The Effectiveness of Telemental Health: A 2013 Review

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Abstract

Introduction: *The effectiveness of any new technology is typically measured in order to determine whether it successfully achieves equal or superior objectives over what is currently offered. Research in telemental health—in this article mainly referring to telepsychiatry and psychological services—has advanced rapidly since 2003, and a new effectiveness review is needed.* ***Materials and Methods:*** *The authors reviewed the published literature to synthesize information on what is and what is not effective related to telemental health. Terms for the search included, but were not limited to, telepsychiatry, effectiveness, mental health, e-health, videoconferencing, telemedicine, cost, access, and international.* ***Results:*** *Telemental health is effective for diagnosis and assessment across many populations (adult, child, geriatric, and ethnic) and for disorders in many settings (emergency, home health) and appears to be comparable to in-person care. In addition, this review has identified new models of care (i.e., collaborative care, asynchronous, mobile) with equally positive outcomes.* ***Conclusions:*** *Telemental health is effective and increases access to care. Future directions suggest the need for more research on service models, specific disorders, the issues relevant to culture and language, and cost.*

Key words: *telepsychiatry, effectiveness, telemental health, videoconferencing, telemedicine*

Introduction

Telemental health, a use of telemedicine to provide mental health assessment and treatment at a distance, enters its sixth decade as a well-known practice in the medical field—it has increased access to care, and patients and providers are very satisfied with it for a wide variety of services.[1] In this article, we used the term "telemental health" to refer to telepsychiatry and other psychological services, as the term has been used in social science and other fields as well. The American Telemedicine Association (ATA) has published telemental health practice guidelines,[2] as has the American Association of Child and Adolescent Psychiatry.[3] A new generation of studies on telemedicine has replaced the "primary" view of telemental health as a new and different way of providing health services to a contemporary view that it is a vehicle for providing care that is here to stay. The studies supporting this contemporary view have examined the effectiveness of telemental health to answer the question "Is telemental health 'effective' to do 'what' for 'whom' and 'when' at this point in time, based on its evolution?"

Effectiveness implies that telemental health works. In telemedicine and telemental health, few authors have explicitly addressed effectiveness[4]; however, research appears to be changing this.[5] The underlying premise of being "effective" is the assurance that the chosen technology is specific to the objective of the service being offered.[6]

Effectiveness needs to be considered from the perspective of the patient, provider, program, community, and society as a whole. The only previous review of telemental health's effectiveness considered it effective in terms of providing access, improving basic outcomes, and being well-accepted.[4] Telemental health was judged to have broad utility for clinical disorders, facilitated empowerment of patients, and had good educational outcomes. Today, its effectiveness is better described in terms of the model of telepsychiatry used[7,8] and the population being served (e.g., rural, underserved, children).

This article discusses telemental health's effectiveness related to clinical care. There is a review of diagnostic (reliability/validity) or assessment processes, populations (child, geriatric, and ethnic), new models, settings (e.g., collaborative care, asynchronous, emergency, home health), mental health disorders, and cost-related and other outcomes. Recommendations for further effectiveness studies will be offered, and future directions for telemental health services will be discussed.

Materials and Methods

A comprehensive review of the telepsychiatric literature was conducted in the MEDLINE, PubMed, PsychInfo, Embase, Science Citation Index, Social Sciences Citation Index, Telemedicine Information Exchange databases, Centre for Reviews and Dissemination, and The Cochrane Library Controlled Trial Registry databases for the period of July 2003 to March 2013. (The previous review[4] covered 1965 to June 2003). The *Journal of Telehealth and Telecare* was also manually searched for those years when it was not on MEDLINE. Key words included telepsychiatry, telemental, health, telecare, telemedicine, e-health, videoconferencing, effectiveness, efficacy, access, outcomes, satisfaction, quality of care, rural, mental health, cost, children/child, cultural/culture, geriatric, population, home health, medical home, emergency, face-to-face, in-person,

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reliability/validity, and international; the term "in-person" will be used rather than "face-to-face" in this article.

Article titles and abstracts were reviewed by the authors to see if they were applicable to the theme of effectiveness. Data on effectiveness appear in a wide range of range of case studies, case series, project descriptions, and program evaluations to more formal research trials.[5] Selected articles were pulled, and their references were reviewed to identify additional articles that may have been missed by the keyword search. In total, 755 articles were initially reviewed for this article, with 670 excluded because of little information/data on effectiveness. Although more reviews of the topic or related topics would have been interesting, 15 were chosen as most salient; this left 70 actual studies. Interventions like education, medication management, and most of the therapies were excluded by the words searched.

Effectiveness, overall, was determined on the basis of clinical parameters, the beneficial effects of a program or policy under optimal conditions of delivery, and other data under more real-world conditions.[9] This differs from evidence of efficacy ratings, which is traditionally organized as A (best) to F (least). A key component of effectiveness is feasibility and/or replicability or adaptation to other settings (also known as disseminability). Clinical research trials usually assess effectiveness compared with in-person service, preferably with a design that is randomized. Tips for program effectiveness[4] have been updated and are summarized in *Table 1*; this compilation, however, is not based on research or analysis of studies.

Measures of Effectiveness

DIAGNOSIS (VALIDITY AND RELIABILITY) AND ASSESSMENT (*TABLES 2* AND *3*)

Studies of telemental health's reliability and validity started with 128–384 kilobits per second (Kbps) and now occur at 384+Kbps; these of course do not apply to asynchronous and other telephonic options. Diagnoses have been made reliably, with good inter-rater reliability, for a wide range of psychiatric disorders in children, adolescents, and adults; less information is available on geriatric patients, but preliminary results are positive. Limitations have been largely overcome, including patients' difficulties in hearing, concentration, and attention; some rural areas that lack access because of line or satellite technology are more restrictive, but patients often travel to a nearby site.

A wide range of scales has been studied for adults and children/adolescents via videoconferencing, as reviewed by Yellowlees et al.[2] for the ATA and Richardson et al.[5] These include the Brief Psychiatric Rating Scale (BPRS), Scales for the Assessment of Negative and Positive Symptoms (SANS and SAPS, respectively), the Structured Clinical Interview for the Diagnostic and Statistical Manual (DSM) (SCID), Hamilton Depression Rating Scale (HDRS), Diagnostic Interview Schedule (DIS) (initially by telephone), the Abnormal Involuntary Movement Scale (AIMS), and the Yale Brown Obsessive Compulsive Scale (semistructured) (YBOCS). For children/adolescents, the DSM-IV, Schedule for the Assessment of Depression and Schizophrenia (K-SADS), and DIS (DISC) have been used. The Geriatric Depression Scale (GDS) and many neuropsychiatric scales like the Mini-Mental Status Examination (MMSE), CAMCOG (neuropsychiatric test, computerized), National Adult Reading Test, Quick Test, and Adult Memory and Information Processing Battery are effective. The reliability and validity of asynchronous telepsychiatry has been shown using English and Spanish versions of the SCID and Mini-International Neuropsychiatric Interview (MINI).

COMPARISON WITH IN-PERSON CARE

Since the last review,[4] studies have compared many parameters using traditional comparison and noninferiority studies.[5,10] Some have noted that with some populations (i.e., children and adolescents), telepsychiatry may be better than in-person services because of the novelty of the interaction, direction of the technology, the psychological and physical distance, and the authenticity of the family interaction.[11] Reports have also included reduced length of hospitalization,[12,13] better medication adherence,[12,14] symptom reduction of disorders,[12–15] and effective therapy such as using evidence-based treatments for posttraumatic stress disorder, including group cognitive processing.[16–18]

SPECIFIC POPULATIONS: CHILD, GERIATRIC, AND THOSE OF CULTURE

The feasibility, acceptability, and sustainability of telemental health for children and adolescents have now been shown,[19,20] and it has been hypothesized that this approach may be better for some disorders, such as autism-spectrum patients, than in-person care.[11] A qualitative study of young people's perspectives on receiving telepsychiatric services revealed that the sessions were helpful, they felt a sense of personal choice during the consultation, and they generally liked the technology.[21] Attention-deficit hyperactivity disorder treatment by telepsychiatry[3,22–24] has been actively studied, and, once again, satisfaction is high among all parties in a variety of settings.[22,23]

Child research in telemental health has progressed into new areas[20] like randomized trials and Web-based data systems, with work from adults being replicated. Diagnosis appeared to be reliable in early studies,[25,26] demonstration of clinical improvement with the use of cognitive behavioral treatment for depression followed,[27] and then primary care patients treated by telemental health showed improvement in terms of depression and subscales of the Child Behavioral Check List.[28,29] Psychiatric consultation leads to newly diagnosed anxiety or mood disorders in almost one-third of patients seen and a change in the patient's medication for 82% of patients at initial assessment, 41% at Year 1, and 46% at Year 3.[30] Collaborative care for adolescent depression is under evaluation.[31]

In terms of geriatric services, the benefits of telepsychiatry are emerging from neuropsychiatric studies (see above) and a few clinical studies. Preliminary studies in nursing homes have mainly focused on depression or dementia, with telemental health evaluation judged as more facile and efficient in terms of the use of consultant time.[32] Assessment, cognitive intervention, and outcomes appear to be similar to in-person results.[32] Telepsychiatry to a rural geropsychiatric inpatient unit yielded positive results in terms of

Table 1. How to Evaluate the Effectiveness of Telemental Health

Measures
Starting points
Case report, series, or mix of patients
Project or program description
Qualitative analysis: impressions, perceptions, or information to form additional questions
Cost, cost comparison, or cost offset, often of "direct" costs
Project or program evaluation, sometimes retrospective
Small(er) total *n*
Micro- (e.g., one party) analysis
Some control of variance or limited interplay of variables
Cross-sectional analysis
Goals
Prospective, question-based
Comparison group
Study design "same as" or "equal to"
Noninferiority trials
Study design randomized controlled trial
Cost-effectiveness, -benefit analysis with computations of direct and indirect costs
Evaluation that "drives" the objectives and prospectively collected
Generally, large(r) total *n* (but not always guarantee "good" study)
Micro- (all parties individually) and macro- (system-wide = patient, provider, clinic, health system, community, and other parties) analyses
Analysis of variance
Longitudinal analysis
Access
Increased access to care
Improved level of, or quality of, existing care
Specific to the need (e.g., consultation–liaison rather than management [only] to primary care)
Complements or integrates service delivery (or prevents use of more intensive or costly service)
Quality of care
Reliable/valid
Diagnosis and assessment
Detection of limitations and process to "control" for them is delineated
Improved level of, or quality of, existing care
Specific to the need (e.g., consultation–liaison rather than management [onl] to primary care)
Complements or integrates service delivery (or prevents use of more intensive or costly service)
Population
Setting
Satisfaction and related intangibles (e.g., empowerment)
Costs
Technology
Adequate description of equipment, bandwidth, frames per second, and other parameters
Data on failures, problems (i.e., reliability)
Time, effort, and other "hidden" costs of "new" technologies (e.g., asynchronous telepsychiatry)
Administration
Feasibility
Level of coordination to initiate, maintain, and financially support

satisfaction compared with in-person care[34] and in a 5-year study of patients referred for evaluation of potential cognitive impairment, 55%, 14%, and 12% had Alzheimer's disease, another psychiatric illness, or mild cognitive impairment, respectively.[35]

Ethnicity, culture, and language issues affect health,[36] and there is often inadequate access to specialists[37]—inroads to patient needs and preferences that can be met by telemental health are progressing. A recent study of nearly 40 rural health clinics compared impressions of 25 primary care providers (PCPs) and 32 staff impressions of factors important to care: using providers who value differences (5.4 and 7.0, respectively), quality of the provider's care (4.9 and 7.0, respectively), access to care in general (4.5 and 7.0, respectively), and availability of trained interpreters for use with patients (4.4 and 7.0, respectively).[38] Others are studying the specific needs of Hispanics/Latinos,[37,39,40] Asians,[41] Native Americans,[35,43,44] Eastern Europeans,[44] and those using sign language[45]—all using telepsychiatry for service provision. With patients of different cultural backgrounds, using the patients' primary language allows for a more comfortable atmosphere where they may express their genuine feelings and emotions.

SUMMARY OF OUTCOMES FOR AGE/POPULATION AND SPECIFIC DISORDERS *(TABLE 2)*

Results are encouraging, overall. Videoconferencing appears to be as effective as in-person care for most parameters, such as feasibility, outcomes, age, and satisfaction with a single assessment and consultation or follow-up use. Illnesses studied have been depression,[9,15,31] posttraumatic stress disorder,[16–18] substance use,[46] and developmental disabilities.[30]

Table 2. Summary of Clinical/Outcome Studies by Population (Age)

TOPIC, STUDY	*N*	PATIENT POPULATION	KBS	LOCATION	COMMENT(S)
Geriatric					
Lyketsos et al. (2001)	NAP	Geriatric outpatients	NS	United States	Video reduced "unneeded" hospitalizations.
Poon et al.[33] (2005)	22	Geriatric dementia patients	1.5 Mb	China	Significant, comparable cognitive improvement in video and in-person; high satisfaction; feasible assessment, intervention, and outcomes
Rabinowitz et al.[32] (2010)	106	Nursing home residents	384	United States	Reduced travel time, fuel costs, physician travel time, personnel costs
Weiner et al.[35] (2011)	85	Adult and geriatric dementia patients	NS	United States	Feasible alternative to face-to-face care in patients with cognitive disorders who live in remote areas
Adult					
Graham et al. (1996)	39	Adult outpatients	768	United States	Video reduced "unneeded" hospitalizations.
Zaylor et al. (1999)	49	Adult depressed or schizoaffective outpatients	128	United States	Video equals in-person in GAF scores at 6-month follow-up.
Hunkeler et al. (2000)	302	Adult primary care outpatients	NS	United States	Video by nurses improved depressive symptoms and functioning and had high satisfaction versus in-person.
Ruskin et al.[16] (2004)	119	Adult Veterans	384	United States	Depression outcomes video and in-person equal, as were adherence, satisfaction, cost
Manfredi et al.[74] (2005)	15	Adult inmates	384	United States	Feasibility from an urban university to rural jail; less need for inmate transport
Sorvaniemi et al.[59] (2005)	60	Adult emergency patients	384	Finland	Minor technical problems occurred; assessment and satisfaction fine
Modai et al.[76] (2006)	24/15	Adult outpatients	NS	Israel	Video greater than in-person cost per service and more hospitalization cost (less available per usual care)
Urness et al.[75] (2006)	39	Adult outpatients	384	Canada	Video less than in-person for encouragement; improved outcomes for both
O'Reilly et al.[13] (2007)	495	Adult outpatients	384	Canada	Video equal to in-person in outcomes, satisfaction; 10% less expensive per video
Yellowlees et al.[53] (2010)	60	Non-emergency adult patients	NAP	United States	First ATP to demonstrate feasibility
Pediatric					
Nelson et al.[27] (2003)	28	Children	128	United States	Video equals in-person in reducing depression over 8 weeks; satisfaction high, but 15/100 consultations had an issue with technology.
Greenberg et al.[77] (2006)	NS	Children	NS	Canada	Video experiences positive; family caretakers and service providers frustrated with limitations of the video
Myers et al.[78] (2006)	115	Adolescents, incarcerated	384	United States	80% of youth successfully prescribed medications, and they expressed confidence with the psychiatrist's recommendations; youth expressed concerns about privacy.
Myers et al.[23] (2010)	172	Children and adolescents	384	United States	Parents' satisfaction higher with school-aged children and lower with adolescents; adherence high for return appointments
Pakyurek et al.[12] (2010)	NAV	Children/adolescents in primary care	NS	United States	Video might actually be superior to in-person for consultation.

(continued)

Table 2. Summary of Clinical/Outcome Studies by Population (Age) *continued*

TOPIC, STUDY	*N*	PATIENT POPULATION	KBS	LOCATION	COMMENT(S)
Lau et al.[79] (2011)	45	Children and adolescents	NS	United States	Video reaches a variety of children, with consultants providing diagnostic clarification and modifying treatment
Jacob et al.[80] (2012)	15	Child outpatients	NS	United States	Patient satisfaction was high, and PCPs found recommendations helpful; outcomes pending on follow-up
All ages					
De Las Cuevas et al.[14] (2006)	130	All ages—outpatients	384–768	Spain	Video equals in-person, including those in remote areas with limited resources
Depression					
Ruskin et al.[16] (2004)	119	Adult Veterans	384	United States	Video equals in-person for adherence, patient satisfaction, and cost.
Fortney et al.[15] (2007)	177	Adult outpatients	NS	United States	Video can help adapt collaborative care model in small PC clinics, and symptoms improved more rapidly in intervention group versus usual-care group.
Moreno et al.[37] (2012)	167	Adult patients	NS	United States	Video may close gap in access to culturally and linguistically congruent specialists; improves depression severity, functional ability, and quality of life
Fortney et al.[9] (2013)	364	Adult patients	NS	United States	Video collaborative care group had greater reductions in severity than usual-care group.
PTSD					
Frueh et al.[18] (2007)	38	Adult male Veterans	384/NS	United States	Video equals in-person in clinical outcomes and satisfaction at 3-month follow-up; video less comfort versus in-person in talking with therapist post-treatment and had worse treatment adherence
Morland et al.[17] (2010)	125	Adult male Veterans	384/NS	United States	Video CBGT for PTSD-related anger is feasible for rural/remote Veterans, with reduced anger.
Germain et al.[81] (2009)	48	Adult patients	NS	Canada	Video equals in-person in reducing PTSD over 16–25 weeks
Substance abuse					
Frueh et al.[46] (2005)	14	Adult male outpatients	384/NS	United States	Video had good attendance, comparable attrition, and high satisfaction.
Developmental disability					
Szeftel et al.[30] (2012)	45	Adolescents	NS	United States	Video led to changed Axis I psychiatric diagnosis (excluding developmental disorders) 70%, and changed medication 82% of patients initially, 41% at 1 year, and 46% at 3 years; video helped PCPs with recommendations for developmental disabilities.
Panic disorder					
Bouchard et al.[82] (2004)	21	Adults	384/NS	Canada	Video 81% of patients panic-free post-treatment and 91% at 6-month follow up via CBT
Hispanic					
Moreno et al.[37] (2012)	167	Adult patients	NS	United States	Video lessens depression severity, raises functional ability and quality of life, and improves access to culturally and linguistically congruent specialists.
Chong et al.[40] (2012)	167	Adult patients	NS	United States	Video is acceptable to low-income depressed Hispanic patients, but its feasibility is questionable.
Yellowlees et al.[55] (2013)	127	English- and Spanish-speaking patients	NS	United States	ATP equal for English- and Spanish-speaking patients

(continued)

Table 2. Summary of Clinical/Outcome Studies by Population (Age) *continued*

TOPIC, STUDY	*N*	PATIENT POPULATION	KBS	LOCATION	COMMENT(S)
American Indian					
Shore et al.[43] (2008)	53	Male adult patients	NS	United States	Video equals in-person assessment, interaction, and satisfaction; comfort level high and culturally accepted
European					
Mucic[44] (2010)	61	Adult outpatients	2Mbit (Denmark) 10Mbit (Sweden)	Denmark	Video improved access, reduced waiting time, and reduced travel to see bilingual psychiatrists; high satisfaction video preferred via "mother tongue' rather than interpreter-assisted care
Asian					
Ye et al.[41] (2012)	19	Adult outpatients	NS	United States	Primary language facilitates expression of feelings, emotional discomfort, or social stressors.
Sign language					
Lopez et al.[45] (2004)	1	Adult female, deaf since birth	NS	United States	Video communication was fine with ASL interpreter, and psychiatric symptoms improved.

Those studies before 2003 are not referenced in this regular article since it is not a review; name and year of those not referenced are given in Hilty et al.[4] (2003).

ASL, American Sign Language; ATP, asynchronous telepsychiatry; CBT, cognitive behavioral treatment; NAP, not applicable; NAV, not available; NS, not specified; PC, primary care; PCP, primary care provider; PTSD, posttraumatic stress disorder.

MODELS AND SETTINGS OF TELEMENTAL SERVICES

Consultation to primary care versus management. Past studies showed positive outcomes for patients when using a consultation model of care into primary care sites. Specialists changed the diagnosis and medications in 91% and 57% of cases, respectively, with primary care interventions led to clinical improvements in 56% of cases.[1] Provider knowledge, skills, and complexity of questions improve over time,[47] particularly in rural PCPs.[48] The most intensive model of consultation to primary care is collaborative care, which has now been more formally applied to telemedicine[9,15,31] with encouraging results. The virtual collaborative care team was able to produce better outcomes than the traditional "gold standard" methodology of primary care psychiatry.[9]

Models of care have been thoroughly studied and well articulated.[7] Examples are:

1. Randomized controlled trial for depression in adults, using disease management and telepsychiatric consultation versus usual care over 12 months.[49]
2. Phone and e-mail physician-to-provider consultation system for adults and children with developmental disabilities, using a 24-h warm-line.[50]
3. An integrated program of mental health screening, therapy on site, and telepsychiatric consultation (phone, e-mail, or video), with continuing medical education and training on screening questionnaires.[28,29]
4. Cultural consultation to rural primary care using telemedicine.[38]
5. Disaster response to a bioterrorism attack was evaluated as feasible in terms of training and consultations.[51]
6. Collaborative care via telepsychiatry is co-provision of medication for primary care patients by the telepsychiatrist and PCP in rural communities, based on the earlier models of in-person care to achieve national standards of antidepressant prescriptions.[9,52] This model is often integrated with stepped models of care, which, similar to the above, use "less intensive or expensive interventions" first; then if patients fail to improve, "step it up" to more intensive services.
7. Asynchronous telepsychiatry (ATP) to primary care (described below) is feasible and helpful (described below).[53,54]

ATP. ATP services, formerly known as store-and forward services, have been demonstrated to be feasible, valid, and reliable in English- and Spanish-speaking patients in primary care.[53–55] Asynchronous telemedicine is used in radiology, dermatology, ophthalmology, cardiology, and pathology, and it is now available in psychiatry, where it may also facilitate the "medical home," a patient-centered approach that supports the PCP to improve patient care and health.[56]

ATP works at the patient end via taping a videorecording of local providers and patients, use of a basic questionnaire, and uploading of videos and patient histories for a remote psychiatrist for review in a Health Insurance Portability and Accountability Act (HIPAA)-adherent manner.[57] He or she evaluates the information, diagnoses the patient, and makes two or three treatment recommendations in a report. ATP is specifically designed for patients who can be primarily managed in primary care, but could offer the

Table 3. Summary of Telemental Health Cost Studies: Since 1998

COST	*N*	PATIENTS	KBPS/ FRAMES	LOCALE	COMMENTS
Mielonen (1998)	14	Adult inpatients	NS	Finland	Savings in healthcare costs, reduction in travel, and ease and speed of consultation
Trott (1998)	50	Adult and child outpatients	NS	Australia	Substantial savings in healthcare costs from reduction in traveling and patient transfers
Alessi (1999)	NAV	Adult forensic inpatients	NAV/NAV	United States	Video is cost-effective.
Doze (1999)	90	Adults	336–384/NS	Alberta	Costs break even at 7.6 consultations.
Simpson (2001)	379	Adult outpatients	128–384	Canada	Costs break even at 224 consultations/year; less if used for administration, too
Elford (2001)	30	Children and parents	336	Newfoundland, Canada	Cost $400 per consultation via video or by patient traveling
Hailey (2002)	NAP	Adults	NAP/NAP	United States	Reduced costs to rural patients
Edwards et al.[83] (2003)	518	Adults and children		United States	Video saved $400/consultation versus in-person
Jong[68] (2004)	71	NS	NS	Canada	Video saved $2,000/consultation versus in-person and saved government $140,088 in 2003.
Ruskin et al.[16] (2004)	119	Adult Veterans	384/NS	United States	Video greater than in-person unless psychiatrist traveled >22 miles away, and the productivity (increasing number of patients/day) minimized costs.
Cluver et al.[63] (2005)	10	Adult outpatients	NS	United States	In-home portable video works but costly for the average person
Persaud et al.[69] (2005)	215	Adults	NS	Canada	Video versus in-person of equal cost, overall, as patient costs more for in-person literal consultation $240–$1,048 (Canadian $) versus telehealth $17–$70, but from societal perspective, video costs more at $1,736–$28,084 versus in-person $325–$1,133.
Harley[84] (2006)	11	Adults	128	United Kingdom	Video in rural areas costs 4 times less than in-person, once a threshold of 5–6 episodes per year is completed.
Modai et al.[76] (2006)	24/15	Adult outpatients	NS	Israel	Operational video costs greater than in-person, particularly if resulted in hospitalization (223.7% higher); video costs of sessions 32% higher unless travel included (then only 10.6% higher)
O'Reilly et al.[13] (2007)	495	Adult outpatients	384/NS	Canada	Video 10% less expensive per patient than service provided in-person
Shore et al.[42] (2007)	53	Adults	384/NAP	United States	Video costs lower than in-person
Smith et al.[66] (2007)	1,499	Children	NS	Australia	Video cost about $600/consultation versus $1,000+ in-person
Spaulding et al.[67] (2010)	257	Children/adolescents	384+?	United States	Video cost $168/consult more but only $31 if travel costs included
Rabinowitz et al.[32] (2010)	106	Nursing home residents	384/NS	United States	Reduced travel time, fuel costs, physician travel time, personnel costs
Pyne et al.[85] (2010)	395	Adult outpatients	NS	United States	Video $85,634/QALY for collaborative care
Butler and Yellowlees[54] (2012)	125	Adult primary care patients	ATP[5]	United States	ATP and video fixed costs $7,000 and $20,000, respectively, and per consultation ATP was $68.18, video was $107.50, and in-person $96.36; this means ATP is most cost-effective at 249 consultations/year.

Those studies before 2003 are not referenced in this regular article since it is not a review; name and year of those not referenced are given in Hilty et al.[4] (2003).

ATP, asynchronous telepsychiatry; KBPS, kilobits per second; NAP, not applicable; NAV, not available; NS, not specified; QALY, quality-adjusted life years.

opportunity for PCPs to collaborate with psychiatrists to provide specialized care, and it is less costly than video and usual care.[53]

Emergency room telepsychiatry. Telepsychiatry emergency services have been slow to develop in psychiatry compared with neurology (e.g., stroke), obstetrics (e.g., fetal monitoring), and other clinical areas. This is surprising despite the consultation models used and the long delays before mental health evaluation may occur on site. The effectiveness of emergency telepsychiatric consultations has rarely been studied; however, one study of patients with mainly depression, bipolar disorder, and schizophrenia revealed that 65% were discharged, 16% were admitted, and 19% were transferred.[58] This study, which examined eight programs, found that most rated themselves as moderately successful (3/5 or 4/5, with 5 best) and patients and emergency physicians rated services at 4.4/5. The same was found in another study.[59] Guidelines on how to be effective in providing emergency telepsychiatry need to be evaluated.[60,61]

Medical home, home health, and other mobile technology methods. These services are in development and need to be better studied, although costs are dramatically decreasing. The patient-centered medical home is a concept founded on the presence of inadequate treatment in primary care and/or an inability to access needed services.[56] The patient-centered medical home allows telepsychiatric input at home, still under the general purview of the PCP, and it has been shown to improve patient care and health.[62] Desk-mounted video systems offer great convenience for therapy to cancer patients to avoid travel, but the cost used to be prohibitive for most consumers.[63] Internet-based video technology via personal computers and mobile devices must be HIPAA-adherent. Use of these technologies is increasingly becoming available and will support the move of telepsychiatry to the home, such as programs that are now being implemented by the Veterans Health Administration.[64]

ACCESS TO CARE

Access appears to have been greatly increased, based on the recent decade's research—with a few exceptions. Patients may have less travel, absence from work, and time waiting, more clinical choice and control, and better outcomes, as summarized previously.[4] Satisfaction, generally, with services is so high that it *de facto* precludes study. Rarely do patients report a less satisfactory interaction by videoconferencing than in-person. A few access-to-care issues remain unresolved for patients: (1) privacy and confidentiality where some patients prefer services delivered from elsewhere (e.g., living on a reservation or wanting total anonymity for personal reasons), (2) cultural and language nuances related to telemental healthcare, and (3) inadequate payment for indigent, rural, and other underserved patients. PCPs and communities are generally happy to "keep" their patients locally for continuity of care.

COST ISSUES AND IMPLICATIONS

Ideally, costs should be considered for patients, clinics, providers, and society at large—with both direct and indirect costs accounted for. Direct costs include equipment, installation of lines, and other supplies. Fixed costs also include the rental cost of lines, salary and wages, and administrative expenses. Variable costs include data transmission costs, fees for service, and maintenance and upgrades of equipment. Costs may also include projections for travel, transfers in emergencies, waiting times, and more "appropriate" use of other services or, more globally, by rural towns retaining dollars that would have been otherwise lost to suburban centers upon referral.

With regard to cost, there is benefit to delineate between differing types of cost analyses.[65] The cost-offset model, which implies treating mental conditions may reduce other health costs, is widely used. Cost-minimization analysis implies the same effectiveness model, but different (lower) costs. Cost-effectiveness assesses intervention costs versus alternative expenditures; a subtype is cost-utility analysis, which includes data on health-related quality-of-life measures (i.e., quality-adjusted life-years). Cost-benefit analysis values all outcomes by translating them into economic terms to the degree possible and is particularly important when an intervention appears far too expensive at face value (or cross section) but not longitudinally (e.g., a transplant helps someone live and work an additional 50 years; this calculation gets into quality of life-years analysis).

Cost studies have differences in data sought, their collection, and how they are analyzed (*Table 3*). Videoconferencing may be cost-effective if someone does not have to travel or transfers as "expensive" services are avoided. Savings may be shown versus in-person with high consultation rates (e.g., 1,500 consultations total),[66] "break-even" or other thresholds used (e.g., number of consultations/year), or when the patient's travel, time, and food are included.[66,67] A break-even analysis is highly specific to a program, with a range of consultations needed, from 7 to 774 depending on methods of calculation.[66] A comparison of ATP, video, and in-person showed fixed costs were $7,000 for ATP and $20,000 for regular video, and the cost per consultation was $68.18 for ATP, $107.50 for videoconferencing, and $96.36 in-person; this means ATP is most cost-effective at 249 consultations/year.[54] Governments have been tabulating savings, too,[68,69] and an economic evaluation of telehealth data collection with rural populations has been completed.[70]

Conclusions, Implications, and Recommendations for Future Research

Today, telemental health services are unquestionably effective in most regards, although more analysis is needed. They are effective for diagnosis and assessment, across many populations (adult, child, geriatric, and ethnic), and in disorders in many settings (emergency, home health), are comparable to in-person care, and complement other services in primary care. Overall, better evaluation with formal measures (i.e., randomized trials, lack of inferiority designs) and analysis of variance to predictors of outcomes are necessary. Studies need to be focused on areas where there is currently a relative paucity of information, such as anxiety, substance use, and psychotic and other disorders.

A key area the integration of telepsychiatric models like collaborative care into services in primary care settings. The fact that it worked better than usual models is a key step—it may change our decision-making about how to best do things in the future. Web-based data management[37,71,72] will facilitate services, as can stepped models of care. For example, a new stepped model might have low tier physician-to-provider phone or e-mail consultation followed by ATP, then therapies, and finally videoconferencing.

A plan for assessment and care for patients with ethnic, cultural, and language issues is essential.[54,73] Scientific and policy questions from this discussion include:

- What tools, methods, and measures are needed to assess the patients, providers, and health systems?
- What are the intersections of culture, sociodemographic, geography, and technology in health?
- Will patients' disorder, racial or ethnic identity, or other factors determine whether e-mental health or in-person care is more effective?
- What is the most cost-effective and feasible way to provide language/interpreting support?

Limitations of this article include that it is not a systematic, fully longitudinal review of the literature. Second, the scope was limited to exclude specifics on medication management, the therapies (largely), and other treatments. Furthermore, not all findings apply to all locales or settings therein. Fourth, the landscape of healthcare is rapidly changing, with consumer/patient use of technology—the field will be hard pressed to keep up. Finally, plans that offer the most "adaptability" or "flexibility" of telemental services—beyond this article's scope—will afford the most opportunities for improvement.

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