Evaluation of a Statewide Telemedicine Program

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Abstract

Objectives: To assess the effectiveness of a statewide telemedicine and eHealth program in California and its impact on reducing barriers to health services for rural and underserved populations. **Methods:** Data were collected via surveys, site visits, document reviews, and informal interviews over a four-year period by an external evaluation team. **Results:** Medical consultations in 33 medical specialties were provided in 22 counties. Patients and providers were satisfied with telemedicine services, and the technical support and education provided was rated as being of high quality. Many policies and barriers exist that impede full deployment and sustainability of telemedicine programs. Provider recruitment is a challenge; consumer demand was lower than expected. Trial and error for program planning and implementation was the norm for this pioneering effort. Although technological and communicative networking among the grantees was initially minimal, it increased over time. **Conclusions:** Telemedicine can improve access to medical care for people who reside in rural populations and underserved markets. We speculate that a systematic statewide telemedicine program with a few regional telemedicine centers may be a better approach than numerous stand-alone programs.

Keywords: telemedicine, eHealth, telehealth, rural health, telemedicine sustainability

Introduction

Telemedicine is the use of telecommunications and information technologies for the provision of healthcare at a distance (California Telemedicine & eHealth Center [CTEC], 2006). This service-delivery method may be as simple as two health professionals discussing a case over the telephone or as complex as using videoconferencing equipment or satellite technology to conduct a real-time consultation between medical specialists in two different countries. The terms eHealth and telehealth are sometimes inaccurately interchanged with telemedicine. Like the terms "medicine" and "healthcare", telemedicine often refers only to the provision of clinical services; the term telehealth can refer to clinical and non-clinical services such as medical education, administration, and research (CTEC, 2006).

Telemedicine has the potential to improve health care by bridging geographic gaps and mitigating service barriers, because it allows patient access to specialists who are practicing hundreds of miles away. Despite the potential benefits, its use is not statewide due to a lack of an organized and shared infrastructure, public knowledge, provider participation, as well as lagging policy.

Though California faces a lack of health care across the state and across all of its demographics, the disparity of feasible health care is most notable among children/families and working adults (Patton, Duerksen, & Baxamusa, 2007). Rural populations also face hardships with lack of local healthcare providers, geographical and weather isolation, and poverty (Reschovsky & Staiti, 2005).

The California State Health Association (2010) cites several statistics related to rural California. In California 5.1 million people reside in rural regions. Of the 58 counties in California, 44 are rural; 80% of California's landmass is designated rural. There are 935 residents per doctor in rural

California compared to 460 per doctor in urban areas of the state. Approximately 45% of rural Californians live in regions designated as primary care health professional shortage areas (California State Rural Health Association, 2010).

Without access to health care, many uninsured or underinsured Californians rely on emergency department services to treat routine, on-going specialty/subspecialty, and/or dental care needs that burdens the emergency services programs (Marcin, Ellis, Mawis, Nagrampa, Nesbitt, & Dimand, 2004 & Patton, et al., 2007). Also, in rural areas, patients may not seek or obtain needed medical care due to a combination of lack of available care and resources, as well as geographic barriers and economic hardships. These include medical appointment travel times greater than one hour each way, extreme weather conditions, and work and school absenteeism (Marcin, et al., 2004).

The statewide lack of culturally competent physicians in addition to language barriers also affects health care in California. Although one third of California's population is of Latino or Mexican descent, only 16% of physicians in the state are Spanish-speaking (Ramos-Gomez, 2008). Using telemedicine technology, patients can have access to either providers who speak the same language or language translation services.

Telemedicine is progressively being viewed as a method to address the limited access to healthcare particularly in rural communities. In fact, some studies are exploring how in addition to increasing access to healthcare, telemedicine may help a community retain its local revenue, aid in business recruitment and retention, and provide continuing medical education /lifelong learning for medical professionals (Telemedicine Association of Oregon [TAO], 2006; Brown, 2005). The current barriers to using telemedicine, such as low reimbursement rates and the lack of availability of a communications infrastructure to remote regions, are slowly being eliminated. In some states, such as California and Kentucky, legislation has been passed that requires private insurers, Medicare, and Medicaid to reimburse at the same rate as face-to-face consultations (Brown, 2005). On the technology end, competing technology manufacturers and telecommunication companies now offer low-cost equipment and bandwidth services (Norris, Hart, Larson, Tarczy-Hornoch, Masuda, Fuller, House, & Dyck, 2002). Many states currently use networks that link public government, business, education, and healthcare (Brown, 2005). These existing networks can be expanded to include statewide telemedicine programs.

While telemedicine is not new, it is becoming more sophisticated with new technologies (i.e., wireless devices, higher speed, lower cost networks, mobile devices, robotics). These newer ways of delivering health services hold promise as a potential solution to limited access to care in rural environments as well as improving patient outcomes (Majerowicz & Tracy, 2010). As a result, more resources are being directed toward its use. Efforts are needed to advance public policies that specifically address the use of telemedicine. The issue of interstate licensure provides an excellent example of a specific issue in need of policy changes. A Congressional-mandated policy that supports medical licensure cooperation among neighboring states (such as reciprocity) for the limited purposes of telemedicine would aid in standardizing care and reducing the risk of malpractice (American Telemedicine Association, 2010). In addition to ensuring patient and provider safety, research needs to explore the development of self-sustainable models that use existing technology. In order to make telemedicine cost effective applying the best practices of previous and current telemedicine programs would ensure patient and provider safety (TAO, 2004). This research needs to include well-conducted feasibility studies on business planning, provider outreach/recruitment, and patient/population medical needs.

Research Purpose

Beginning in 1999, The California Endowment (The Endowment) pioneered the development of a telemedicine infrastructure to serve rural communities throughout California. The

Endowment funded a 10-year telemedicine initiative, in two five-year increments, designed to increase access to medical care in rural areas. The funding was provided to the California Telemedicine and eHealth Center (CTEC) to develop telemedicine and eHealth capacity and competence among providers, while increasing access to specialty care for California's rural and underserved populations. CTEC funded 10 grantees throughout the state, as well as two telemedicine learning centers (one in Northern California and the other in Southern California). The telemedicine learning centers (TLCs) provided telemedicine training courses to healthcare and technology professionals.

An external evaluation team was hired by The Endowment to help determine the effectiveness and scope of The Endowment's investment in the development of telemedicine networks. The evaluation scope of work, established by The Endowment, included determining if the funds invested in the telemedicine initiative improved access to and utilization of health services in California. Additionally, the evaluation investigated how well the program supported network development within the larger framework of existing partnerships and extended telemedicine to rural and underserved communities.

Walter R. McDonald & Associates, Inc. and Goodwell Technologies, Inc. comprised the external evaluation team for the CTEC network development grant funded by The Endowment for the second increment of the CTEC 10-year funding cycle (2004-2009). The evaluation took place from October 3, 2005 through October 15, 2009.

Methods

CTEC disseminated a request for proposals to select the 10 grantees. Nine of the grantees were already providing telemedicine services. The grantees requested funding to continue and/or expand their services. Grantees were located throughout the state and included academic centers, hospitals, and community clinics. The specialty services varied. One grantee focused solely on dentistry, another on optometry, and the other eight grantees provided services in a variety of specialty areas (i.e., mental health, dermatology, cardiology). The methods used to provide services were primarily audio conferencing and store and forward. Eight of the grantees also provided continuing education courses to healthcare professionals (distance-education classes). Many of them offered continuing education units to participants, and the delivery method was through audio conferencing.

CTEC funded an academic center to be the Northern California TLC. CTEC disseminated a request for proposals to establish the Southern California TLC, which was funded in 2007. These two centers, both housed in academic institutions, provided education to clinicians, administrators, and technology professionals on topics such as service delivery, legal issues, how to troubleshoot technical problems, training staff, billing, and technology selection.

Based on CTEC's objectives, The Endowment developed the evaluation objectives, which did not include clinical outcomes. Data collection efforts focused on five areas:

1. Network Development. The development, expansion, and sustainability of technological and communication interagency networks as well as building evaluation capacity among the grantees. This included both technological network infrastructure integration and social networking, including the sharing of information and resources. The evaluation capacity piece focused on assisting the grantees with developing methods and tools that could be used beyond the grant to evaluate their own programs.

2. Technical Assistance. The quality and quantity of CTEC's technical assistance to the grantees. Technical assistance referred to providing support, information, and resources to the grantees for program planning, implementation, and sustainability as well as for assistance with selecting

technology, working with vendors, and solving problems related to the functionality of the equipment.

3. Education and Training Services. The impact of the training activities and eHealth-related professional development conducted by the Northern California Telemedicine Learning Center (NCTLC) and the Southern California Telemedicine Learning Center (SCTLC). The two TLCs offered one- and three-day courses for healthcare clinicians, administrators, and technology professionals considering providing telemedicine services or who were currently offering services and wanted to improve and expand their existing programs.

4. Policy Development and Systems Change. The systems change aspect related to technology's contribution to health workforce retention and or development. The policy development component assessed CTEC's contribution to the institutionalization of eHealth and tele-medicine. This included CTEC's efforts to promote policy changes to augment eHealth and telemedicine utilization.

5. Community Assessments (note: the tasks outlined by The Endowment under this topic area were related to assessing how the community responded to the telemedicine programs after they were introduced not assessing the community needs). The levels of patient and provider satisfaction with telemedicine and eHealth services. This area also covered the quality and quantity of the resources and best practice models CTEC produced. These products were designed to assist the telemedicine community with developing, implementing, and sustaining programs. The best practices were identified by CTEC and shared via publications produced and disseminated by them. The resources were sample forms, job descriptions, newsletters, and training videos. The best practice publications and resources were available on CTEC's web site, and the printed versions of the publications could be ordered and received by mail.

The approach to evaluate CTEC, its 10 grantees, the two learning centers, and their effect on rural health entailed collecting and analyzing qualitative and quantitative data. The evaluation team utilized the following data collection methods:

1. Surveys. Paper and online surveys were the primary data collection method used, because the grantees were geographically dispersed and the ability to include common indicators while still being able to tailor the surveys to the objectives of the specific projects. Table 1 lists the survey instruments, the related purpose, and the dissemination methods used to assess each of the five areas.

   The surveys were disseminated by the evaluation team and the grantees. The surveys that the grantees disseminated were the patient and provider satisfaction surveys. These instruments had similar questions (multiple choice and rating), but also included some specific questions tailored to their program and information needs. These were paper surveys. The surveys that the evaluation team disseminated to the grantees (networking survey, grantee meeting survey, technical assistance survey, training and information needs survey) included the same multiple choice, rating, and open-ended questions. With the exception of the grantee meeting survey, these were all online surveys.

   Three surveys (needs assessment, course evaluations, post-training) were used to evaluate the two learning centers. The surveys were similar, but they did have slightly different multiple, rating, and open-ended questions that were tailored to the information needs of the centers and the course learning objectives. The needs assessment and post-training surveys were online and disseminated by the evaluation team. The course-evaluations were paper surveys that employees of the TLCs

Table 1

Evaluation Tools, Related Purpose, and Dissemination Methods

Focus Area, Related Data Collection Instruments, and Number of Respondents	Purpose of the Data Collection Instrument	Dissemination Method
1. Network development		
a. Network assessment survey (n=8)	a. To measure the level of collaboration among the grantees and other telemedicine organizations.	a. In May 2008, the online survey was sent to all of the grantees. Follow-up reminders were distributed two-weeks after the first notification.
b. Grantee meeting evaluation (n=21)	b. Measured the value and satisfaction of the annual grantee meetings.	b. Grantee meetings were held in 2006 and 2007 to share information and network. At the end of the meeting, an evaluation was disseminated to the participants.
2. Technical assistance		
a. Technical assistance survey (n=52)	a. Evaluated the quality of program and technical assistance provided by CTEC to the grantees.	a. Disseminated between February 2006 and August 2008 to the 10 grantees every six months (the survey was distributed six times, total). Follow-up reminders were distributed two-weeks after the first notification. The same survey questions were used each time.
3. Education and training services		
a. Needs assessments (n=110)	a. To assess the training needs and interests of the telemedicine training course attendees.	a. The online surveys were conducted for both telemedicine learning centers (TLCs). For the NCTLC a pre-training assessment online survey was disseminated prior to each course to people who registered for the course. For the SCTLC, a needs assessment was conducted one time prior to the first course in June 2008. The target audience was potential course attendees in community clinics in two local counties.
b. Course evaluations (n=130)	b. To evaluate the quality of the courses in term of content, delivery, and meeting of course objectives.	b. Paper surveys were used for both of the TLCs and distributed at the end of each day of training.
c. Post-training surveys (n=82)	c. To assess the ability of the attendees to apply the information learned at the training and to identify any recommended changes to the curriculum	c. The link to the online survey was emailed to the course participants two or three months after the course ended. A follow-up reminder was sent two weeks after the initial contact.
4. Policy development and systems change		
a. Training and information needs assessment (n=6)	a. Assessed dissemination of policy information by CTEC and training documents developed by CTEC.	a. The online survey was disseminated once to the grantees in September 2008. Follow-up reminders were sent two weeks later.
5. Community assessments		
a. Patient (n=165) and provider (n=80) satisfaction surveys	a. Measured patient and provider satisfaction with using telemedicine.	a. The tools were used and collected throughout the evaluation. The surveys were disseminated to the patient and providers immediately following the telemedicine consultation. The patient satisfaction survey was available in both English and Spanish.
b. Training and information needs survey (n=6)	b. Assessed the quality of the best-practice models and form templates that CTEC produced and distributed as well as the quality and comprehensiveness of CTEC's dissemination of policy information.	b. This online survey was disseminated to grantees September 2008. Follow-up reminders were sent two weeks later.

distributed to course participates at the end of each training day. The completed course evaluations were mailed to the evaluation team for data analysis.

2. Interviews. The Principle Investigator (PI) of the evaluation team conducted informal unstructured interviews during the two site visits to a northern and a southern community clinic. The interviews were held with the Director of the clinic, and a technical person joined one of the interviews. The purpose of the interviews was to discuss the lessons learned, resources needed, sustainability plans and barriers, and future plans for the program. The interviews were each two to three hours in length. The PI also visited the two learning centers and attended training at the NCTLC. These visits were to see the centers and discuss lessons learned and future plans.

Table 2

Summary of Findings

Focus Area	Results
Network development	There was little interagency networking between grantees and other telemedicine organizations, although grantees indicated a desire to have more networking opportunities. The results of the networking survey can be found in Table 3 (see Appendix C). The majority of agencies indicated no or low-level interactions.
Technical assistance	All of the grantees utilized the technical assistance services that were available to them, and reported that it was beneficial. The grantees indicated that training materials related to business models and legal issues are needed along with updated information about reimbursement policies.
Education and training services	Learning centers assist organizations with the transition into using telemedicine or for program enhancement. Attendees wanted more information on sustainability and reimbursement, less statistical information, and ideas for physician recruitment. The respondents preferred courses via audio-conferencing or online as opposed to in person.
Policy development and systems change	Policies, particularly ones related to reimbursement, continue to be a barrier to telemedicine programs being self-sustaining. Telemedicine programs struggle with developing business plans for sustainability, and there is a need to develop a business model that creates a consistent road to program profitability.
Community assessments	An in-depth needs assessment had not been conducted prior to funding and implementing the programs. As a result, there was lower consumer demand in some areas and gaps and duplications in services existed. Patients and providers were highly satisfied with telemedicine, and technological problems were the chief complaint of both patients and providers.

3. Document reviews. All 10 grantees were required by CTEC to submit online monthly, midpoint, and final reports to CTEC throughout their funding period. The evaluation team reviewed these reports. The reports were developed by CTEC and the evaluators who assessed the first five-years of the CTEC project.

Statistical Package for the Social Sciences (SPSS) was used to analyze the quantitative data and thematic analysis was used for the qualitative data. No software was used to analyze the qualitative data—the data were categorized by the evaluators. The evaluation team submitted six-month reports of the findings to The Endowment, CTEC, 10 grantees, and two learning centers. In-person meetings were conducted twice a year with the evaluation team, The Endowment, and CTEC to discuss the findings and the future evaluation efforts. A meeting with this same group was held after the final evaluation report was completed. In addition, within 90 days of each grantee completing their funding cycle the evaluation team wrote a report on the findings for that specific grantee. Those reports were disseminated to The Endowment, CTEC, and the

grantee, and the findings were discussed during the bi-annual meetings with The Endowment, CTEC, and the evaluation team.

Table 3

Telemedicine Network Assessment Survey Results, May 2008

Five Levels of Interaction				
Networking Level 1	**Cooperation Level 2**	**Coordination Level 3**	**Coalition Level 4**	**Collaboration Level 5**
• Aware of Organization • Loosely defined roles • Little communication • All decisions are made independently	• Provide information to each other • Somewhat defined roles • Formal communication • All decisions are made independently	• Share information and resources • Defined roles • Frequent communication • Some shared decision making	• Share ideas • Share resources • Frequent and prioritized communication • All members have a vote in decision making	• Members belong to one system • Frequent communication is characterized by mutual trust • Consensus is reached on all decisions

	N/A	No Interaction	Level 1	Level 2	Level 3	Level 4	Level 5
Grantee 1 (urban hospital)	1	4	1	1	0	0	0
Grantee 2 (rural community clinic)	1	3	3	0	0	0	0
Grantee 3 (rural community clinic)	0	3	1	0	0	0	3
Grantee 4 (rural community clinic)	0	4	3	0	0	0	0
Grantee 5 (academic urban hospital)	0	4	1	0	0	0	1
Grantee 6 (rural hospital)	1	2	2	0	1	0	1
Grantee 7 (rural community clinic)	0	0	3	1	1	0	1
Grantee 8 (rural community clinic)	0	1	2	1	1	0	2
Grantee 9 (rural community clinic)	0	3	1	0	2	1	0
Grantee 10 (academic urban campus)	0	3	0	1	2	0	1
Organization A (NCTLC)	0	0	0	3	1	0	0
Organization B	0	0	0	1	0	0	0
Organization C	0	0	0	1	0	0	0
Organization D	0	0	1	0	0	0	0
Organization E	0	0	1	0	0	0	0
Organization F	0	0	0	0	1	0	0
Organization G	0	0	0	0	1	0	0
Interaction &Level Totals	3	27	19	9	10	1	9

Table 3 Interpretation: Each of the grantees was asked about the level of interaction they had with other grantees and telemedicine organizations. For example, grantee one ranked their level of interaction with grantees two through 10 as well as listed any non-grantee organizations that they interacted with, including the Northern Telemedicine Learning Center (the Southern California Learning Center was not operational at the time of the survey). The grantees indicated the level of interaction they experienced using the descriptions of the five levels explained in the survey. The N/A category was provided so that grantees could select that category for the row in which they were listed as the grantee.

Results

The 10 grantees combined provided 18,499 medical consultations in 22 counties in California and 33 specialty areas, and delivered 1,576 distance education sessions. Many of the grantees did not have specific and measurable objectives in their grant proposals. The grantees that had measurable objectives fell short of achieving them primarily because utilization levels were lower than expected. Grantees encountered problems such as start-up delays, difficulty with recruiting providers, low reimbursement rates, legal barriers, and lower than expected consumer demand. The low reimbursement levels were known prior to the

project start-ups, which is why sustainability was a concern and continues to be problematic. The results for each of the five areas are summarized in Table 2 (see Appendix B).

Table 3 shows the level of social networking that was conducted (see Appendix C). Each grantee was asked to rate their level of collaboration with the other grantees and other telemedicine agencies. As the table indicates, little networking occurred, and many grantees indicated no interaction with the other grantees. This may be because the projects were diverse; the organizations did not find or see a need for it, time constraints, or other factors. Additional research is needed to assess the reasons why the level of networking was so low and if, indeed, networking is useful.

The document reviews, informal interviews, and completion of the individual grantee evaluation reports provided some additional lessons. For example, one grantee created a school-based eHealth network to reduce oral health disparities and facilitate pediatric plastic surgical interventions. The grantee provided teledentistry programs to three rural K-12 school districts. The plan was to have the children who attended near-by schools walk to the teledentistry clinic housed in one of the centrally located schools. This concept was intended to alleviate the legal guardians from having to take time off from work to take the child for his or her dental visit. Given legal considerations, the guardian still needed to be present for all direct patient interactions with the eHealth program. This eliminated most of the initial benefits of the school-based clinic idea, because the parent or legal guardian still had to take time off work and physically remove the children from the classroom and bring them to the eHealth clinic.

Some grantees encountered political barriers, particularly the large organizations. Memorandums of understanding between departments prior to starting programs may alleviate these delays and reduce time needed to work through these challenges. The evaluators found that programs should begin with a limited number of objectives and expand as having too many diverse objectives can have a negative impact on their achievement. Having a person designated to overseeing the program (i.e., Telemedicine Coordinator) assisted with program integration, utilization, and effectiveness. The reason is that employees at clinics with telemedicine programs may view it as an inferior option, not stay updated on how to utilize the equipment, not consider this as an option when scheduling patients, or encounter other barriers to utilization of this approach to providing services. No shows rates were problematic as well as grantees not developing business plans at the beginning of their funding cycle. These two issues have contributed to the sustainability problem. A summary of the recommendations can be found in Table 4 (Appendix D).

Acknowledgments
Project funded by The California Endowment

Table 4
Recommendations for Effective Telemedicine Programs

Focus Point	Recommendations
Networking	The reasons for limited networking needs to be identified and the effectiveness of networking must be determined. If it is found to be effective, it should be encouraged and opportunities provided.
Technical assistance	Technical assistance is needed to support program implementation, growth, and sustainability.
Education and training services	Training in telemedicine is needed and should be made available virtually.
Community assessments	A systematic needs assessment is needed to prevent gaps in services and the misallocation of funds.
Policy development and systems change	Advocacy and leadership are needed for telemedicine programs to become self-sustaining and for full deployment throughout the state. Policy changes (i.e., reimbursement rates, interstate licensure, increased coverage, payment for preventive services) are needed, particularly in the areas of legal restrictions and reimbursement, to assist with sustainability. It is recommended that the concept of a centralized system is explored. This model may increase interoperability, reduce trial and error costs, reduce gaps in services, and increase scalability.

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