SATISFACTION WITH IN-HOME SPEECH TELEREHABILITATION IN CHRONIC POST-STROKE APHASIA: AN EXPLORATORY ANALYSIS

Michel Tousignant PT, PhD[1], Joël Macoir PhD[2,3], Vincent Martel-Sauvageau PhD[2], Patrick Boissy PhD[1], Hélène Corriveau PT, PhD[1], Suzanne Gosselin MD[4], Marie-France Dubois PhD[1], Marilyn Tousignant RN BSc[1], Catherine Pagé MSc[1]

[1] Research Center on Aging, Centre intégré universitaire de santé et de services sociaux de l'Estrie - Centre hospitalier universitaire de Sherbrooke (CIUSSS de l'Estrie – CHUS), Sherbrooke, Québec, Canada
[2] Université Laval, Québec, Canada
[3] Centre de recherche - CERVO - Brain Research Center, Québec, Canada
[4] Centre intégré universitaire de santé et de services sociaux de l'Estrie - Centre hospitalier universitaire de Sherbrooke (CIUSSS de l'Estrie – CHUS), Sherbrooke, Québec, Canada

Abstract

Patient satisfaction with healthcare has a major impact on clinical outcomes and compliance. Satisfaction with telehealth services for speech and language problems has been documented but not in post-stroke aphasia. The main objective here was to evaluate patient satisfaction with speech tele rehabilitation based on the PACE pragmatic rehabilitation approach in post-stroke aphasia. This study was embedded in a pre-/post-test feasibility and efficacy study in which 20 patients with chronic post-stroke aphasia received 3 weeks of speech therapy (9 sessions) through in-home tele-rehabilitation. A telerehabilitation platform based on a commercial videoconferencing system (Tandberg 550 MXP) with custom software was used to transmit audio, video and data through a high-speed Internet connection between the participant's home and the clinician. Participants' satisfaction with in-home telerehabilitation and healthcare received was assessed using French adaptations of the Telemedicine Satisfaction Questionnaire and Health Care Satisfaction Questionnaire. Satisfaction with functional communication, i.e. communication in common situations of daily life, was compared pre- and post-intervention with participants and caregivers. Participants' satisfaction with in-home telerehabilitation was excellent (94%±4.3%). Satisfaction with healthcare received was good overall (80%±11.4%) and for three factors measured independently, i.e. relationship with healthcare professional (84%±12.5%), services delivered (73%±13.8%), and general healthcare organization (84%±12.0%). Participants' and caregivers' satisfaction with communication was higher after the intervention (p=0.001 and p<0.001, respectively) and was correlated with age (r=-0.60; p=0.007). Patients with post-stroke aphasia receiving speech tele-therapy were very satisfied with this service delivery method. Also, technology use was not an issue for seniors post-stroke.

Keywords: aphasia; communication; telepractice; telemedicine; service delivery; satisfaction; stroke

Introduction

The prevalence of stroke in Canada is very high. Someone has a stroke every 10 minutes[1,2] and approximately 315,000 Canadians currently live with stroke impairments.[2] Such impairments depend on lesion location and size.[3] Stroke is defined as a sudden loss of brain function caused by neuronal cell death after an interruption of blood flow, or the rupture of blood vessels within the brain. It is a major public health problem that affects motor functions and memory as well as language functions such as the ability to listen and understand, read and write. One third of all stroke survivors suffer from aphasia.[4] Aphasia is a condition in which an individual's cognitive capacity may remain intact[5] but oral and/or written expression and comprehension are impaired to differing degrees.[6,7] Almost all individuals with aphasia also have anomia, which is defined as word-finding difficulties that lead to major difficulties in daily life conversations. Aphasia may also affect the ability to read, spell, produce

sentences, comprehend, etc. Aphasia has dramatic repercussions not only on the affected person's quality of life[8-10] but also on his/her family. Aphasia reduces the individual's social interactions,[11-13] which leads to serious and often longstanding personal and professional limitations. The potential impact of language therapy for persons with aphasia is therefore of great interest.

There is growing evidence that speech therapy can have a positive influence on communication abilities in post-stroke aphasia. A Cochrane Review identified significant improvements in functional communication, reading comprehension and expressive language function when patients with stroke received speech and language therapy, compared to those who did not.[14] Multiple forms of speech therapy are designed to enhance overall communication abilities or specific language functions, such as naming, reading or sentence production. In post-stroke aphasia, speech therapy is based on a collaborative care approach that usually begins at the hospital in the acute phase, continues in intensive rehabilitation programs, and ends at home or during weekly visits to an outpatient clinic.

Unfortunately, in Canada, access to speech and language therapy is often delayed due to the unavailability of timely rehabilitation services. In 2014, only 16% of Canadians with stroke were able to access in-patient rehabilitation, and of those, only 50% accessed rehabilitation centres within two weeks of their stroke.[15] As a consequence, the optimal rehabilitation for patients with post-stroke aphasia is often compromised by limited access to speech therapy.

In this context, it is essential to develop effective complementary service delivery alternatives. The accelerated development of new technologies in the field of information and communication technology (ICT) enables clinicians to propose innovative and intensive treatments delivered remotely using speech tele-therapy.[16-23] This approach, which relies on telecommunication technologies, has been used to assess various clinical populations. Thus, it is an interesting avenue for the behavioural treatment of acquired language deficits post-stroke.

Telehealth has often been used for the remote assessment of language and communication deficits in aphasia.[24] In a systematic review conducted by Molini-Avejonas et al. (2015),[24] the 103 selected papers focused primarily on speech (19%), language (17%), voice (9%), swallowing (6%), hearing (32%), multiple areas (14%) and others (4%). The majority of the studies focused on assessment (37%) or intervention (37%). Most studies concluded that the telehealth procedure had advantages over the non-telehealth alternative (86%). A recent study provides additional arguments for the benefits of telerehabilitation in post-stroke aphasia.[25] It showed that multimodal language therapy delivered through synchronous telerehabilitation had positive effects on functional communication in chronic aphasia.

Since it is known that telerehabilitation benefits patients with post-stroke aphasia, exploring users' satisfaction with this novel service delivery method is called for. Satisfaction with and perception of the healthcare received can have a significant impact on rehabilitation outcomes.[26] If satisfied with their care, patients are more likely to make more efforts in their rehabilitation program, improve their quality of life and use the same provider/institution for future needs.[27] Satisfaction is a relevant outcome for rehabilitation to help describe the value of treatment[28] and document its relevance to patient needs.[29]

Satisfaction with the use of teletreatment has been described by others (for a review, see Molini-Avejonas et al., 2015).[24] However, none of these studies concerned post-stroke aphasia. In this context, the goal of this study was to document, in an embedded study on efficacy,[25] the satisfaction of patients receiving speech tele-therapy for post-stroke aphasia.

Methods

Design

This satisfaction study was embedded in a pre-/post-test feasibility and efficacy study.[25] Clinical outcomes were assessed twice at baseline to allow each participant to be his/her own control (T1, T2), immediately following 3 weeks of speech tele-therapy (T3), and 6 weeks after the end of the intervention (T4). This paper reports only the satisfaction measures taken at T3 (Figure 1).

Recruitment

The target population was composed of individuals aged 18 and over with chronic post-stroke aphasia. Participants were recruited through lists and referrals from the Centre intégré universitaire de santé et de services sociaux de l'Estrie - Centre hospitalier universitaire de Sherbrooke (CIUSSS de l'Estrie – CHUS), Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale (CIUSSS de la Capitale-Nationale), and Association québécoise des personnes aphasiques (AQPA).

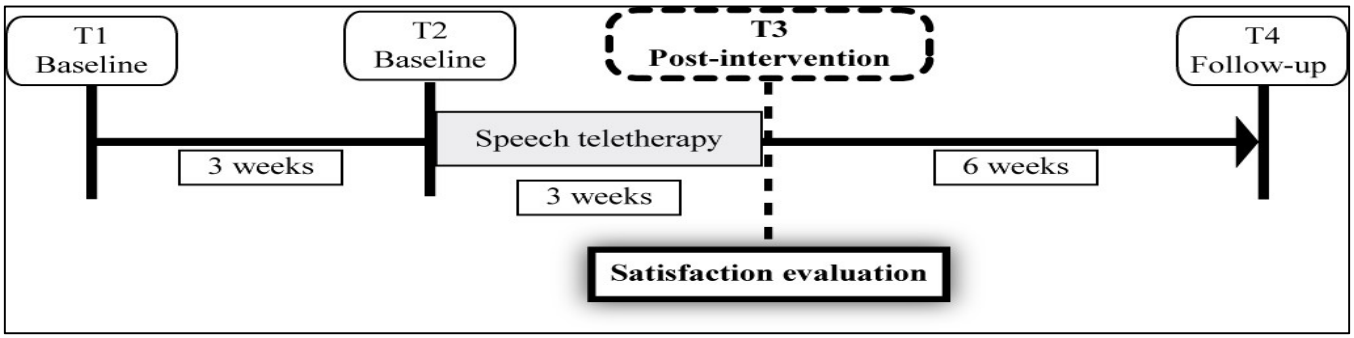

Figure 1. Study design.

Inclusion and exclusion criteria were formulated to exclude potential spontaneous recovery and ensure a stable neurological profile. Participants had to present chronic aphasia secondary to a first and unique left hemisphere stroke. They had to be at least one year post-stroke to avoid any influence of spontaneous recovery[30] and present moderate to severe anomia (score ≤ 20/31 on the picture naming subtest of the Montréal-Toulouse aphasia battery (MTAB)).[31] Finally, a family caregiver needed to be available during the speech therapy sessions. Exclusion criteria included: 1) comprehension deficits severe enough to impair comprehension of treatment tasks (score ≤ 6/9 (words) and ≤ 18/38 (sentences) on the designation subtest of the MTAB); 2) unawareness of communication difficulties (score ≤ 3/5 on the anosognosia subtest of the Protocole Montréal d'Évaluation de la Communication (MEC);[32]

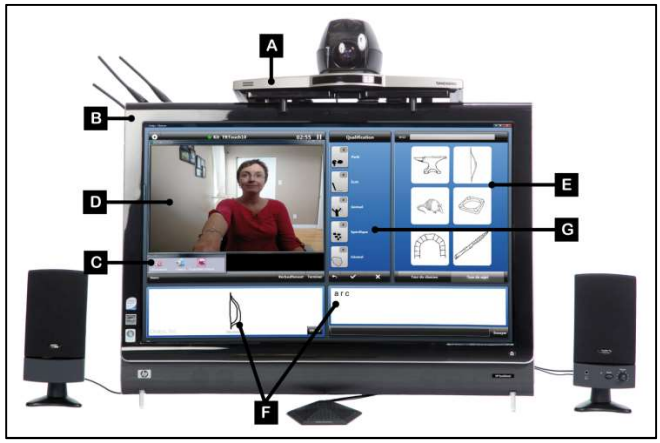

Figure 2. Technological infrastructure. A) Videoconferencing system; B) Touchscreen computer; C) Camera and session management software (TeRA); D) Videoconferencing software; E) Speech therapy software (Pictionary); F) Text and drawing area; G) Research metrics (number of cues, success/failure).

3) receiving conventional speech therapy at the same time as participating in the study; 4) impaired and uncorrected hearing or vision (questionnaire); and 5) other neurological disease (e.g. dementia, Parkinson disease). Eligibility for the study was verified during Phase 1 (T0).

Technological infrastructure for telerehabilitation

Based on experience from previous studies, a telerehabilitation platform was developed for this project comprising in-home and clinician systems (Figure 2).

The hardware core of these systems is the videoconferencing component (Tandberg 550 MXP) [A], which uses an h.264 video codec and integrates a pan-tilt-zoom (PTZ) wide-angle camera and omni-directional microphone. The system is mounted over a 25.5 inch Touchsmart embedded computer [B], which displays the video received from the other end and enables user interaction with the software. Video and audio data were encrypted and transmitted over a high-speed Internet connection, allowing communication using a maximum bandwidth of 512 kbps for both upload and download.

The software core of the systems has two main components: camera and session management software [C], videoconferencing [D], and speech therapy software [E]. The management software, TeRA, was developed by our team and provides easy management of sessions with patients as well as easy connection establishment and local and remote camera controls using an intuitive mouse-based point-and-click control scheme. Dedicated speech therapy software (Pictionary) was developed by Oralys Inc., and provided all the required elements for the chosen speech rehabilitation session. Pictionary implements a PACE session by displaying an array of images on both the clinician and patient sides, randomly selecting one of them (ensuring the selected image is shown to one

participant and hidden from the other) and managing the turns, providing tools (chat area, drawing area) and research metrics (number of visual, written and gestural cues used in a sequence, and number of general and specific hints required to correctly guess the image, success/failure of the turn). Prior to the first session, a subset of 35 images was selected for each participant from a larger image database.

Speech tele-therapy

During the 3-week intervention period, participants attended three therapy sessions per week for a total of 9 sessions (S1 to S9). To reduce habituation to the patient, three different speech therapists took turns to provide treatment.

The intervention was tailored to each participant by using the 35-item list individually compiled at baseline. The general goal was to encourage alternate communication strategies using an adapted procedure based on the PACE pragmatic rehabilitation approach.[33] Thus, during a session, therapist and participant alternated as transmitter and receiver to guess the chosen item from verbal (words, description) or non-verbal instructions (drawing, writing, mime). For each turn, the software randomly selects six images from the list and displays them on both sides (patient, clinician). One of the images is randomly chosen by the software as the current work image, ensuring that it was not previously selected in the current session. Using visual aids (drawing area with a stylet used with the touchscreen, keyboard typing area and camera for gestures) [F] and audio aids (for speech), clinician and patient are able to communicate to get the other party to guess the selected image they have on their side for each of the 35 turns in the session. The clinician's version of the software recorded each turn time, success or failure in guessing within the allotted time, counts of general or specific verbal cues, counts of gestures and counts of written hints given or received [G]. These data provide a detailed characterisation of each session and track the progress of each participant's communication abilities.

Satisfaction outcomes

Participants' satisfaction with telehealth services and general healthcare received were evaluated immediately after the end of the 3-week intervention (T3 evaluation). Their satisfaction with in-home telehealth was assessed using a French adaptation of the Telemedicine Satisfaction Questionnaire.[34] The English questionnaire has good construct validity and internal consistency (Cronbach's alpha = 0.93). The items were identified as the most important aspects of patient satisfaction with telemedicine from a review of the literature. Items related to the technology (i.e. sound and video quality), contact with the therapist and overall satisfaction were addressed. The questionnaire comprises 15 items scored on a 5-point Likert scale from 1 = strongly disagree to 5 = strongly agree. The highest possible score is 75, which indicates great satisfaction with telehealth.[35]

Patients' satisfaction with healthcare services was assessed with the French version of the Health Care Satisfaction Questionnaire, which showed good internal consistency (Cronbach's alpha coefficient for the overall scale = 0.92).[36] The multidimensional nature of the concept of satisfaction is analysed through the presence of three factors: 1) satisfaction with the relationship with the health care professional, 2) satisfaction with the services delivered, and 3) satisfaction with the general healthcare organization. The questionnaire comprises 26 questions divided into two sections dealing respectively with: 1) satisfaction with healthcare received in different situations, and 2) importance given to these situations when consulting within the general healthcare organization. Answers are scored on a four-point Likert scale where 1 = "not satisfied at all" or "not important at all" and 4 = "very satisfied" or "very important". The total score can be computed as the mean overall satisfaction for the three factors. Higher scores indicate a high degree of satisfaction.

Finally, participant's and caregiver's satisfaction with functional communication was evaluated with the satisfaction scale of the *Échelle de communication verbale de Bordeaux (ECVB)* questionnaire.[37] This scale, comprised of 34 questions, was specifically designed to assess the effectiveness of communication in common situations of daily life. The score ranges from 0 to 10, where 0 = "not satisfied at all" and 10 = "very satisfied".

Statistical analysis

Descriptive statistics for each variable were produced to generate a profile of the participants. Mean and standard deviations were also used to draw a picture of the participants with respect to both telemedicine and healthcare services. A mixed model analysis of variance (mixed-ANOVA) was used to measure the pre-/post-intervention difference in satisfaction with functional communication of the participants and their caregivers. Finally, the relationship between variables that could interfere with communication (age, years of

schooling and anomia severity) and satisfaction with both in-home telerehabilitation and healthcare received were analysed using Pearson correlations.

Results

Sample

Of the 23 participants who started the study, two were excluded after the T1 assessment because they no longer met the inclusion criteria and one dropped out of the study during the intervention period because she moved without notifying the research team. The remaining twenty participants completed the 3-week intervention and all the assessments. The participants' sociodemographic and language characteristics were recorded at baseline (Table 1).

Table 1. Participants' characteristics (n=20).

Characteristics		Mean ± SD	(n)	(%)
Time since stroke (y)		6.3 ± 7.0	-	-
Age (y)		63.7 ± 10.1	-	-
Years of schooling		11.7 ± 4.2	-	-
Dominance	Right	-	18	90
	Left	-	2	10
Gender	Men	-	14	70
	Women	-	6	30
Living alone	Yes	-	8	40
	No	-	12	60
*MT-86 denomination (/31)		11.3 ± 6.6	-	-
MT-86 designation words (/9)		7.9 ± 0.9	-	-
MT-86 designation sentences (/38)		27.8 ± 4.3	-	-

*MT-86: *Protocole Montréal-Toulouse d'examen linguistique de l'aphasie*[38]

Satisfaction

Participants' satisfaction with telehealth and general healthcare received was excellent, with a mean score of 70/75 (93%, SD=3.2) on the Telemedicine Satisfaction Questionnaire.

Table 2. Satisfaction with healthcare services (n=20).

Satisfaction factors	Score (%) Mean ± SD
Total score	80.1 ± 11.4
Satisfaction with relationship with healthcare professional	83.7 ± 12.5
Satisfaction with services delivered	73.4 ± 13.8
Satisfaction with general healthcare organization	84.2 ± 12.0

Satisfaction with healthcare services was also good overall, as well as for the three factors measured independently. (Table 2)

Satisfaction with functional communication was significantly higher after the intervention than before for both participants (Δ 2.0/10; p=0.001) and caregivers (Δ 1.3/10; p<0.001). Only age presented a significant correlation with the participants' satisfaction with technology and speech tele-therapy (r=-0.60; p=0.007).

Discussion

The goal of this study was to investigate participants' satisfaction with their experience with speech tele-therapy and the healthcare received.

Results showed that participants were very satisfied with the speech telerehabilitation, with satisfaction reaching 93%. More specifically, participants felt that their contact with the therapist (i.e. easy to see, hear, communicate with him/her) was good even though it was not through a conventional face-to-face communication delivery method. They also appreciated that tele-therapy meant that they did not have to travel to a clinic to receive the service, which was a positive aspect. Almost all the participants (18/20) would highly recommend speech therapy through teletreatment to a friend or family member. These results are consistent with those reported in studies measuring patients' satisfaction with the technology and services provided during in-home rehabilitation after discharge from total knee arthroplasty surgery,[35,39] patients with balance problems post-stroke receiving Tai Chi telerehabilitation,[40] and patients with arm motor impairments post-stroke.[26] In all cases, patients' satisfaction was good to excellent with all the facets of their experience in telerehabilitation. As demonstrated by this exploratory analysis, age, but not years of schooling or anomia severity, presented a significant correlation with the participants' satisfaction with the technology and services provided during in-home rehabilitation (r=-0.60; p=0.01). The participants' age ranged from 40 to 78 years old, and being older had a negative impact on satisfaction with technology but not enough to be dissatisfied.

Satisfaction with healthcare received was high for two of the three factors measured, i.e. 80% and 84%, respectively, for satisfaction with the relationship with the healthcare professional and with the general healthcare organization. Satisfaction with the services delivered was somewhat lower, at 73%. This may be

because items included in this factor were more or less adapted to this population with a chronic condition. Questions such as "the professionals tell you about the different choices you have" or "the professionals give you all the information you need about where to go, what to do, and what not to do" were not really adapted to this population as they had lived with this condition for some time. Moreover, the treatment protocol was very strict (individuals were excluded if they were having another speech therapy intervention elsewhere) for methodological reasons (standardisation), which may have led to the feeling of having less choice. We thought that this would not be the case in a real clinical environment, where clinicians usually offer more flexible treatments.

Satisfaction with functional communication was higher after the 3-week intervention than before for both participants and caregivers. This means that new communication abilities acquired during the speech tele-therapy seemed to improve functional communication, as perceived by both participants and caregivers. Although this is not a "robust variable" with demonstrated psychometric properties, we think that this "feeling of improvement" is very important: ultimately, this is the goal of speech therapy.

This pilot study has some limitations. First, the participants were not randomly selected. Thus, it is possible that the study participants were more enthusiastic and positive about modern technology. Patients who agreed to participate in the study may have been more educated or more familiar with computers or the Internet, which means that selection biases cannot be excluded. Moreover, because there was no comparison group, it was not possible to compare the results obtained with teletreatment to outcomes from conventional speech therapy.

However, one aspect favours good internal validity. Standardised instruments and independence of clinicians decrease the possibility of information bias. Also, using different instruments with different aspects of satisfaction is a key point. External validity is enhanced by the wide range of years between stroke and teletreatment. Moreover, the use of three therapists with different types of experience for the teletreatment enhances generalisation across speech therapists.

This novel intervention method was received with a high degree of satisfaction. Paying special attention to older people when explaining new technology may ensure a good experience. In-home speech tele-therapy has the advantage of intervening with patients in their living environment without needing to travel. Using telerehabilitation to provide in-home speech therapy could increase access in a context where this kind of service is almost non-existent. Moreover, treatment intensity and frequency can be enhanced by using the speech therapist's travel time (between patient's home and the clinic) for treatment time by staying physically at the clinic.

Conclusion

The feasibility and efficacy of teletreatment for chronic neurological impairments affecting oral expression have been demonstrated.[25] Based on our results, we can add that satisfaction is not an issue with teletreatment. However, a randomised study is required to generalise the results and confirm the benefits of and satisfaction with teletreatment in the management of acquired language deficits.

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Corresponding author:
Michel Tousignant
Research Centre on Aging
Centre intégré universitaire de santé et de services sociaux de l'Estrie - Centre hospitalier universitaire de Sherbrooke (CIUSSS de l'Estrie – CHUS)
1036 Belvédère Sud, Sherbrooke, Québec, Canada J1H 4C4
Tel: 819-780-2220 ext. 45351
Fax: 819-829-7141
Email: Michel.tousignant@usherbrooke.ca

Conflict of Interest. The authors declare no conflicts of interest.

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