Evaluating Psychosocial Aspects of Telemedicine and Telehealth Systems

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Telemedicine and telehealth evaluations often address the technological aspects of health care while neglecting the psychosocial implications of the technology. Currently, little is known about the meaning of telehealth care in terms of access, quality of care, or financial impact. This article focuses on the human aspects of using technology to provide mental health care and the insight that psychology can bring to the evaluation process. It discusses telehealth's impact on and interface with health care facilities, specifically in relation to training, informatics, remote consultations, patient outcomes, provider health, and professional practice. It also presents guidelines and suggestions for the implementation of a telehealth evaluation, including evaluation design, examples of outcome-related questions that may be pertinent to telehealth evaluation, and suggestions for psychology's continuing role in telehealth.

Evaluating technology in mental health care delivery has a relatively long but spotty history. In 1969, Houck called for research documentation of the introduction of computers in mental health (Houck, 1969). Thirty years later, developments in communications and computer technologies have led to an entire field of technology-mediated health care, referred to as *telemedicine* or *telehealth*. Simply stated, telemedicine is the use of communications technology in the provision of health care. Telehealth, a broader term, includes telemedicine and other health care related activities, such as health education, administration, and training (cf. Nickelson, 1998). A telehealth system, therefore, includes

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educational, administrative, training, clinical, and technological functions of using communications technology and computers in the provision of health care.

Generally, before 1997, telemedicine programs, whether mental or physical health-related, resembled demonstration projects rather than clinical trials or service delivery programs with evaluation components. Data were based most commonly on provider and/or patient satisfaction, whereas evaluations typically addressed the technological aspects of health care. This focus on the technology of administering, educating, training, and providing health care often neglected the psychosocial implications of the technology. Furthermore, rather than systemic program evaluations, most telehealth evaluations were descriptive studies (Burghgraeve & De-Maeseneer, 1995; General Accounting Office [GAO], 1997; Hoss, Benedict, & Kobos, 1996; Institute of Medicine [IOM], 1996; Masys, 1997; Puskin, Brink, Mintzer, & Wasem, 1995; Puskin & Sanders, 1995; U.S. Department of Commerce, 1997; U.S. Department of Health and Human Services, 1997; Yellowles, 1998). These telehealth evaluations usually collected data on the use of telecommunication technology, computers, and cameras. Patient care data tended to be number and type of consultations. Patient or provider satisfaction and efficacy, if measured at all, usually came from a single, self-report question.

As a corrective, Darkins (1996) suggested that telemedicine applications should be viewed in terms of health care, not in terms of technology. He argued that telehealth should be part of the routine clinical and investigative data sets kept for clinical audit and health-service costing purposes. He pointed to three areas in particular: adequacy of the technology, reliability, and adequate backup provisions in case of failure in the technology-based system. Although sometimes criticized as being overemphasized (J. Grigsby, 1998), of poor quality (Trott & Blignault, 1997), or as only one of several components (Bashshur, 1995a, 1995b), the most commonly reported systemic approach is an economic one. In addition to carefully assessing the economic implications of telehealth implementation (Blumberg, 1997), some see the end
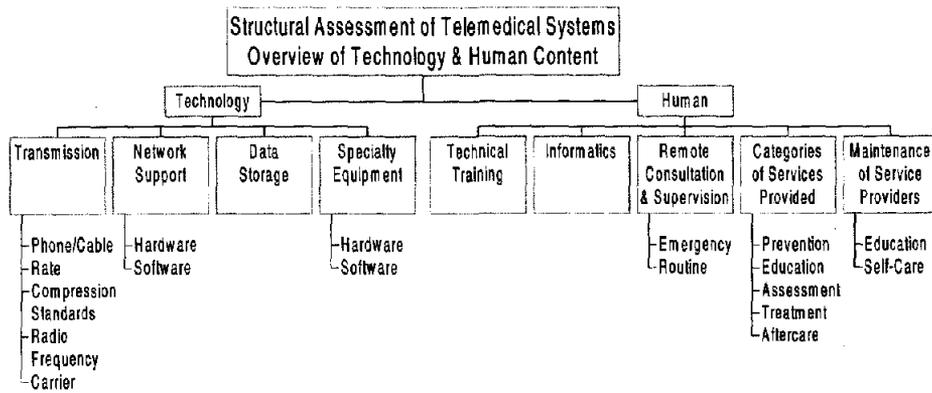
Figure 1. Structural assessment of telemedical systems: Template overview of technology and human content. Adapted from "Psychometric Review of Structural Assessment of Telemedical Systems," by B. H. Stamm, M. E. N. Agnew, & J. M. Rudolph, 1996, in B. H. Stamm (Ed.), Measurement of Stress, Trauma and Adaptation, p. 326. Copyright 1996 by B. H. Stamm.

point of a systemic evaluation as an assessment of the cost-effectiveness of telehealth techniques (Holle & Zahlmann, 1999; McIntosh & Cairns, 1997; Siwicki, 1997). As previously mentioned, psychosocial information, including information about quality of care or changes in patient and provider behaviors—economic or otherwise—is rarely collected. Thus, questions abound regarding the fit between human beliefs and behavior about health care and the technology being used to provide care.

Perhaps these questions remained unasked in the context of rapid technological growth coupled with the dramatic financial pressures on health care because telehealth was assumed to be good; energy was directed toward installing the technology and gauging whether patients and providers used it. The results of this premise are dramatic: Formal telehealth initiatives rapidly proliferated during the past half decade—from fewer than 2,000 consultations (excluding radiology) in 1993 to 41,740 in 1997, to just under 50,000 in 1998 and a great many more than that in 1999 (B. Grigsby, 1997, 1998). Even with this rapid growth and acquisition of knowledge of how, technically, to do telehealth, little is known about the meaning of telehealth in general or mental health care in terms of access, quality of care, or finances.

These human aspects of using technology underlie the technical face of telehealth, and psychology can offer insights to this component of the telehealth evaluation process. The technological aspects can be daunting to some practitioners, masking the significant clinical and human issues underneath and making the systems appear both less approachable and less usable.[1] However, there are a number of ways that telehealth can improve the quality of health care services. Particularly for psychologists, it is important to maintain the centrality of the person in the evaluation equation. What can the data tell us about how telehealth improves the patient's well-being? What can the data tell us about how telehealth improves the provider's, or even the community's well-being? Rather than relying solely on service utilization data, a common practice in managed care, a clinical focus on telehealth evaluation would try to understand the human impact and meaning of the change in service patterns (e.g., from no telehealth to telehealth). Consider the following questions, which begin with

important service utilization questions, but move beyond, toward the impact on the care system, which includes the patient, provider, and larger community.

Service utilization questions:

1. How did the number of outpatient or hospital emergency room visits or admissions to inpatient facilities change with the implementation of telehealth?

2. Did the use of telecommunications technologies for family contact (e.g., family therapy, intervention, and visitation of inpatients) reduce the average length of hospital stay?

3. Did the use of telehealth for postdischarge planning and follow-up reduce the number of admission days and readmissions or lengthen the interval between interventions or admissions?

4. Did the number of serious complications, for example, completed or attempted suicides, change because of implementing telehealth consultation and support services?

Quality of life and level of function questions:

5. Did the level of psychosocial functioning of the patient improve as a result of the telehealth consultation?

6. Did the level of psychosocial functioning of the patient's family or close social support network improve as a result of telehealth consultation?

7. How did referral and patient travel patterns change after implementation of the telehealth system?

8. How did provider error rate, satisfaction, turnover, sick leave, burnout, and stress levels change after implementation of the telehealth system?

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[1] By focusing on the human aspects of telehealth and telemedicine evaluation, we do not wish to imply that the technological side is unimportant. Those wishing to learn more about the technology should consult one of the many telehealth resources, such as the Telemedicine Information Exchange website at http://tie.telemed.org, for a listing of conferences and other resources for learning about telehealth and telemedicine technology.

Evaluating Human Aspects

Telehealth evaluation requires evaluating both human and technology variables (see Figure 1). Technology refers to the things that are required to do telehealth and human aspects refer to doing or receiving the work. For example, the type of cable used for transmission or the software used to interface user and machine is technology. Human aspects are the activities (e.g., E-mail or continuing education) or outcomes (e.g., effect on morbidity or patient satisfaction) of doing the work.

Perhaps the first human aspect that needs to be considered is the context of the evaluation. Telehealth evaluations typically are imposed on functioning health care systems. This means a significant number of people must cooperate with the research design to carry out a successful and meaningful evaluation. Plans handed down from "on high" that increase workloads are typically not well received. Successful evaluations will allow time for early solicitation of staff opinions. To reduce the phenomenon of second-guessing a completed design, administrators must see that staff participate in and understand the rationales of design decisions. Discussing design issues and gathering opinions from staff takes time, but its importance to the success of the evaluation start-up and ongoing process cannot be overstated.

The most important human aspect is the interface between people and the technology of telehealth. The best equipment in the world will not function well if the people using it are not trained and willing to use it. Human activities include (a) training, (b) informatics, (c) remote consultations and supervision, (d) patient services provided, and (e) maintenance of service providers (see Figure 1 for overview; see Figure 2 for detailed view). Each of these variables can be addressed in a variety of ways including associated costs, rate of transmission, satisfaction, and efficacy.

Technical training (see Figure 2, box 1) is necessary for telehealth systems to function well. However, in the business of

setting up a functional telehealth system, adequate training may be overlooked. Beyond technical training, staff need ongoing systemic training regarding telehealth systems. People need training in how to use the equipment and how it fits into a larger picture of caregiving. Important training issues include which face-to-face techniques transfer directly, which should be adapted, and which are new; how to dress for the best effect on camera; general etiquette; and how to move when on different bandwidth cameras. The only way to know whether people are actually learning this information is to monitor their progress. Moreover, data collection in this area can be used to improve and justify ongoing and future training. Rather than developing new measures, existing measurement tools from continuing education can be easily adapted for use in these situations.

Informatics support (see Figure 2, box 2) is common in most hospitals and a growing number of clinics, as well as in universities and private practices. *Informatics* is the creation, shaping, sharing, and application of knowledge (Coiera, 1997), which can include education, administration, and service delivery activities of telehealth. Information specialists, housed in the information technology or computer support sections of health care organizations, tend to concentrate on handling and securing the information that providers, administrators, and evaluators produce in the process of doing telehealth and telemedicine. Providers generally need the part of informatics that relates to location and sharing of information, such as patient records or scientific journal information. Evaluation of informatics might address data security, the quality of the available resources (e.g., which databases are best), access to the resource, and the user interface. The user interface is a very significant part of telehealth applications, but might be ignored in an evaluation. For example, graphical interfaces are easier for timid users, but text-based searches may be preferred by power users who do the majority of the research (for an example, compare
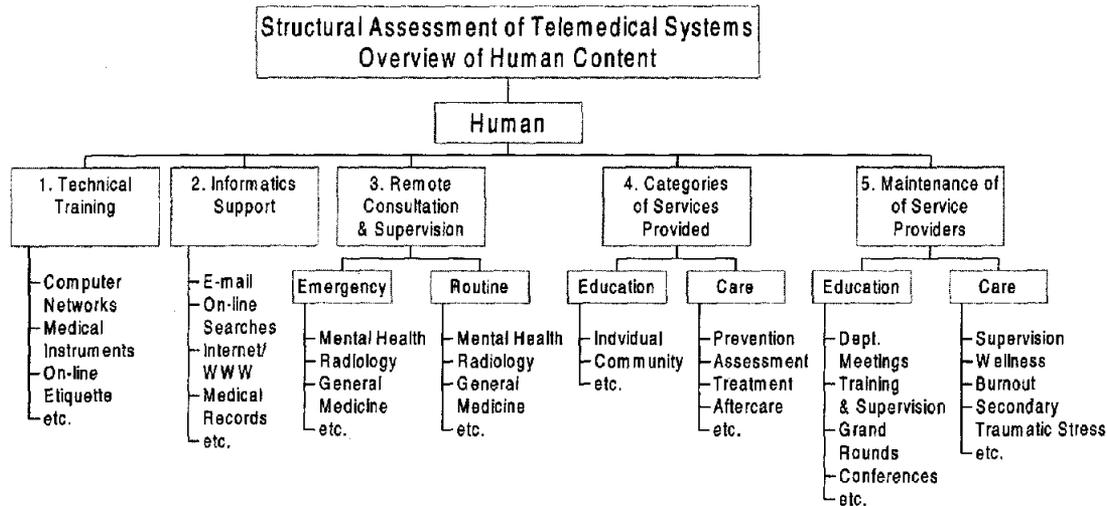

Figure 2. Structural assessment of telemedical systems: Template overview expansion of human content. WWW = World Wide Web. Adapted from "Psychometric Review of Structural Assessment of Telemedical Systems," by B. H. Stamm, M. E. N. Agnew, & J. M. Rudolph, 1996, in B. H. Stamm (Ed.), *Measurement of Stress, Trauma and Adaptation,* p. 328. Copyright 1996 by B. H. Stamm.

the two search methods at the PILOTS database http://www. ncptsd.org/PILOTS.html). What does it mean—in terms of fiscal outlay, staff time, and improvements in staff satisfaction—to the overall cost-effectiveness of maintaining both graphical and text-based search functions? Market-based researchers might only factor in the fiscal costs of dual systems; psychologists can insist on measuring the human aspects such as actual willingness to use the system to establish a true cost-effectiveness of maintaining two search engines.

Whereas information management systems, informatics, may be the most common telehealth application, remote consultation and supervision (see Figure 2, box 3) are the stereotypical telehealth activities. Data gathered in this area should reflect the clinical needs and the clinical questions that remain about using the system. For example, is emergency care better when it is done with remote consultation? Certainly, the time to acquisition of critical care expertise is reduced with telemedicine when compared with physically transporting the patient to a distant health care facility, but is that the true definition of "better"? Another way of looking at the same problem is to ask whether emergency supervision actually ameliorates the need for further care. Routine consultation and supervision could be addressed in terms of quality of care, convenience, or cost-effectiveness, but limitations do exist.

Asking providers to assess the quality of their work may put them at legal risk in potential malpractice suits. One way to minimize the problem of having the providers assess the quality of their work is to focus on their satisfaction by using a proxy measure like "How satisfied were you today with what you could do to help the patient [supervisee]?" Cost-effectiveness is also an important issue when considering the overall benefits of telehealth. Some other perspectives on cost-effectiveness include assessing variables such as the value of convenience for the patient or provider, reduced travel expenses, faster return to work and home settings, continuity of care, and prevention of future emergencies.

Categories of services provided (see Figure 2, box 4) can be educational or care provision. Patients are increasingly proactive in their care. Telehealth evaluations might assess the delivery of consumer-oriented preventative care through individual and community education. Evaluations could track patient access to educational resources such as automated dial-up or Internet sites. In addition, care itself could be addressed. For example, are patients and their families more satisfied with their care options? Are they demonstrably better informed in cases in which telemedicine is used? Does technology-based in-home care improve the maintenance of chronic diseases? Are senior citizens able to retain independence longer with home-based telehealth? Furthermore, it is important to address patient beliefs about care outcomes. Two questions commonly asked for evaluating telehealth are "How satisfied were you with today's encounter?" and "How satisfied were you with the telehealth encounter compared with a face-to-face encounter?" A few experimental designs have addressed the differences between face-to-face and telehealth encounters with generally favorable results (cf. Baigent et al., 1997; Conrath, Dunn, Bloor, & Tranquada, 1977; Glueckauf, 1998) but there is not a body of established evidence.

Maintenance of service providers and support staff (see Figure 2, box 5) is a critical part of the whole system. As do consumers, staff have new options with telehealth, especially in

the area of education and supervision. In some systems, providers routinely receive continuing education through video teleconferencing and on-line classes. Many facilities have embraced distance education because it works, particularly for isolated providers. Nevertheless, little is known about how well it works to improve provider competency and reduce medical error or how it compares with face-to-face interactions. Data should be collected in these areas. It is important to compare the total educational package. Even if the courses are not equivalent to face-to-face classes, do providers improve their skills through increased overall access to new information? A provider who traditionally attends one meeting per year might take part in monthly teleconferences in addition to the one trip. Finally, the health and well-being of the providers themselves could be addressed (cf. Stamm, 1999). Telehealth may have the ability to alleviate the stress of caregiving. Existing measures such as the Compassion Fatigue/Satisfaction Test (available at http://www.bhstamm/tests.htm; Stamm, in press) can be used to track provider satisfaction and stress levels longitudinally following the introduction of a telehealth program.

Implementing a Telehealth Evaluation

To have data that can be aggregated across the different sites in the project, researchers must standardize the collection mechanisms and conditions as much as possible (telehealth systems, almost by definition, link at least two sites). Much can be learned from the literature on clinical trials (e.g., Allison, 1995; Gordon, 1985; Greenhouse, Stangl, & Bromberg, 1989; Spiker, Kraemer, Scott, & Gross, 1991). A multicentered model for collaborative telemedicine research exists in the current telehealth literature (Perednia, 1995, 1996).

Beyond place, time is a variable in most telehealth evaluations. There are four critical time points: (a) baseline, (b) needs assessment, (c) process, and (d) outcome. Most studies begin with a needs assessment. Yet, when implementing new programs (i.e., telehealth) into existing systems (i.e., a health care facility), an adequate needs assessment cannot precede the collection of baseline data because current practices are often not well articulated. Thus, the process begins with a baseline that asks "What is happening now?" Needs assessments are appropriate only after current practices are documented and after establishing a reasonable expectation that this new program will improve the care system. During this phase, the most important goal is to determine whether there is a need to change. It is far better to conclude earlier (when it will be cheaper) than later (when it will be more expensive) that a particular application of telehealth is not appropriate. It is also important not to overlook what is right about the current system so that it can be preserved or enhanced.

Believing their needs to be unique, many telehealth programs develop new measures for evaluations. Yet the use of established measures can reduce the noise caused by instrument variability and enhance the statistical power of the design (Perednia, 1994). In most cases, existing measures related to care delivery, patient satisfaction, therapeutic alliance, patient quality of life, provider work stress, and so forth, can be used to answer the questions that need to be addressed. This is particularly clear when the telemedicine or telehealth is approached as part of the caregiving system rather than as something separate from normal systems of care (cf.

Darkins, 1996). Friedman (2000) urged that it is necessary to collect data using a coherent theoretical structure based on a principle of health and on the identification and needs of the users. Furthermore, he urged that data should be collected simply, in a scalable way, so that one data collection process can meet the needs of multiple systems. Regardless of whether they are designing new measures or using established ones, psychologists may have to adjust their expectations regarding the type and amount of data collected. For example, in one study (Forkner, Reardon, & Carson, 1996; Stamm, 1998), the original provider response form took longer to complete than did the average patient encounter. Providers refused to complete the form, so no data were collected until the form was shorter and fit the normal patterns of care.

Ongoing monitoring of the evaluation can identify problems such as these and allow for midcourse corrections. The degree to which the evaluation can be altered depends greatly on the study design. In blind, randomized clinical trials, far fewer midcourse adjustments are appropriate than in a process-oriented observational study. Yet, Gaston and Gagnon (1996) argued that process research is appropriate even in clinical trials. Generally, the less that is known about what is being evaluated, the more likely that it is important to do midstream checks. In addition, it is important to track the inflow of data to ensure that both the humans and machines counting things keep counting.

The most sought-after data are the outcome data (e.g., Jenkins, 1990). Yet, these data are only as good as the research that produces them. If there is evidence that the evaluation proceeded as planned (or appropriate course corrections were made), there can be a great deal of confidence placed in the outcome data. These data answer the important question, "What happened and how did it happen?" They also help to determine whether what happened was good.

The psychological perspective provides a unique vantage point from which to address evaluation issues. Psychologists can help focus on issues that are important to the staff and clinicians rather than limiting the evaluation to technological or policy questions. Additionally, psychology's longstanding expertise in psychometrics can be brought to bear on designing measures of telehealth. Moreover, evaluation protocols of varying sizes will allow incremental construct validity to develop over time. Thus, it will be possible to understand how telehealth applies at the small clinic level, as well as at the larger health care systems level, and ultimately at the level of the people whose lives telehealth systems touch.

In the end, the goal of any evaluation is to identify the important variables and measure them across time and place. Done well, the evaluation can reveal important information about what is common across time and place and what is unique to a particular time or place. This allows interpretations to be made across the system. It also allows for site-specific or time-specific interpretations. A good evaluation will provide information about what has happened and valuable information for future decisions. The information learned in each evaluation can be used to understand the meaning of the concepts and to improve the design of new and better systems and evaluations. Most importantly, a good evaluation can lead to a telehealth system that values its human interactions as highly as it does the technology on which the system is based.

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