In Review

Clinical and Educational Telepsychiatry Applications: A Review

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Objective: Telepsychiatry in the form of videoconferencing brings enormous opportunities for clinical care, education, research, and administration. Focusing on videoconferencing, we reviewed the telepsychiatry literature and compared telepsychiatry with services delivered in person or through other technologies.

Methods: We conducted a comprehensive review of telepsychiatry literature from January 1, 1965, to July 31, 2003, using the terms telepsychiatry, telemedicine, videoconferencing, effectiveness, efficacy, access, outcomes, satisfaction, quality of care, education, empowerment, and costs. We selected studies for review if they discussed videoconferencing for clinical and educational applications.

Results: Telepsychiatry is successfully used for various clinical services and educational initiatives. Telepsychiatry is feasible, increases access to care, enables specialty consultation, yields positive outcomes, allows reliable evaluation, has few negative aspects in terms of communication, generally satisfies patients and providers, facilitates education, and empowers parties using it. Data are limited with regard to clinical outcomes and cost-effectiveness.

Conclusions: Telepsychiatry is effective. More short- and long-term quantitative and qualitative research is warranted on clinical outcomes, predictors of satisfaction, costs, and educational outcomes.

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Clinical Implications

- Telepsychiatry has been used successfully for many types of patients in many settings.
- Telepsychiatry has been well received by both patients and physicians.
- Telepsychiatry appears to compare favourably with in-person care in terms of validity, reliability, and ability to communicate.

Limitations

- Data are limited with regard to patient outcomes and cost-effectiveness.
- More randomized controlled trials of telepsychiatry are needed.
- Qualitative and quantitative descriptions of telepsychiatry's impact on routine services are needed.

Key Words: *telepsychiatry, mental health, outcomes, education, review, satisfaction, effectiveness, in-person, telephone, cost*

The National Library of Medicine defines telemedicine as the use of electronic communication and information technologies to provide or support clinical care at a distance (1). Each new technology offers advantages and disadvantages, compared with currently available technology. Telemedicine in the form of videoconferencing has increased access to psychiatric care in rural (2–5), suburban (5), and urban areas (6) by linking specialists at academic or regional health centres with health care professionals in underserved areas (7). Preliminary studies have demonstrated positive

outcomes and user satisfaction with telemedicine (8,9). Information is still being sought in regard to how telepsychiatry compares with previous services, what technology is used, and how it may be integrated with other services (10–12). Information is also needed on its costs (10–14), its outcomes (10–12), and its effects on communication and interpersonal behaviour (15,16). Questions with regard to its effectiveness persist because there are few clinical outcome studies, cost data, and randomized trials.

This article reviews the clinical and educational applications of telepsychiatry, focusing specifically on how it is used and its effect on access to care, as well as on its reliability, its outcomes, its effects on communication and interpersonal behaviour, and its costs. We also focus on patient and provider satisfaction, education, empowerment, integration of data streams, administrative planning, and overall effectiveness. When applicable, we compare telepsychiatry with other technologies (for example, telephone and the Internet) and with in-person service. Legal and reimbursement issues are beyond the scope of this article but are discussed elsewhere (1).

Methods

We conducted a comprehensive review of the telepsychiatric literature between January 1, 1965, and July 31, 2003, by searching the following databases: Medline, PubMed, PsycInfo, Embase, Science Citation Index, Social Sciences Citation Index, and Telemedicine Information Exchange. The *Journal of Telemedicine and Telecare* was also handsearched for the years in which it is not available on Medline. We used the following key words: telepsychiatry, telemedicine, videoconferencing, effectiveness, efficacy, access, outcomes, satisfaction, quality of care, education, empowerment, and costs. The primary author reviewed article titles and abstracts, selecting studies for review if they discussed videoconferencing for clinical and educational applications. Selected articles were pulled and references were reviewed for additional potential articles.

Results

Technology Used for Telepsychiatry

Nearly all telepsychiatric services are conducted using interactive videoconferencing. Equipment selection is based on software applications, ease of use, image and sound quality, cost, and compatibility with other units to which one will link. For example, clinics doing 2-way videoconferencing sessions might use the following equipment: dial-up integrated service digital network (ISDN) or T1 lines with a transmission speed of 128 to 512 kilobits per second (KBS), pentium computers with 128 to 512 megabytes of random access memory (RAM), cameras with local and remote pan-tilt-zoom control, colour monitors, and a CODEC (COder-DECoder) for converting the audio and visual information into the binary code for transmission.

Key variables in telepsychiatric videoconferencing are the speed of transmission in KBS, the transmission method, audio quality, and picture quality in frames per second (FPS). Most services transmit between 128 KBS and 512 KBS, although transmission at 768 KBS has been reported. It is important to have adequate bandwidth for the task at hand or to have an alternative clinical option (for example, a primary care provider who evaluates a tremor if it cannot be adequately seen). Terrestrial transmission is most commonly used and is relatively inexpensive; however, it is limited by the availability of access to fiber optic lines in rural areas (2). It provides a good picture when conducted at 128 KBS, although a 0.3 second audio and visual delay may generally occur; transmission at 384 KBS to 512 KBS is virtually live. Satellite transmission transcends geographic limitations, is 8 times as costly (2), and almost always involves a 0.5- to 1.0-second delay (as occurs, for example, in worldwide broadcasts). In addition to bandwidth, frames per second (FPS) is a measure of how closely videoconferencing approximates a real image (for example, 30 FPS is television quality). FPS depends on television technology that refreshes the pixels of the screen image. Its relevance to videoconferencing is that a sudden flux of movement can require a complete change of pixels and overwhelm the available bandwidth, resulting in pixelization, distortion, and freezing at low bandwidths.

The Internet has been used to a lesser degree for videoconferencing. It has no cost (other than the costs of connecting or dialing in from long distance), offers many applications, and is highly accessible. There are 3 major challenges to Internet-based telepsychiatry: insufficient bandwidth, quality of service, and security. The term "quality of service" describes the priority health care services receive, compared with other services on the Internet. For example, if too many users were on the Internet, would digital space for the health care consultation be preserved?

Telemedicine for Psychiatry: Uses, Access to Care, and Programs

Review articles have described clinical applications (8), research applications (9), effectiveness (17), and geriatric telepsychiatry (18). Service points are theoretically limitless: they include clinics, hospital emergency rooms, patients' homes, group homes, nursing homes, homeless shelters, hospices, schools, and forensic facilities. A full range of evaluation, consultation, and management services have been carried out by telemedicine, including case management; decision support; disease prevention and management; legal hearings; forensic evaluation; transplant evaluation; neuropsychological evaluation; individual, family, and group

therapy; home, outpatient, nursing home, and inpatient care; and personal and social support.

One significant advantage of telepsychiatry has been improved access to psychiatric care in rural (2,3,5,19,20), suburban (5), and urban areas (6). With regard to patient care and continuing education, its ability to link specialists at academic or regional health centres with health care professionals in underserved areas is particularly useful (5,19,20). Moreover, this model supports primary care providers who would rather physically locate psychiatrists in their clinics than send their patients to a mental health clinic (5). This model also reduces provider isolation and gives them a hands-on way to learn how to treat patients (5), particularly if they sit in on the telepsychiatric evaluation (21). Consultation by telepsychiatry has been successful, with high initial and longitudinal satisfaction on the part of consultees (22). By avoiding travel to rural sites, it also uses specialist time efficiently.

Currently, over 50 telepsychiatry programs exist in the US, another 14 exist in Canada, and many others exist internationally. The literature describes several telepsychiatry programs, including those offered by Alberta's Mental Health Board; Australia's Rural and Remote Mental Health Service; the US Federal Bureau of Prisons; the Telemedicine Network; Oregon's RodeoNet; the South Carolina Department of Mental Health's Deaf Services Program; Ontario's St Joseph's Health Centre; Texas' Tech University; the University of California, Davis; Ireland's University College Hospital in Galway; the University of Kansas Medical Center; the University of Kentucky; the University of Oulu, Finland; and programs in rural Appalachia and the Highlands of Scotland (20,23,24).

Reliability Studies

There are several studies concerning the reliability of telepsychiatric services (Table 1); they have been summarized in detail elsewhere (8,9). Most studies compare telepsychiatry with in-person care, although some compare it with telephone care. Studies have been conducted for children, adults, and geriatric patients. Nearly all have had good results, generally at transmission speeds of 128 KBS to 384 KBS. A wide range of psychiatric disorders were reliably diagnosed (for example, anxiety, cognitive decline, depression, and psychosis). Overall, interrater reliability has been high (8,25), and in general, diagnostic reliability appears to be excellent with telepsychiatry, with only a few studies detecting minor limitations.

Ratings are sometimes less reliable in adults and geriatric patients when clinicians use the Brief Psychiatric Rating Scale (BPRS) (4,26,27). We speculate that older patients with dementia may have had difficulty responding to questions on the BPRS, resulting in poor reliability. Cognitive examinations with elderly patients using the Mini-Mental State Examination (MMSE) and the clock drawing test at 128 KBS have sometimes, but not always, resulted in lower scores, perhaps owing to patient difficulties with hearing and maintaining attention (4,28–30). No problems have been noticed using the MMSE in other studies.

Clinical Outcome Studies

The literature regarding outcomes for telepsychiatry is small, but growing, and indicates that telepsychiatry may improve outcomes or stabilize patients with chronic, deteriorating courses (Table 2).

Telepsychiatry has enabled 2 opinions rather than 1 (that is, it allows for both primary care provider and specialist opinions) (5). Patients are referred mainly for diagnostic evaluation and (or) treatment recommendations (20,22). In a study of specialty consultation including telepsychiatry, specialists changed the diagnosis in 91% of cases and recommended medication changes in 57% (31). According to clinical global improvement measures, 56% of patients improved. Similarly, nursing telecare to patients reduced depression and improved mental health functioning and patient satisfaction (31). In a comparison with in-person care, patients receiving telepsychiatric care did equally well on self-report and clinical measurements over a 1-year follow-up (32). Similarly, an 8-week trial of cognitive-behavioural therapy delivered by telepsychiatry at 128 KBS to children with depression was as successful as in-person care (33). Positive outcomes may also be defined by reduced transfers for emergencies (34), reduced appointment waiting time (35), reduced use of the psychiatric intensive care unit (36), and reduced hospital admissions (by 50%) (37).

Patient Satisfaction Studies

Assessment of patient and provider satisfaction becomes increasingly important with rapid expansion of telemedicine services (38,39). A systematic review of the satisfaction literature revealed limitations in the form of small sample sizes, informal evaluation, and a lack of randomized trials (40). Teleconsultation appears acceptable to patients, but further exploration is needed. Key predictors of satisfaction with telepsychiatry have not yet been delineated, although transmission speed and equipment quality appear to play important roles because of their impact on transmission quality (8).

Interestingly, although patients expected specialist–patient interaction to be less satisfactory than that experienced in a traditional specialist–patient encounter (41), overall satisfaction has been very high (8,40). High satisfaction has been reported in 17% of patients in one study, despite equipment problems (35). Thus far, reduced time to travel (20,42,43), reduced absence from work (20), reduced waiting time (44),

Table 1 Summary of telepsychiatry reliability studies

Study	*n*	Patients	KBS (FPS)	Location	Comments
Reliability					
Baer and others (103)	10	Adult patients with OCD	128 (—)	US	Ratings of severity of OCD equal to in-person interview ratings
Baigent and others (26)	42	Adult state hospital inpatients	128 (—)	Australia	BPRS ratings similar, though difficulty with "overall concern" and affect
Ball and others (28)	—	Geriatric patients (review article)	Telephone	US	Compared the MMSE and its variants via telephone: good access, does not assess visuospatial and praxis ability, and possible confusion
Chae and others (104)	30	Adult outpatients	33 (—)	Korea	High interrater reliability between telemedicine and in-person interviews
Elford and others (25)	23	Child patients	336 (—)	US	Diagnosis and treatment recommendation: equal to usual, in-person care
Grob and others (4)	27	Nursing home residents	384 (—)	US	MMSE and Geriatric Depression Scale: telepsychiatric assessment equal to in-person assessment
Jones and others (27)	30	Geriatric nursing home patients	128 (—)	US	High reliability of ratings via videoconferencing
Kirkwood and others (105)	27	Adult patients in residential rehabilitation centres	128 (—)	US	Equal reliability for the National Adult Reading Test, the Quick Test, and the Adult Memory and Information Processing Battery
Malagodi and others (46)	4	Occupational evaluation of adult patients	128 video and 16.8 phone (—)	US	Video worked, but took more time and had motion artifact
McLaren and others (62)	7	Community mental health centre	128 (—)	US	Comparison of telepsychiatry (T) and in-person (IP): patient satisfaction higher with T and also higher than psychiatrist satisfaction
Montani and others (29,30)	25	Geriatric patients	128 (—)	US	MMSE: overall good reliability if hearing is sufficient
Ruskin and others (51)	30	Adult inpatients with depression	— (—)	US	Reliability coefficients similar for in-person and telepsychiatry
Zarate and others (106)	45	Adult schizophrenia patients	128 and 384 (—)	US	Global severity and positive symptoms per BPRS and other scales were reliably rated; negative symptoms less so

KBS = kilobits per second; FPS = frames per second; OCD = obsessive–compulsive disorder; BPRS = Brief Psychiatric Rating Scale; MMSE = Mini-Mental State Examination

and more patient choice and control (20) have been reported as positive predictors. Other predictors may include frame speed (27); demographic factors (for example, age, sex, or ethnicity) (8,45); state- and trait-dependent factors (for example, acute depression vs depression in remission) (8,45); cost (8); reduced waiting time, satisfaction with and availability of local services, and familiarity with the local setting (that is, in a remote site) (45); and provider qualities (46). Table 3 summarizes studies of telepsychiatry satisfaction. Several interesting themes have emerged from the literature. First, most patients speak freely when using telepsychiatry, rate highly their preference for using it on subsequent visits, and rate positively the experience with the specialist (47). Patients prefer modes with visual cues rather than telephone services alone. In an open prospective study, patient satisfaction with telepsychiatric care was equal to other specialty care offered via telemedicine (38). Another prospective study allowed patients to select in-person or telepsychiatric care for

Table 2 Summary of outcome studies

Study	*n*	Patients	KBS (FPS)	Location	Comments
Doze and others (20)	90	Adult outpatients	128 to 384 (—)	Canada	Specialists assisted with diagnosis and treatment; no outcomes measured
Graham (107)	39	Adult outpatients	768 (—)	US	Reduced hospitalization
Haslam and McLaren (36)	69	Adult and geriatric outpatients	128 (—)	US	More appropriate use of inpatient services
Hunkeler and others (34)	302	Adult outpatients in primary care	— (—)	US	Nurse telecare improved depressive symptoms, functioning, and satisfaction vs usual care
Johnston and others (19)	40	Nursing facility residents	128 (adjusted to 5-inch square)	US	Elimination of travel and more contact between patients and staff
Kennedy and Yellowlees (32)	124	Adult outpatients	128 (—)	Australia	Clinical improvement at 1-year follow-up on self-report and primary care provider assessments; equal to in-person care
Lyketsos and others (37)	—	Geriatric dementia patients	— (20)	US	Reduced psychiatric hospitalization
Nelson and others (33)	28	Child patients with depression	128 (—)	US	Substantial clinical change, equivalent to in-person care
Nesbitt and others (31)	164	Adult outpatients with specialty consultations including psychiatry	128 to 384 (—)	US	Change in diagnosis in 91% of cases and clinical improvement in 56% of cases
Zaylor (108)	49	Adult outpatients with depression or schizoaffective disorder	128 (—)	US	No difference in GAF scores at 6-month follow-up vs in-person

GAF = Global Assessment of Functioning

evaluation and follow-up care, if applicable (45). When length of wait, insurance, demographic information, and diagnoses were controlled, satisfaction and adherence to appointments were equal for in-person and telepsychiatric care. Children (48,49), adolescents (25), and adults appear to be equally satisfied with telepsychiatry (8). Geriatric patients, too, have reported high satisfaction in studies, including a study comparing in-person and telepsychiatric evaluation (30). Some geriatric patients had trouble hearing (30,50) or felt uncomfortable or inhibited by the equipment, but 94% of patients did not believe that these factors had a detrimental effect on the relationship (50). Satisfaction among the elderly, including a group of patients with depression, has also been reported to be similar to that among younger adults (27,51). Rarely, patients have thought telepsychiatry was impersonal or had greater potential for decreased sensitivity (20).

Provider Satisfaction Studies

Provider satisfaction with telepsychiatry is less well evaluated. In rural Arkansas, medical school graduates from the 1960s, 1970s, and 1980s believed that telemedicine could significantly improve education, information exchange, patient care quality, and the institution's reputation; however, they did not believe it would improve access to care, follow-up care, or provider recruitment (52). Consultee (that is, nurse, psychologist, or other) satisfaction with telepsychiatry was lower than satisfaction with in-person consultation in terms of ease with the process, ability to express oneself, and quality of the interpersonal relationship (49). In another study, however, satisfaction with a consultation-liaison service was high (that is, 4.5 or greater on a scale of 1 = poor to 5 = excellent) and increased after 2 or more consultations over a 1-year period (22). Rural providers had significantly higher satisfaction than suburban or urban providers.

Effect on Communication and Relationship

Three articles have discussed in detail the effects of telemedicine on communication and relationships (8,15,16). Telepsychiatry appears to have both positive and negative effects on communication (8). It allows the establishment of a "social presence" (15). One concern with telemedicine is that the technology may adversely affect communication and the development of a positive therapeutic alliance (53). We review findings from the nonmedical, medical, and psychiatric literature, including comparisons between telepsychiatry, telephone, and in-person services.

A critical variable affecting communication is telemedicine's ability to simulate real-time experiences in terms of image and interaction. Transmission speed has a profound affect on

Table 3 Summary of patient telepsychiatry satisfaction studies

Study	*n*	Patients	KBS (FPS)	Location	Comments
Baer and others (103)	26	Adult patients with OCD	128 (—)	US	Average to better than in-person care
Baigent and others (26)	63	Adult state hospital inpatients	128 (—)	Australia	Many patients were satisfied and preferred it instead of in-person
Ball and others (28)	6	Adult inpatients	Low-cost system (—)	UK	Also measured satisfaction with in-person, telephone, and hands-free telephone
Blackmon and others (48)	43	Child outpatients	— (—)	US	Parent satisfaction was also very good
Bratton and others (50)	20	Geriatric patients in a retirement community	128 (—)	US	Satisfied despite hearing and poor image problems
Callahan and others (38)	93	Adult primary care outpatients	128 (15)	US	Satisfaction equal to a nonpsychiatric population
Chae and others (104)	30	Adult outpatients	33 (—)	Korea	Equal to usual, in-person care
Dongier and others (49)	50	Adult, child outpatients	Closed circuit TV (—)	Canada	Equal to usual, in-person care
Doze and others (20)	90	Adult outpatients	128 to 384 (—)	Canada	Positive because of less travel and less absence from work; negative perception
Elford and others (109)	23	Children	336 (—)	US	Diagnosis and treatment recommendation equal to usual, in-person care
Graham (107)	39	Adult outpatients	768 (—)	US	Positive patient acceptance of telepsychiatry aftercare (90% positive ratings)
Hilty and others (45)	40	Adult primary care outpatients	384 (15)	US	Satisfaction equal for in-person and telepsychiatric care, if patient given the choice
Johnston and others (19)	40	Nursing facility residents	128 (—)	US	Patients and families expressed appreciation for the service
Kirkwood and others (105)	27	Adult patients in residential rehabilitation centres	128 (—)	US	Patients expressed high satisfaction while doing reading and memory tests
McCloskey and others (43)	236	Adult outpatients	128 (—)	US	Rural Montana; would have had to travel significantly
McLaren and others (58)	3	Adult schizophrenia patients	— (—)	UK	Patients felt comfortable and some preferred it to in-person
Mielonen and others (81)	14	Adult inpatients	— (—)	Finland	High patient satisfaction (80% considered it to have been useful)
Ruskin and others (51)	—	Geriatric outpatients	— (—)	US	Geriatric satisfaction similar to adult satisfaction
Simpson and others (35)	230	Adult outpatients	384 (—)	Canada	High level of satisfaction with the service and equipment
Simpson and others (44)	546 visits	Adult outpatients	384 (—)	Canada	High level of satisfaction with the service and equipment, despite equipment problems in 17% of cases
Trott and others (80)	50	Adult and child outpatients	— (—)	Australia	High level of acceptance by patients and mental health professionals

audio and video quality. Terrestrial transmission at 384 KBS to 768 KBS provides a good picture and no audio delay. Low-KBS terrestrial transmission (for example, < 128 KBS) and satellite transmission provide good pictures, but with 0.3-second and 0.5-second signal delays, respectively. If delays are too great, words are cancelled out when parties speak simultaneously. Consequently, they may perceive the other as interrupting, and a turn-taking conversation may occur (54,55). Some of this may be caused by the presence of others in the room or by the patients' belief that they are being videotaped or that information exchange takes place primarily on a verbal channel, rather than a video channel, regardless of how high-quality the video channel is (15,54,56). Nevertheless, no differences in the development of rapport were found in a small cohort comparing 0.0-second, 0.3-second, and 1.0-second signal delays (57).

Decreased ability to detect nonverbal cues in patient interviews has been reported during videoconferencing (58), which may limit mutual connections and understanding (59). In a physical environment, informational cues are incorporated without conscious awareness (for example, a patient is seen walking in a reticent way). The virtual environment created by telemedicine may differ, particularly when low-cost systems are used (55), although it appears to provide enough of the physical environment for good decision making (16). Videoconferencing provides more cues than telephone conferencing; however, it may require more time than does the telephone to communicate the same ideas (56,60,61), although this was not found in 2 studies (62).

Several papers comment on telepsychiatry's effect on psychotherapy. In a report of psychoanalysis carried out by telephone, no significant psychotheraupeutic differences were found between office and telephone therapy (63). Nevertheless, such sessions may have a distancing effect on the relationship and may not allow detection of key physical cues. Most patients make use of whatever method is available to bring material into the transference, including strong affects (64). Some analysts prefer listening with an averted gaze, actively blocking out visual information to enhance processing of verbal information (65,66). Basic indications and contraindications have been suggested for using telephone and videoconferencing methods for psychotherapy (65), but more rigorous evaluation is warranted before drawing conclusions.

Some wonder whether it is necessary to have a preexisting relationship (that is, to see the patient first in person) to minimize telepsychiatry's possible negative effects, if any, on the specialist–patient relationship. A preexisting relationship has been reported helpful for psychotherapy supervision (67) and was required in a study that compared telepsychiatric interventions with in-person therapy or usual care populations (68). Two studies using formal assessments revealed no difficulty developing an alliance and no adverse events noted (69,70).

Some of the barriers created by the telemedicine interface (that is, the technology–human interface) may be dramatically lessened in the future through virtual reality or 3-dimensional technology. It may be as if the patient is in the room with the specialist.

Cost Studies

This article reports cost studies briefly, because the quality of data in the literature is suboptimal and little information has been collected in a systematic, controlled, prospective fashion (10). Ideally, direct and indirect costs should be collected for patients, clinics, providers, and society at large. Direct costs include equipment, installation of lines, and 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 equipment maintenance and upgrades. Cost analysis is difficult for several reasons. For example, technologies continue to evolve and become dated rapidly (71), and costs depend on use. In addition, the cost may seem high, since usual care often amounts to no care. New cost analyses are being completed, but the heterogeneous methods skew the data. Cost-effectiveness and cost–benefit analyses are recommended (17,72–74).

Several studies have reported cost data (Table 4). Usually, telepsychiatry is less expensive for patients (35,42,75,76). Telepsychiatry services have been estimated to be less expensive (3,77,78), as expensive (10), or more expensive than outreach in-person services (20,50,79) Telepsychiatry appears cost-effective in reducing costly transfers (for example, in the case of forensic psychiatry; 77,80,81) and hospitalization (36,37). Break-even cost analyses are often used, as is the case with the telepsychiatry program in Alberta (with 7 consultations weekly; 20,44,75).

A metaanalysis of cost data found that only 38/551 articles contained any quantifiable data. It is therefore premature to conclude that telemedicine is cost-effective (82). Several detailed guidelines have been recently published (10,11,83–85), as have recommendations for cost-effectiveness (86) and cost–benefit (73) evaluations.

Integrating and Organizing Telepsychiatry into Daily Practice

The increased availability of broadband systems, whether satellite-based, cable, fibre, or digital subscriber lines (DSLs), has reduced their price. Consequently, there is more opportunity to provide effective telepsychiatry services, incorporating multiple data streams, to any place in the world, any time, from the doctor's desktop. Inevitably over time, we will move to global health care systems wherein clinicians and patients

Table 4 Summary of telepsychiatry cost studies

Study	*n*	Patients	KBS (FPS)	Location	Comments
Alessi and others (77)	—	Adult forensic inpatients	— (—)	US	Telepsychiatry is cost-effective
Doze and others (20)	90	Adult patients	336 to 384 (—)	Alberta	Costs break even at approximately 390 consultations yearly; less if used for administration, too
Hailey and others (10)	—	Adult patients	—	US	Reduced costs to rural patients
Hailey and others (42)	—	A review of 5 mental health studies; adult patients	—	International	Savings to health system and patients through less travel
Gammon and others (67)	—		—	Norway	Costs break even at 18 trips (800 km) or 34 trips (300 km)
Haslam and McLaren (36)	69	Adult and geriatric patients	128 (—)	US	Reduced cost by more appropriate use of inpatient services and cheaper case conferences and patient assessments
Lyketsos and others (37)	See comments	Geriatric patients with dementia in long-term facility	— (20)	US	Admissions: 21 in 1997–1998 and 11 in 1999–2001; 100 fewer hospital days total
Mielonen and others (81)	14	Adult inpatients	—	Finland	Savings in health care costs, reduction in travel and ease and speed of consultation
Simpson and others (35)	379	Adult outpatients	128 to 384 (—)	Canada	Savings of $210 per consultation for patients who would have had to travel
Simpson and others (44)	546	Adult outpatients	384 (—)	Canada	Costs break even at approximately 350 consultations yearly; less if used for administration, too
Trott and others (80)	50	Adult and child outpatients	—	Australia	Substantial savings in health care costs from reduction in travelling and patient transfers
Werner and Anderson (79)	—	Theoretical analysis	—	US	Not feasible: start-up costs; high cost per visit (for example, $322 for community mental health centre–rural site medication check-up; less for University–rural site)

interact in electronically distributed worldwide environments supported by broadband technologies, either wired or wireless. These global delivery environments on the doctor's desktop will incorporate various features, including technology to allow video consultations in real time or video e-mail for store-and-forward programs as well as electronic consumer-owned or provider-shared voice-driven health records. Practice-management and communications software, serviced from central servers or kept on doctors' local networks, will allow them to link seamlessly, peer-to-peer, with their colleagues. Many of telepsychiatry's current organizational problems will be overcome through the use of Web-based scheduling systems. Such systems will allow patients to connect to their doctors in a manner similar to the way in which we use the Internet to reserve, for example, a hotel room (87). Specialists' electronic desktops will have a very strong educational focus, because doctors and other health care professionals will be able to receive their continuing health education via their desktops. Several commercial companies are already starting to manufacture and distribute these systems (88). The practice and practitioners of telepsychiatry have to meet the challenges contained in the recent crucially important report from the Committee of Quality Health Care in America of the Institute of Medicine, which noted that "information technology must play a central role in the redesign of the health care system" (89). Telepsychiatry is not yet completely integrated into daily mental health service delivery. Substantial further research is required, especially to examine the human- and change-management issues that have to be overcome for this to occur (90).

Education

Telemedicine has been used for several educational initiatives, including provider education (91,92), clinical consultation (5), and supervision (67). It has successfully linked academic centres with rural areas for continuing medical education, both in North America and internationally (7,92). Clinical consultations also reduce provider isolation, provide case-based learning (93), and help with decision support (94).

Empowerment

Patient travel time is reduced (20,42,43), as is time absent from work (20) and waiting time (35). Further, patients have more choice and control regarding treatment (20). Primary care providers have access to specialists for patient care and education, are able to keep their patients rather than referring them (22), and feel good about their practice. Communities also keep their patients, reduce the costs for transfers (80,81), and retain dollars that would have otherwise been lost to suburban centres upon referral (95). Communities presumably also benefit from providing a higher quality of care and more opportunities for staff education, as well as from greater ease with recruitment and accreditation (17).

Effectiveness

The overall effectiveness of telepsychiatry has recently been evaluated (17,32). According to its Latin root, effectiveness is defined as "having the power to produce an effect . . . a decisive effect; efficient; as, . . . an effective . . . remedy" (96). Ideally, effectiveness should be considered for the patient, provider, program, community, and society. With what telepsychiatry's effectiveness is being compared is another key issue. If there is no service at all, then telepsychiatry will be judged highly effective. Standard care in communities has often not been completely evaluated, and without direct comparison, it is hard to judge telepsychiatry's effectiveness. If superior local services already exist, telepsychiatry is usually not initiated. Effectiveness also depends on the experience and skill of the consultant—even with limitations imposed by technology, a good telespecialist may be better than a local specialist.

Telepsychiatry's effectiveness has been evaluated with regard to access to care, quality of care (that is, outcomes, reliability, satisfaction, and comparison with in-person care), costs, education, empowerment, and other factors that influence effectiveness (for example, technology and administrative coordination) (17). According to preliminary data (17), telepsychiatry appears effective, although it is premature to claim it is cost-effective (22).

Telepsychiatry's effectiveness needs to be further assessed (8,9,42,75,76,97). Frameworks have been proposed (10–14) and key aspects have been recently summarized (17). All parameters could benefit from more assessment, particularly in terms of outcomes and costs. Randomized controlled trials of telemedicine are feasible, enable recruitment of patients, and maintain enrollment (98).

Discussion

Telepsychiatry is being used successfully for various clinical, educational, and research purposes. The technology, speed of transmission, and program structure vary widely among many clinical settings. One significant advantage of telepsychiatry has been improved access to psychiatric care in rural, suburban, and urban areas. Compared with in-person care, most studies have shown it to reliably diagnose a wide range of conditions in adults, children, and geriatric populations. It appears to be generally acceptable to patients. Overall, telepsychiatry appears to allow the building of relationships, with clear advantages over the telephone and few disadvantages, compared with in-person care. Educational use has included didactic, case-based consultation and supervisory initiatives. Telepsychiatry appears to have greatly empowered patients, providers, programs, and communities.

More rigorous assessment of telepsychiatric service is needed in various areas, and lessons learned may also be valuable for elements of in-person psychiatric service (for example, outcomes and costs) not commonly studied outside research settings. More data are needed on patient outcomes for almost all age groups and disorders. Measurement of satisfaction needs to be more specific about several key variables: demographic factors (for example, age, sex, or ethnicity), state- and trait-dependent factors, cost, travel time for both patients or specialists, waiting time, and quality and availability of local services. More data are needed on referring and consulting provider satisfaction, with attention to the variables listed above as well as to training, specialty, years in practice, type of practice, and other factors that affect practice. In addition, the technology needs to be better described so that its effect on the measurement of all parameters can be understood. Such technology includes bandwidth, audio quality, FPS, size of the transmitted video image (rather than the size of the monitor), computer speed, and name or make of the CODEC and other equipment (99). Information about the cost of telepsychiatry services needs to be collected in a standard, prospective fashion (10), preferably through cost-effectiveness and cost–benefit analyses. Longitudinal evaluation is needed throughout the telepsychiatry literature, and studies need to report quantifiable data that can be pooled when appropriate for metaanalysis (82).

Table 5 lists guidelines for program viability and delivering quality clinical care (7,8). Programs should be based on underlying patient and provider needs, with incentives for each of the parties involved. Clinical guidelines and protocols in telemedicine can significantly improve program quality

Table 5 Guidelines for program viability and for delivering quality service

1. Do a thorough needs assessment in the region that the program is planning to serve.
2. Obtain overall and financial support of the program from senior leadership of the organization.
3. Use clinically proven technology.
4. For each consult, be certain that the technical equipment is appropriately matched to the service and needs of the patient and their condition.
5. Evaluate options, implementation, and maintenance of telepsychiatry with a team of clinicians, technicians, and administrators in both the hub and the spoke sites.
6. Adequately train all site coordinators in the technical and procedural aspects of the service, including referral guidelines and transfer of patient medical information to the specialist and back to the referral site.
7. Obtain a telepsychiatric champion and provide adequate training for others with regard to the technology, adapt clinical practice to fit its use, and identify its limitations.
8. Provide regular technical maintenance and prompt trouble-shooting.
9. Coordinate timing of consults (that is, the patient is there at the right time, the telepsychiatrist has adequate time, and (or) referring providers or staff stop in if desired).
10. Adequately evaluate outcomes, satisfaction, and costs to the patient, the referring provider, and the specialist, as well as to the program (coordinator, technical staff, and administration).

and efficiency. Training practitioners to practise telepsychiatry requires ensuring their comfort with the equipment, adapting it to clinical practice, and being aware of its limitations. Several factors have led to the downfall of telemedicine programs. Many programs fail because of inadequate needs assessment and inadequate support from organization leaders. Inadequate technical support will alienate all parties. Inadequate collection of outcome, satisfaction, and other data jeopardizes the renewing of contracts or grants. Specialist participation requires resolution of various issues, including remuneration, clinical responsibility from a distance, impact on usual practice, credentialing, and medicolegal coverage, as well as organizational support to supply service to remote populations.

It appears that telepsychiatry use will continue to grow. Its curve of growth or decline will depend on how well programs are organized and adapt to potential pitfalls. Some obstacles (for example, costs and access to broad bandwidth lines) will recede as technology advances. Integration of videoconferencing with other digital technologies appears particularly promising in terms of clinical care, patient and provider education, provider–specialist communication, and electronic medical records. The computer can significantly facilitate clinical care and education (100,101) if it fits with the demands of clinical practice and the cognitive structures of clinicians (102).

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Résumé : Applications cliniques et éducationnelles de la télépsychiatrie : une étude

Objectif : La télépsychiatrie, sous forme de vidéoconférence, comporte d'énormes possibilités pour les soins cliniques, l'éducation, la recherche et l'administration. Ciblant la vidéoconférence, nous avons examiné la documentation sur la télépsychiatrie et comparé celle-ci avec les services fournis en personne ou par l'entremise d'autres technologies.

Méthodes : Nous avons mené un examen exhaustif de la documentation sur la télépsychiatrie de 1965 à 2003, à l'aide des mots clés télépsychiatrie, télémédecine, vidéoconférence, efficience, efficacité, accès, résultats, satisfaction, qualité des soins, éducation, habilitation et coûts. Nous avons choisi d'examiner les études qui traitaient de vidéoconférence pour des applications cliniques et éducationnelles.

Résultats : La télépsychiatrie est employée avec succès pour divers projets de services cliniques et éducationnels. La télépsychiatrie est faisable, élargit l'accès aux soins, permet la consultation de spécialistes, donne des résultats positifs, permet une évaluation fiable, a peu d'aspects négatifs en ce qui concerne la communication, satisfait généralement les patients et les fournisseurs de soins, facilite la formation, et habilite les parties qui s'en servent. Les données sont limitées relativement aux résultats cliniques et à la rentabilité.

Conclusions : La télépsychiatrie est efficace. Il faut davantage de recherche quantitative et qualitative à court et à long terme sur les résultats cliniques, les prédicteurs de satisfaction, les coûts et les résultats en matière d'éducation.