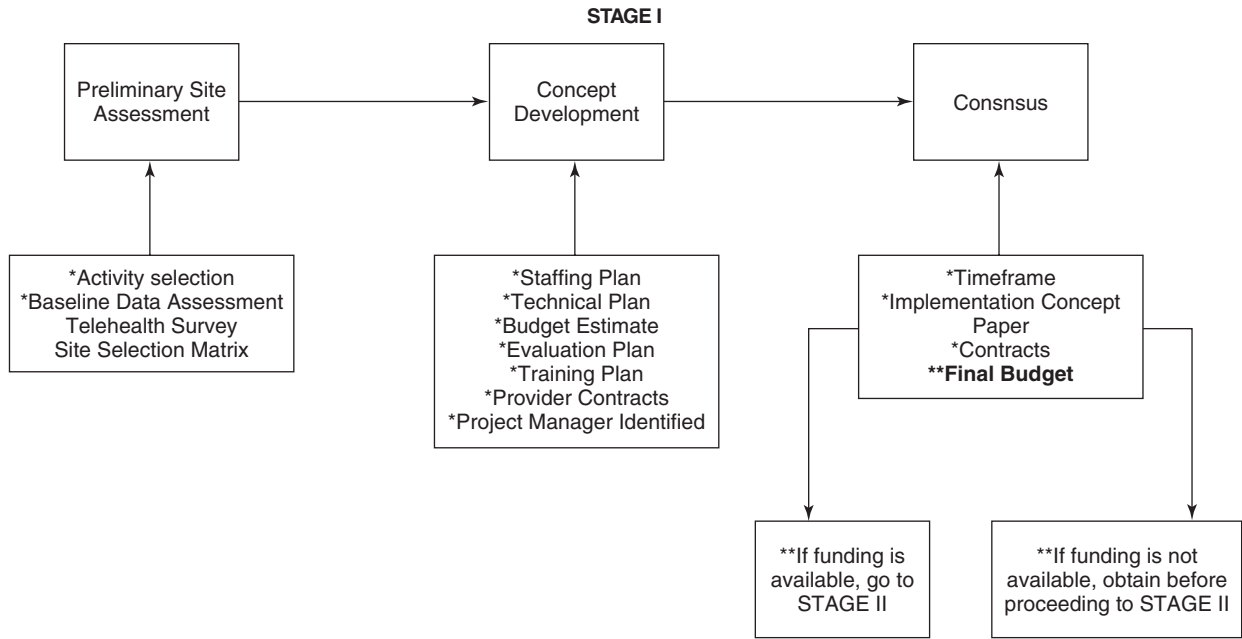
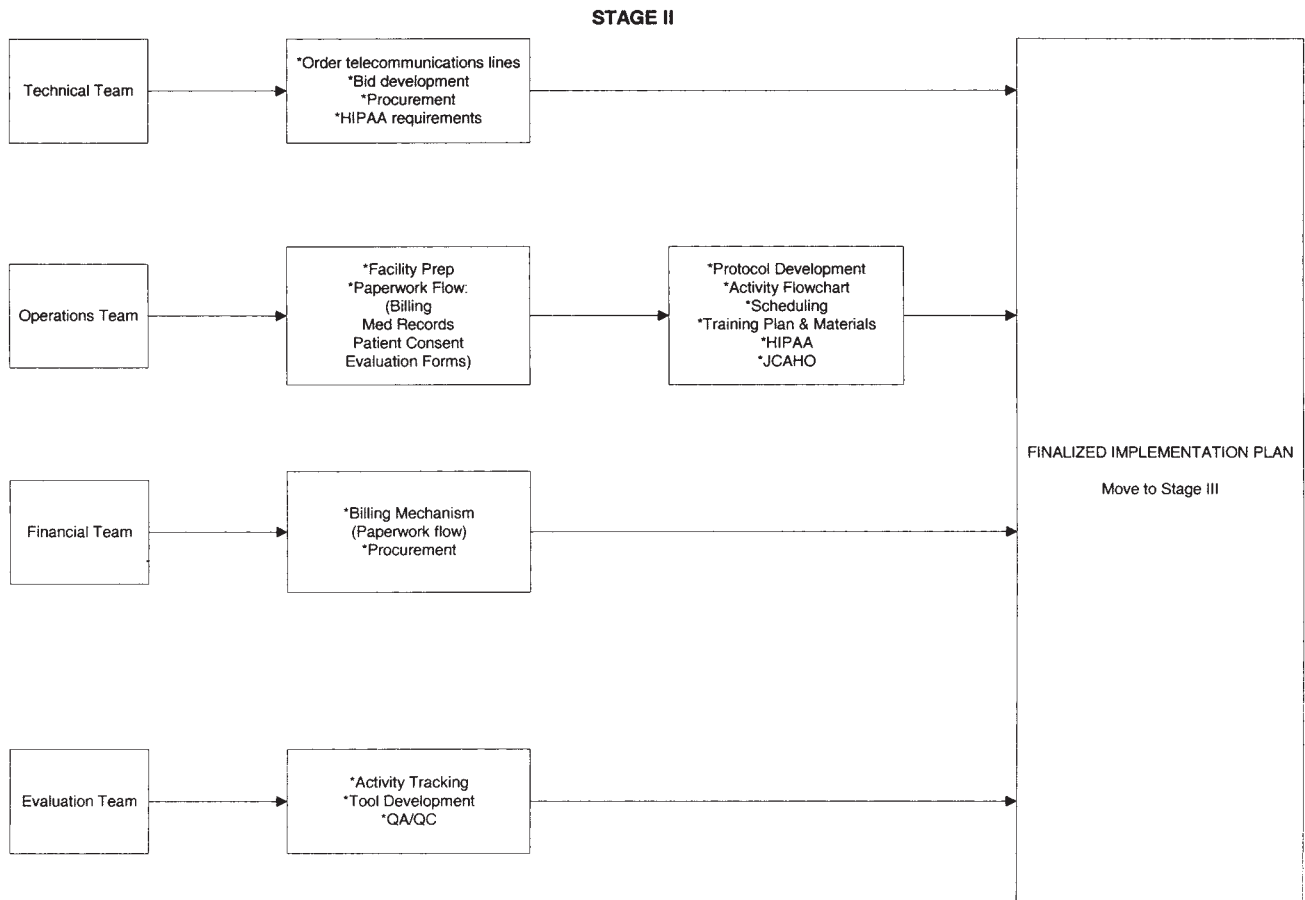


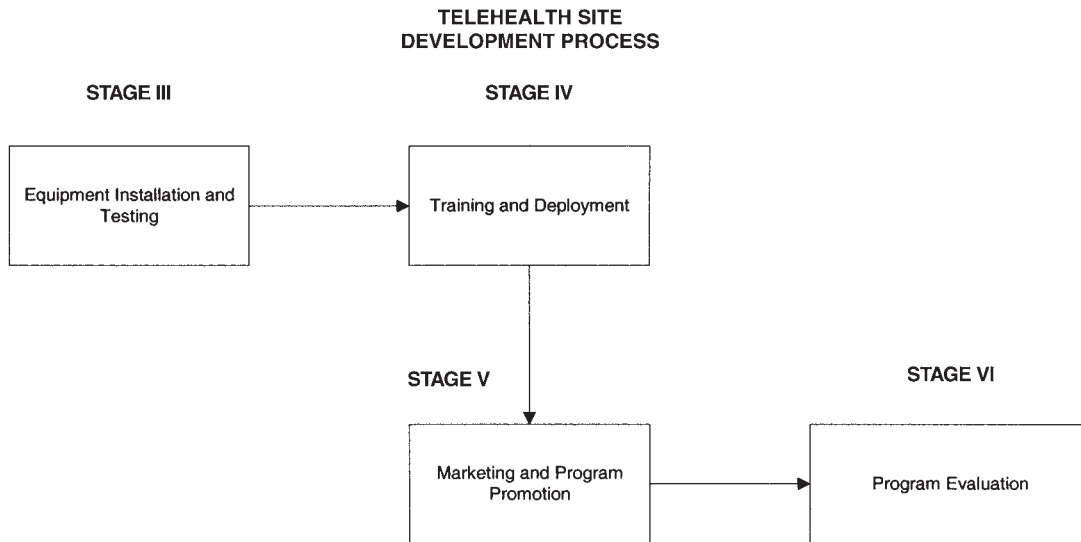
FIG. 1. The algorithm decision tree and steps followed to evaluate a potential telehealth application. If the telehealth application being evaluated has the resources, the process proceeds to stage II following the steps outlined. CfTH, Center for Telehealth; Bus Mgr, business manager.

TELEHEALTH SITE DEVELOPMENT PROCESS



TELEHEALTH SITE DEVELOPMENT PROCESS





**FIG. 2.** Telehealth site development process. The algorithm and decision tree followed through six stages in developing and evaluating a potential telehealth site. Proceeding past Stage I depends upon identifying the necessary resources for further planning, implementation, training, promotion, and evaluation.

ing rapidly, the systems should be both H.320 and H.323 compliant.

2. The cost of the system must be justifiable.
3. It should be feasible for on-site staff to provide general assistance and troubleshooting for the equipment, and the equipment should be user friendly.

Requirements based on needs assessments:

1. The technology should “fit” the application.
2. Specific user needs should be addressed, and the system should support necessary peripheral devices.
3. The type and size of the equipment should be tailored to the audience size and physical design of the room.

Since equipment is often used for more than one application, it is important that it be adaptable without sacrificing important components or features. Telecommunications must meet equipment specifications, as well as being affordable, scalable, and available to support the application when needed.

Engineering and equipment specifications, installation, and testing should be included in any bill of sale, rental agreement, or contract. A minimum of a 1-year maintenance agree-

ment should be a part of the agreement, along with training on the use of the equipment. Final payment should not be made until all requirements for the system are met and confirmed by testing. These provisions are intended to make the vendor a responsible party. Nonetheless, the organization should outline technical and general equipment specifications, user needs, and a recommended engineering and network plan.

*Interaction with vendors.* In dealing with vendors, it is important to determine the specific needs both technically and functionally, and it would help to request multiple quotes to receive fair prices from vendors.

*Start-up phase*

*Clinical acceptance.* We faced clinician resistance from both the hub and spoke sites. For example, in trying to establish emergency services, we had several meetings with a spoke site to identify ways for using the interactive video system for emergency services. In addition, we met with the emergency department at the UNMH for the same purpose. Both groups expressed concern over the reliability of the system for emergency services. Since the telemedicine equipment was not located within the emergency room, physicians at the UNMH

TABLE 1. THE MATRIX USED TO SCORE THE POTENTIAL PROGRAMS AND ASSIST IN CONSIDERING SUCCESSFUL DEPLOYMENT

Site selection matrix by criterion and weight

Organization name and location	Score	Administrative support		Business management		Technical capability		
		#1: Alignment of strategic goals for new site (5) <sup>a</sup>	#2: Policies/procedures (4) <sup>b</sup>	#3: Commitment of resources (5)	#4: Potential for long-term financial sustainability (5)	#5: Realistic, affordable technology and telecommunications (5)	#6: Technical personnel (2)	#7: Local provider champions (4)
1	Score	0	0	0	0	0	0	0
2	Points	0	0	0	0	0	0	0
3	Score	0	0	0	0	0	0	0
4	Points	0	0	0	0	0	0	0
5	Score	0	0	0	0	0	0	0
6	Points	0	0	0	0	0	0	0
7	Score	0	0	0	0	0	0	0
8	Points	0	0	0	0	0	0	0
9	Score	0	0	0	0	0	0	0
10	Points	0	0	0	0	0	0	0
Rated by:								
Date:								

The scoring system can be used to rank programs and determine in a more objective manner how best to direct and prioritize use of limited resources. The scale was from 0 to 5, HSC 5 Health Sciences Center with 0 the lowest and 5 the highest. UNM, University of New Mexico.

<sup>a</sup>Scoring guidelines/examples for reviewers' reference would include letter of support from CEO, mid-managers, Board of Directors, etc.

could not afford to leave their posts to come to the telemedicine room for consultations, even though it was in close proximity. Remote site physicians expressed reservations about using the system during an emergency. They felt the system would be in real time and may actually be detrimental to providing quality care.

Therefore, when encountering provider resistance, it would be prudent not to push the issue, but instead to find alternate non-clinical applications that will allow providers to use the system and become comfortable with it. As confidence and familiarity are gained, providers are likely to use it for clinical consultations.

*Staffing.* Competent staff is critical, including the following: (1) telemedicine site coordinators at every site, (2) a telemedicine technical

manager, (3) technical support staff at remote sites, (4) an overall administrator for strategic planning and interaction with network sites, and (5) a clinical champion or medical director who can serve as a liaison with other clinicians. Without clinical champions during the early stages of development, a telemedicine network cannot be sustained.

*Marketing of the program.* The medical director promoted the program at the hub and spoke sites. Through the auspices of the HSC Public Affairs office, the program was described in newspaper and magazine articles, including a half-hour program on the local public television station. We conducted numerous demonstrations for state and federal legislators, healthcare professionals, administrative departments, and



telemedicine champions at both the hub and spoke sites. These include community business leaders and health providers. The electronic backbone developed to support the telehealth applications will, in all probability, provide additional capacity for other business users.

*Reimbursement.* Because the low number of clinical consultations (sometimes only one or two consults per month) we did not pursue reimbursement from third-party payers for telemedicine consultations. Clinical providers either provided services as a test, without consideration of being reimbursed, or services were provided under contract to a specific agency. This is the case with the active clinical programs: primarily weekly child psychiatry clinics of approximately four to eight patients and monthly feeding evaluation consultations of approximately four patients. These pilot applications aimed at determining the viability of providing clinical assessments to distant sites. Nonetheless, it is important to start out with a clear policy to assure provider acceptance. In the long run, reimbursement is critical for sustainability. This program assisted in drafting the "New Mexico Telehealth Act," which was passed in the 2004 New Mexico State Legislative regular session.

*Protocols.* Clinical protocols for all specialty services that were either proposed or developed by our CfTH staff were established at

both the spoke and hub sites, consistent with the OAT templates.

Since clinical consultations overall were initially low, these protocols were largely ignored in the spoke sites. However, it is critical that Health Insurance Portability and Accountability Act (HIPAA) and JCAHO regulations are considered and included in all protocols.

*Training and on-going technical assistance.* Training is important on a regular on-going basis.

Remote staff turnover was a serious problem. At one rural hospital site there have been a total of five administrators in a 3-year period, a bankruptcy, and a change in the primary physicians twice. At the community clinic site, there have been two staff reorganizations and high turnover.

On-going technical assistance is also necessary. In most cases, the telemedicine site coordinator also served in this role. It is critical for remote sites to have maintenance contracts in place.

*Strategic planning.* During the duration of the grant period, the system was used more for administrative videoconferencing and distance education than for medical consultations. The incremental cost was recovered by billing back to the requesting department or program for line charges, videoconferencing usage fees, and technical fees. A more comprehensive plan is under development for long-term sustainability of an NMTN and the CfTH, as well as bring-

TABLE 2. INDEPENDENT BARRIERS TO ADOPTION AND SUSTAINABILITY OF TELEHEALTH

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1. Weak economy, particularly in rural communities and rural states
  2. Low reimbursement rates and lack of commitment for reimbursement by payors
  3. Bankruptcy and closure of many health facilities.
  4. The emergence of "for-profit" entities into the healthcare market and no persuasive case for return on investment
  5. Competition and reluctance to collaborate and achieve economy of scale
  6. Rapid turnover of healthcare professionals in both the provider and administrative arenas
  7. Inadequate strategic and business planning. Need predictable revenue resources which cover expenses or other identified value to justify a "cost-center"
  8. Lack of focus on areas of greatest potential success, e.g., high-need, high-potential volume, greatest health benefit, existing remote and hub "champions," clinical effectiveness, and cost-effectiveness.
  9. Failure to identify "true" needs and ongoing *changes* in needs. Past or current needs are expected to change and require ongoing reassessment. No continued quality improvement approach in place
  10. Inadequate supply pool of specialty providers to meet the demands. There is often reliance on limited number of champions and an impact of turnover associated with minimal depth of number of particular specialists to maintain effort during the period of the "early adoption" and/or then inadequate number of specific specialists to meet any increased demand during the period of rapid adoption and increased utilization.
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TABLE 3. TECHNOLOGY-RELATED BARRIERS TO ADOPTION AND SUSTAINABILITY OF TELEHEALTH

1. Relatively high equipment and communication costs accompanied by rapid obsolescence and ongoing maintenance costs with difficulties in predicting return on investment
2. Lack of local technical expertise. Inadequate number of trained local personnel to support the systems and the network, as well as train or assist other potential end-users
3. Lack of adequate broadband communication infrastructure and/or Internet connectivity
4. Resistance to improving infrastructure by the communication industry due to perceived poor return on investment
5. Provider resistance to use the telehealth technologies
6. Lack of perceived value to the participants and end-users. Providers perceive it as additional work despite potential value to the patients
7. Perceived or real inconvenience; increased time required for scheduling; potential increased involvement of referring provider. Referring provider and consultant must go to telemedicine system away from their clinical practice area. Systems not portable enough to get to patient's bedside and thus must bring patient to the system. Should be as convenient as current methods of obtaining and providing consultations; need for site coordinator, patient presenter, ease of access
8. Perception of inadequate revenues generated to cover expenses and insufficient additional benefit to justify as a "cost" center
9. Within an academic environment, no perceived educational or research benefits to their overall mission
10. Delay in adoption or "institutionalization" and integration of telemedicine into standard practice ("diffusion of innovations" key elements not addressed). Need for orientation/training and marketing efforts, as well as nurturing after initiation and continued reinforcement
11. Need to reflect current referral patterns and build on existing relationships or develop relationships between referring and consulting providers
12. Failure to address security, patient confidentiality, and privacy issues. HIPAA regulations may have a major impact. Providers and patients must be confident in the security of the system. Barriers between healthcare organizations and willingness to share patient data. Telehealth applications need to integrate with information systems
13. Lack of consistency and clarity regarding interstate licensure and inter-organizational credentialing for telemedicine services. Potential requirement for a consultant to be credentialed in every facility in which services are provided and licensed in every state where services provided
14. Lack of clinical standards with potential for liability; therefore informed consent needed
15. Concerns about adequate monitoring of quality of services provided. Lack of adequate means to enforce medical standards and discipline offenders
16. Concerns about "turf" and "stealing" patients. Competitive healthcare market interferes with cooperation, coordination, and development of an "open" system among healthcare organizations

ing together public and private entities in collaborative efforts to expand and enhance sustainable telehealth in the state. The development of local regional and state telehealth alliances can facilitate sustainable telehealth

programs by forming a "network of networks" in which resources and expertise can be shared related to technical infrastructure, provider services, and telehealth program planning. Several barriers to adoption and sustainment

TABLE 4. CRITERIA FOR SUCCESS

1. High demand and need for the service
2. Predicted high volume of utilization
3. Willing consultants to provide the service
4. Appropriate technology, technical, and operational support available at both the hub and spoke sites for the proposed application
5. Adequate training and orientation of providers in effective use of telehealth technologies.
6. Development of appropriate protocols to insure efficiency in patient encounters, consultation, and education
7. Provide means to insure clinical activities are reimbursable<sup>7</sup>
8. Financially feasible to sustain: cost savings and/or revenue generating and/or perceived value added with revenues committed to support operations
9. Administrative and provider "buy-in"<sup>8</sup>
10. Appropriate, accepted, measurable, and achievable performance indicators by which success can be determined by the decision-makers and key stakeholders
11. Market to the consumer/patient who can realize the real benefit of improved access in his or her community even when the provider system is resistant

of telehealth were encountered. These are outlined in Tables 2 and 3.

We developed a set of criteria for success telehealth applications, outlined in Table 4.

### CONCLUSIONS

The rapidly developing information technology known as telemedicine/telehealth presents both anticipated and unique challenges for integration and adoption into the healthcare system.<sup>1-6,9-12</sup>

New strategies for overcoming the barriers to telehealth and winning the battles on the frontlines must include appropriate prospective planning, a realistic business case, a complete solid business plan for successful sustainability, and adequate, appropriate performance measures against which success or failure can be measured.<sup>13-18</sup> Programs must be objective in their planning and assessment and not be influenced by the lure of the technology.<sup>19-21</sup> Developing programs should consider building upon existing active clinical and educational health outreach programs in which telehealth can be integrated, thus augmenting the program and adding value to the participants. Also, consumers realize the potential value of telehealth for their personal wellness, increased demand for their service may assist in driving adoption by the healthcare delivery systems. Furthermore, it is necessary to reflect the diversity of the healthcare system and its stakeholders in a rural environment.<sup>22-29</sup> Finally, based on relevant attainable performance measures, careful objective and well-developed evaluation efforts must be continued to determine the true impact and value of telehealth upon the health and wellness of the populations served.<sup>19-21,30-35</sup>

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### REFERENCES

1. Bashshur R, Sanders J, Shannon G. *Telemedicine theory and practice*. Springfield, IL: Charles C Thomas, 1997.
2. Darkins AW, Cary MA. *Telemedicine and telehealth: principles, policies, performance and pitfalls*. New York: Springer, 2000.
3. Turisco F, Metzger J. *Rural telehealth care delivery. Connecting communities through technology*. Oakland, CA: Prepared by First Consulting Group for the California HealthCare Foundation, 2002.
4. Bird K. *Teleconsultation: a new health information exchange system: third annual report to the Veterans Administration*. Boston: Massachusetts General Hospital, 1971.
5. Grigsby B, Allen A. Fourth annual telemedicine program review. *Telemed Today* 1997;5(4):30-38.
6. Mintzer CL, Wasem CJ, Puskin DS. Program activity in the second year of the rural telemedicine grant program, part 1 and part 2. *Telemed Today* 1997;5:32-39.
7. Veit FC, Sancu LA, Young DY, Bowes G. Adolescent health care: perspectives of Victorian general practitioners. *Med J Aust* 1995;163:16-18.
8. Whitten P, Franken EA. Telemedicine for patient consultation: factors affecting use by rural primary-care physicians in Kansas. *J Telemed Telecare* 1995;1:139-144.
9. Alverson DC. *Telemedicine/telehealth-reaching for sustainability in business briefing: next-generation healthcare*. London: World Markets Research Centre, 2001.
10. Sutfenfield K, Tokarski C, Kilbride J. Highlights from the ATSP Telehealth Conference 2002: briefings on telemedicine activity in the US and abroad during the past 12 months. *Medscape TechMed* 2002;2(4):1-7.
11. Robinson A. Video-conferencing: under-used by rural general practitioners. *Aust Health Rev* 2002;25:131-135.
12. Jennett PA, Hall WG, Morin JE, Watanabe M. Evaluation of a distance consulting service based on interactive video and integrated computerized technology. *J Telemed Telecare* 1995;1:69-78.
13. Zincone LH Jr, Doty E, Balch DC. Financial analysis of telemedicine in a prison system. *Telemed J* 1997;3:247-255.
14. Brunnicardi BO. Financial analysis of savings from telemedicine in Ohio's prison system. *Telemed J* 1998;4:49-54.
15. McCue MJ, Mazmanian PE, Hampton CL, Marks TK, Fisher EJ, Parpart F, Malloy WN, Fisk KJ. Cost-minimization analysis: a follow-up study of a telemedicine program. *Telemed J* 1998;4:323-327.
16. Agha Z, Schapira RM, Maker AH. Cost effectiveness of telemedicine for the delivery of outpatient pulmonary care to a rural population. *Telemed J e-Health* 2002;8:281-291.
17. Stensland J, Speedie SM, Ideker M, House J, Thompson T. The relative cost of outpatient telemedicine services. *Telemed J* 1999;5:245-256.
18. Burgiss SG, Julius CE, Watson HW, Haynes BK,

- Buonocore E, Smith GT. Telemedicine for dermatology care in rural patients. *Telemed J* 1997;3:227–233.
19. Currell R, Urquhart C, Wainwright P, Lewis R. Telemedicine versus face to face patient care: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev* 2000;(2):CD002098.
  20. Whitten PS, Mair FS, Haycox A, May CR, Williams TL, Hellmich S. Systematic review of cost effectiveness studies of telemedicine interventions. *BMJ* 2002; 15:324:1434–1437.
  21. Kristiansen IS, Poulsen PB. [Saving billions with telemedicine—fact or fiction?] *Tidsskr Nor Laegeforen* 2000;120:2305–2311.
  22. Gelber H. The experience of the Royal Children's Hospital Mental Health Service videoconferencing project. *J Telemed Telecare* 1998;4(Suppl 1):71–73.
  23. Balch DC, Tichenor JM. Telemedicine expanding the scope of health care information. *J Am Med Inform Assoc* 1997;4:1–5.
  24. Goins RT, Kategile U, Dudley KC. Telemedicine, rural elderly, and policy issues. *J Aging Soc Policy* 2001;13: 53–71.
  25. Kesler C, Balch D. Development of a telemedicine and distance learning network in rural eastern North Carolina. *J Telemed Telecare* 1995;1:178–182.
  26. Tait CP, Clay CD. Pilot study of store and forward teledermatology services in Perth, Western Australia. *Australas J Dermatol* 1999;40:190–193.
  27. Norton SA, Floro C, Bice SD, Dever G, Mukaida L, Scott JC. Telemedicine in Micronesia. *Telemed J* 1996;2: 225–231.
  28. Bujnowska-Fedak MM, Staniszewski A, Steciwko A, Puchala E. System of telemedicine services designed for family doctors' practices. *Telemed J e-Health* 2000;6: 449–452.
  29. Brismar B. [Hospital without borders—visions of telemedicine.] *Nord Med* 1995;110:209–210.
  30. Gustke S, Balch DC, Rogers LO, West VL. Profile of users of real-time interactive teleconference clinical consultations. *Arch Fam Med* 2000;9:1036–1040.
  31. Karp WB, Grigsby RK, McSwiggan-Hardin M, Pursley-Crotteau S, Adams LN, Bell W, Stachura ME, Kanto WP. Use of telemedicine for children with special health care needs. *Pediatrics* 2000;105(4 Pt 1): 843–847.
  32. Hersh W, Helfand M, Wallace J, Kraemer D, Patterson P, Shapiro S, Greenlick M. A systematic review of the efficacy of telemedicine for making diagnostic and management decisions. *J Telemed Telecare* 2002;8: 197–209.
  33. Hailey D, Roine R, Ohinmaa A. Systematic review of evidence for the benefits of telemedicine. *J Telemed Telecare* 2002;8(Suppl 1):1–30.
  34. Roine R, Ohinmaa A, Hailey D. Assessing telemedicine: a systematic review of the literature. *CMAJ* 2001; 165:765–771.
  35. Hersh WR, Helfand M, Wallace J, Kraemer D, Patterson P, Shapiro S, Greenlick M. Clinical outcomes resulting from telemedicine interventions: a systematic review. *BMC Med Inform Decis Mak* 2001;1:5.

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## APPENDIX: TELEHEALTH SURVEY

1. What are the greatest challenges you face as an organization? Please describe how your idea for a "telehealth initiative" will address health problems in your community and describe your overall goals for the program. How would telemedicine help you meet these challenges?
2. How would the implementation of telemedicine fit with your organization's strategic goals and objectives? (*Please provide letters of support for this project from your CEO, local administrator, and Board of Directors, if possible.*)
3. Please describe any policy measure you will implement that will require or encourage use of the equipment by your employees.
4. Will time be allotted for employees to learn to use the equipment?
5. Is your organization willing to develop clinical protocols on the use of the technology for all services delivered?

*(continued)*

6. Please describe your policy on the use of technology (if appropriate) for community groups and other agencies. Include information such as fees charged and stated requirements.
7. Will the key people involved in the project be able to commit time for planning and implementation? If so, for how long?
8. To what extent can you share in the start-up costs (non-recurring)?
9. On-going maintenance of the equipment is of major importance. Can your organization provide for this after the first year?
10. Depending upon the type of technology used, charges for telecommunications costs could be \$1,000/month. Can you budget for monthly recurring costs?
11. Can your organization support a local coordinator for the program? Staff who can run the equipment? Schedule? Maintain documentation? Receive training?
12. Will you be able to provide necessary furniture, computer, and telephone for a site coordinator related to this project?
13. Does your facility have network infrastructure or telecom infrastructure (other than your telephone system)? If yes, please explain.
14. Do you currently use any telemedicine equipment? If yes, please list and describe.
15. Does the primary facility you would like to "communicate with" have telemedicine equipment?
  - Yes, please explain
  - No
  - I don't know
16. What types of high bandwidth telecommunications are available in your area? If you are not certain, leave blank.
17. Does your facility have an Information Systems Department or individual?
18. Please indicate the telemedicine applications you are interested in:
  - Clinical:
    - Initial urgent evaluation of patient, triage decision
    - Pre-admission evaluation/planning
    - Medical or surgical follow up, medication check
    - Supervision and consultation for primary care encounter in remote site
    - Diagnostic evaluations based on history, physical exam
    - Extended diagnostic work-up or short-term management of self-limited condition
    - Chronic disease management for condition requiring a specialist not available locally
    - Discharge planning
    - Patient education
    - Patient or family support
    - Other specialty service(s), explain
  - Education:
    - Wellness/prevention health education
    - Community education
    - Continuing education for professionals
    - College credit classes
    - School-based health education
    - Other, explain
  - Administrative:
    - Local/state government
    - Private industry
    - Your organization
    - Other, explain

19. Will your organization be willing to commit time for accumulating activity data, user and participant surveys, etc.? If so, have you identified personnel to do so?
20. Please describe the kind of technology you envision will be needed for this project. Do you have space allocated for the equipment required? Do you foresee any conflicts with integrating telemedicine into current practice patterns? If so, how will you address these problems?
21. Does your project lend itself to phased implementation? If yes, explain.
22. What specialty medical services do you receive from University of New Mexico Health Sciences Center and at what volume?
23. Which University of New Mexico healthcare professionals are involved in these services? Have they been consulted regarding this project? If so, what is their willingness to participate? Documentation may include copies of existing contracts or letter of support for the current provider.
24. List all the non-clinical services from University of New Mexico Health Sciences Center that you already receive relevant to the telehealth initiative that you propose.
25. Where do you refer patients for medical services relevant to the telehealth initiative you propose? List all organizations and the volume of referrals relevant to the telehealth initiative.
26. Which healthcare professionals outside University of New Mexico Health Sciences Center are involved in these services? Have they been consulted regarding this project? If so, what is their willingness to participate? Documentation may include copies of existing contracts or letter of support for the current provider.
27. What non-clinical services from health care organizations other than University of New Mexico Health Sciences Center do you already receive relevant to your proposed telehealth initiative? Please list.