

WHEELCHAIR SEATING ASSESSMENT AND INTERVENTION: A COMPARISON BETWEEN TELEREHABILITATION AND FACE-TO-FACE SERVICE

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ABSTRACT

This study compared outcomes of wheelchair seating and positioning interventions provided by telerehabilitation (n=10) and face-to-face (n=20; 10 in each of two comparison groups, one urban and one rural). Comparison clients were matched to the telerehabilitation clients in age, diagnosis, and type of seating components received. Clients and referring therapists rated their satisfaction and identified if seating intervention goals were met. Clients recorded travel expenses incurred or saved, and all therapists recorded time spent providing service. Wait times and completion times were tracked. Clients seen by telerehabilitation had similar satisfaction ratings and were as likely to have their goals met as clients seen face-to-face; telerehabilitation clients saved travel costs. Rural referring therapists who used telerehabilitation spent more time in preparation and follow-up than the other groups. Clients assessed by telerehabilitation had shorter wait times for assessment than rural face-to-face clients, but their interventions took as long to complete.

Keywords: Telerehabilitation, Telehealth, Videoconferencing, Wheelchair Seating, Outcomes, Rehabilitation

INTRODUCTION

Telehealth refers to the use of telecommunication systems to facilitate the delivery of “health-related information and services” (Scott et al., 2007). In this article, we will use the related term telerehabilitation to describe the use of real-time, interactive videoconferencing for the provision of specialty rehabilitation consultation, assessment, and treatment.

A literature search with keywords “telehealth,” “telemedicine,” and “telerehabilitation” generated mostly case studies, pilot studies, and cost-effectiveness studies (Aoki, Dunn, Johnson-Throop, & Turley, 2003; Whitten, Johannessen, Soerensen, Gammon, & Mackert, 2007). Many of the early studies were designed in haste with pressure to demonstrate feasibility; study designs had limitations, samples were small, and comparison to conventional face-to-face healthcare provision was often lacking (Hailey, Ohinmaa, & Roine, 2004; Miller, 2007; Whetton, 2005; Whitten et al., 2007). Equipment utilization that did not live up to forecasted expectations (Scott et al., 2007) hindered the recruitment of desired numbers of participants (Grigsby & Bennett, 2006). As well, the rapidly evolving nature of the hardware and software associated

with this mode of health care provision makes comparison to earlier studies challenging. In the absence of evidence, some healthcare service providers and recipients are hesitant to accept the use of telehealth as part of regular practice (Miller, 2007).

In recent years, as technologies become ubiquitous and costs decline, more resources are being allocated to support their use. Research is also progressing beyond pilot and feasibility studies (Hailey, 2001; Aoki et al., 2003; Miller, 2007) toward validity and reliability of assessments and effectiveness of interventions conducted via telehealth.

BACKGROUND

The slow uptake of videoconferencing technologies by rehabilitation professionals such as physical and occupational therapists may be attributed to a belief that services delivered through videoconferencing are not “as good” as services delivered face-to-face because the nature of rehabilitation is “hands-on” (Reimer, 2006; Russell, 2007). Yet, for clients who live in remote areas or

cannot travel, telerehabilitation may be the only way for them to receive rehabilitation services. Evidence for using telerehabilitation to provide wheelchair positioning and seating service is limited (Allegretti et al., 2003; Cooper et al., 2002; Khoja, Casebeer, & Young, 2005; Malagodi, Schmeler, Shapcott, & Pelleschi, 1998; Malagodi & Smith, 1999). Despite this, consultation with seating specialists via telerehabilitation is a commonly cited example of telerehabilitation applications in the literature (Hjelm, 2005; Hughes, Hudgins, Hooper, & Wallace, 2003; Lemaire, Boudrias, & Greene, 2001). According to the National Initiative for Telehealth Framework, clinicians should use telerehabilitation for assessment and intervention only if they are confident that the standard of care is "reasonable and at least equivalent to any other type of care that can be delivered to the patient/client..." (National Initiative for Telehealth Framework [NIFTE], 2003, Clinical Standards and Outcomes [CSO]-6, p.8). Although initial anecdotal and pilot experiences have given seating specialists the confidence that the service provided via telerehabilitation is "at least equivalent" in keeping with the NIFTE guidelines, more research-based evidence regarding the equivalency or comparability of interventions is needed.

ALBERTA TELEHEALTH NETWORK

The vision of the Alberta Telehealth Network is that "telehealth will be an integral part of ensuring all Albertans have equitable access to effective, efficient, and timely health service." Network goals include improving access, quality, and capacity of health care services to all areas of the province (Alberta Telehealth Business Plan 2006-2009, 2006). In 2003 there were more than 300 videoconferencing sites in Alberta used for clinical (14%), educational (52%), and administrative purposes (34%) (Ohinmaa & Scott, 2006). This is a rapidly advancing technology, and currently, the Network has over 800 telehealth capable sites, with Internet Protocol (IP) connections the predominant method of connection. This enables users to connect at a higher bandwidth, which improves screen resolution and clarity. IP is also less costly than ISDN.

The Network also has a telerehabilitation team that supports the clinical staff. The telerehabilitation team members include the clinical facilitator (based at the Glenrose Hospital), the remote telehealth site contact, and the telehealth bridge technician. The clinical facilitator receives the telehealth referral requests; contacts the remote site to confirm room/equipment availability; coordinates the connection details; confirms the appointment date/time with all attendees (i.e. patient, remote site therapist, seating team); provides on-call technical support the day of the session; and maintains statistics of telehealth usage (i.e. participant data entry). The remote site contact has a basic understanding

of equipment operation and ensures the room and videoconferencing equipment is set-up the day of the session. They provide basic equipment training to first time users at the beginning of each session, and act as the main contact for the clinical facilitator when technical issues arise. A bridge technician, who is able to monitor a session from a distance, is also available for technical support and trouble-shooting.

At the time of data collection in 2006-2007, these sessions utilized ISDN lines which allow for 384 kbps, real-time video links. The Glenrose telehealth room used was set up with blue-painted walls, overhead fluorescent lighting, two 32" Sony CRT Monitors, Tandberg 6000 codec (B version hardware platform) and a Tandberg Wave I Camera (mounted above the codec/monitors). Far end control (the ability to adjust the remote site's camera) was also possible on point-to-point connections (i.e., max 2 sites connected without the use of a bridge). Sometimes the remote sites would have a second handheld camera to provide close-ups or views not possible with the clinical carts used for the main camera. There was a real-time transmission delay the longer the distance to the remote site, which resulted in quick back and forth audio comments sometimes canceling each other out. Speakers needed to be clear, indicate when finished speaking, and wait for a response (e.g., "go ahead"). If wounds were involved, high-resolution photos were sent in advance, as they provided much clearer pictures. During the session the wound was examined only in relation to contact with the seating surface. A telehealth tips sheet was sent ahead, which included suggestions for client's clothing (e.g., not black, relatively form fitting) to improve visuals during assessment.

TELEREHABILITATION AND SEATING IN ALBERTA

Most Alberta residents are eligible for provincial funding of a wheelchair and seating system if they are assessed by an authorized seating team (occupational therapist, physical therapist, and an assistive device provider (vendor). The funding program Alberta Aids to Daily Living (AADL) established a protocol for face-to-face and telerehabilitation assessments, including minimum requirements for education and experience of therapists and vendors who assess for and authorize seating equipment. For example, all clinic personnel, as well as therapists who may assist with assessment at the remote telehealth site, must take the Alberta Seating Education Course (AADL). This includes education regarding the standard procedure for the in-chair and mat components of a seating assessment. The therapist at the remote site must also have a working relationship with the seating team, which is usually established by working for one day in a clinic doing a minimum of four assessments with the team. If the referring therapist

has not met these requirements, then a qualified therapist (assessing therapist) is required to attend the telerehabilitation session to carry out the seating assessment. A telerehabilitation seating appointment would follow the same process as a face-to-face appointment. Both types of sessions involve rapport building, problem identification, in-chair and out-of-chair (mat) assessment, and goal setting. Documentation is similar, although clients or their proxy need to sign a telehealth consent form.³ A copy of the assessment summary and intervention plan is always forwarded to the referring therapist by fax. Depending on a client's needs, commercial equipment is either provided or recommended, or measurements are taken for custom-made components to be fabricated.

Staff attendance varied between the two modes of assessment. All face-to-face assessments included the core specialized seating team – client, occupational therapist, physical therapist, and seating technician, and sometimes involved a physiatrist or orthotist, if needed. Clients may have had family, caregivers or the referring therapist present, depending on their situation. For clients who lived outside Edmonton and were assessed face-to-face, the referring therapist was usually never present, and familiar professional caregivers present only if a family member could not accompany or provide basic care for the client during the visit. A telerehabilitation assessment typically has the client, the referring therapist (who may also be the assessor), a familiar professional caregiver, and family members at the remote site; two therapists are present at the clinic site. If the intervention was likely to involve off-the-shelf equipment, the vendor seating technician attended at the remote site and installed trial seating during the session; if it involved custom equipment, then a custom technician attended at the clinic site.

The Seating Service at the Glenrose Rehabilitation Hospital in Edmonton is one of 12 clinics across Alberta that provides seating assessments and interventions to clients with wheelchair seating and positioning needs. All 12 sites collaborate with commercial vendors of medical equipment in their area in the provision of off-the-shelf seating components. As well, the Glenrose Seating Service is one of five clinics that also provide custom-fabricated seating components. The catchment area for the Glenrose Seating Service includes Northern Alberta, Northeast British Columbia, and the Northwest Territories (NWT). Clinics in Calgary and High River (both in Southern Alberta) have also used telerehabilitation for screening, consultation, assessment, and intervention. The Glenrose Seating Service has been involved with providing seating consultations, assessments, and interventions via telerehabilitation since 2000. Prior to telerehabilitation, seating therapists and a commercial vendor would travel to rural sites, but only when there were three or four clients who were at, or could travel to, an outreach clinic in order to justify travel expenses. In 2004, monthly

telerehabilitation sessions became part of regular practice and outreach clinics were phased out. Presently, 25% of the clients seen by the Glenrose Seating Service come from out-of-region or rural sites; of these, 20% are assessed by telerehabilitation.

PURPOSE OF THE STUDY

The purpose of this study was to compare the effectiveness, client satisfaction, cost, and timeliness of seating services delivered via two modes. Specifically, we tested the hypotheses that there was no difference in the following variables when seating services were delivered via telerehabilitation compared to services delivered face-to-face.

1. Attainment of client specified goals
2. Client and therapist satisfaction with seating components and service provision
3. Costs (client expenses and therapist time)
4. Time (wait time and time to complete seating interventions)

The regional Health Research Ethics Board approved the study. A research assistant contacted potential client and referring therapist participants by telephone. She informed them about the intent of the study and answered their questions before they verbally consented to participate. An informational letter and written consent form was mailed to the participants subsequently.

METHODS

SUBJECTS

Ten out-of-region clients assessed by telerehabilitation formed one group of the study. Two groups of clients assessed face-to-face formed the comparison groups; clients in one group were from out-of-region, and clients in the other were from within region. Out-of-region typically referred to rural areas. Within region referred to the greater urban area where the specialized seating team was located.

Out of a possible 18 clients who had received their seating assessment via telerehabilitation between July 17, 2006 and July 16, 2007, 10 consented to participate. Clients were eligible for inclusion if they received recommendations for seating intervention. Of the eight clients who were excluded from the study, two refused, one did not require seating intervention, one consented but died before seating was completed, and one client's therapist left her position before she could be recruited; no attempt was made to recruit the remaining three due to complexity of client conditions, (i.e., it would not

have been possible to find comparable clients for the comparison groups).

To control for variables that would confound between-group comparison, clients in the comparison groups were systematically sampled based on three characteristics of the telerehabilitation clients: age group (pediatric <18 years, or adult ≥ 18 years), diagnostic category (acquired neurological, progressive neurological, other), and type of seating intervention (commercial, custom, hybrid, or custom modifications to an existing device). All clients had to be outpatients residing within the province of Alberta, and have been assessed within three months of the telerehabilitation client they were compared to. Initially, there was a requirement for clients to have a referring therapist so that data could be collected from the therapist's perspective. This criterion was removed for the groups who were seen face-to-face when it became clear that it would not be possible to recruit the desired number of clients otherwise. Three out-of-region clients did not have a referring therapist; one in-region therapist consented then withdrew from the study after all of the client data was collected and one therapist had retired after the client had consented and provided data.

MEASUREMENT TOOLS

The following section describes the measurement tools used to evaluate four areas of inquiry:

1. CLIENT-CENTERED GOALS

As part of regular practice during seating assessments, either face-to-face or by telerehabilitation, clients and/or their caregivers are asked to identify outcome-focused goals they hope to achieve with the seating intervention. These individualized, client-centered goals are transcribed onto a Seating Outcomes Evaluation form that is sent out three months after seating is completed allowing the client to rate whether each identified goal has been exceeded, met, partially met, or unmet. For the purpose of this study, this form was sent out one month after seating was completed. As well, for the purpose of this study, if a client had a referring therapist, a copy of the form was sent for them to complete based on their own perspective of how the goals their client identified were met.

2. SATISFACTION

The Quebec User Evaluation of Satisfaction with Assistive Technology Version 2.0 (QUEST 2.0) survey was used to examine client satisfaction (Demers, Weiss-Lambrou, & Ska, 2002). The QUEST 2.0 evolved from the original QUEST developed by Demers, Weiss-Lambrou, and Ska (1996). The 2.0 version is a 12-item survey that assesses a user's satisfaction with both an assistive device and the service provision around the dispensing of the assistive device. Users rate their satisfaction in the following areas: dimensions, weight, ease of

adjusting, safety and security, durability, ease of use, comfort, effectiveness, service delivery, repairs/servicing, professional service, and follow-up services. Users rate each item on a 5-point Likert scale: 1= very dissatisfied, 2= dissatisfied, 3= somewhat satisfied, 4= satisfied, and 5 = very satisfied. In addition to rating satisfaction of the 12 items, users are invited to write comments regarding each item, and are requested to select three of the items that they considered to be most important.

Both the original QUEST and the 2.0 version have been used for clinical and research purposes to evaluate satisfaction with various types of assistive technology among different disability and age groups. Two studies used the QUEST to determine user satisfaction with wheelchair and seating components or systems (Bursick, Treffer, Fitzgerald, & Joseph, 2000; Weiss-Lambrou, Tremblay, LeBlanc, Lacoste, & Dansereau, 1999). It was found to be reliable for use with persons with multiple sclerosis who required mobility devices, persons with lower-limb prosthesis, and users of manual and power wheelchairs. In these studies it had a high test-retest reliability (ICC = 0.91), good alternate-form equivalence (ICC 0.91), and high internal consistency (Cronbach α = 0.82). As well it showed fair to moderate correlation to another assistive device scale (Pearson r = .34 to .45 for total scores) (Demers et al., 2002; Demers, Monette, Lapierre, Arnold, & Wolfson, 2002).

For this study, the QUEST 2.0 was mailed to clients and referring therapists at the same time as the Seating Outcomes Evaluation. It was clarified on the QUEST 2.0 form that "assistive device" referred to the seating components that were recommended and dispensed to the client. As permitted by the developers, two additional open-ended questions were added to the QUEST 2.0: a) Describe what you found the most helpful or what you liked best about this experience; b) Describe what you found the least helpful or what you found the worst about this experience.

3. COSTS AND TIME

a. Client travel costs

A form was used for clients and caregivers to document actual or potential expenses incurred, including gas for vehicle, charges for transportation (e.g. handibus or ambulance fees), payment of accompanying staff, and accommodation. To address discrepancy in costs of accommodation and fluctuation of gasoline cost, the following strategy for calculating client expenses was used:

- Mileage cost = round-trip distance from client's town or city limits to Edmonton city limits (in kilometers) multiplied by \$0.48

- \$100 per night of accommodation
- Number of nights of accommodation = round trip distance ÷ 350, rounded to closest whole number

b. Therapist time

Data for time spent by the seating therapists was gathered from a workload measurement system where therapists recorded time spent with each client. Therapists recorded both direct time (i.e., any interaction with the client or caregiver) and indirect time (i.e., paperwork, follow-up with vendors or referring therapists, coordinating appointments). Time spent was calculated from the month of assessment to two months after seating intervention was completed. "Completion date" was defined as the date after which equipment was provided and successfully trialed with any necessary adjustments made.

Referring therapists were asked to report all time spent by themselves and any support personnel preparing the referral, prior to and during the assessment, and any travel or follow-up required after the assessment. If a second therapist (i.e., assessing therapist) was required to perform the seating assessment at the remote site, they were also asked to count all time spent in relation to the client's seating assessment.

4. LENGTH OF TIME FOR SERVICE

The seating database contained this data. Wait time was calculated as the time between the referral being "ready to book" (i.e., all client details obtained and clarified), and the "assessment date" (i.e., date of telerehabilitation or face-to-face assessment). Length of time to complete was calculated as the time between the "assessment date" and the "completion date," as defined above.

DATA ANALYSIS

Quantitative data was entered into an SPSS 15.0 database. Frequency distributions were used to describe characteristics of the three groups. One-way analyses of variance were used to compare means between three groups for each of the variables. The alpha level was set at .05; post-hoc comparisons were performed when statistical significance was found. Comments written on the QUEST and the answers to the open-ended questions were transcribed verbatim and are summarized in the results section.

RESULTS

Full data sets were collected from a total of 29 clients; partial data was received from one client. Twenty-four referring therapists consented and returned the required data (3 clients did not have a referring therapist; 1 therapist declined participation; 2 therapists did not return data after providing consent). Assessing therapists were present at 6 of the telerehabilitation sessions to undertake the seating assessment when the referring therapist did not meet the seating education standards. Table 1 describes the demographics of the client participants who were included in the study to show the similarities and differences of the groups being compared.

TABLE 1

Description of Client Participants by Group (n=10 for each group)

Characteristics		Telerehabilitation	Out-of-Region face-to-face	In-Region face-to-face
Gender	Male/Female	2/8	5/5	9/1
Number of clients	Pediatric (<18years) *	1	1	1
	Adult (>18years)	9	9	9
Diagnostic category	Progressive neurological ‡	5	2	4
	Acquired neurological ■	4	5	5
	Other §	1	3	1
Place of residence	Facility	4	0	1
	Home	5	9	8
	Group Home	1	1	1
Type of seating prior to intervention	None	1 adult	2 adults	
	Wheelchair and commercial cushion	3 adults	1 adult	3 adults
	Wheelchair and commercial seating	2 adults	3 adults 1 child	6 adults
	Wheelchair and custom fabricated seating	4 adults 1 child	3 adults	1 child
Type of wheelchair seating provided after assessment	Commercial	6 adults 1 child	6 adults 1 child	6 adults 1 child
	Custom fabricated	2 adults	3 adults	2 adults
	Modifications to existing seating components	1 adult	None	1 adult

* Only one pediatric client in each group

‡ Multiple sclerosis, Parkinson's disease, dementia; ■ spinal cord injury, traumatic brain injury, cerebral vascular accident, cerebral palsy; § cancer, dystonia, developmental delay

The ages of the pediatric clients included in this study ranged from 3 to 15 years. The mean ages (minimum-maximum) of the adult clients were: telerehabilitation, 72.2 years (41-87); out-of-region, face-to-face, 36.7 years (18-61); and in-region, face-to-face, 52.0 years (22-77).

CLIENT-CENTERED GOAL ATTAINMENT

Once a seating intervention was completed, clients or caregivers, or both, were asked to rate how the goals set at the seating assessment were met. The score for each goal was entered. As clients could set one to four goals, an average of the rated goals was calculated.

Table 2 provides the mean goal ratings for each group as rated by the clients and the therapists. Tests of between-group effects showed the differences in client ratings between the three groups were not statistically significantly different ($F(2,25) = 2.45, p = .11$), nor were the differences in therapist ratings between the three groups ($F(2,20) = .91, p = .42$).

TABLE 2

*Comparison of Goal Attainment scores**

Client ratings	n	Mean (SD)	95% Confidence Interval
Telerehabilitation	8	2.79 (.87)	2.25 – 3.33
Out-of-region, face-to-face	10	2.42 (.66)	1.94 – 2.90
In-region, face-to-face	10	2.83 (.25)	2.35 – 3.31
Therapist ratings			
Telerehabilitation	8	2.72 (.89)	1.97 – 3.47
Out-of-region, face-to-face	7	2.50 (.63)	1.92 – 3.08
In-region, face-to-face	8	2.30 (.39)	2.64 – 3.29

* 1=goal not met; 2=goal partially met; 3=goal met; 4=goal exceeded

Clients in all groups most commonly identified positioning (postural correction or accommodation) and comfort (usually as it related to sitting tolerance) as goals. Clients, with their caregivers, also identified intervention goals related to function (ability to mobilize wheelchair or perform activities of daily living), prevention or healing of pressure sores, and ease of seating component use. Clients specified an average of two to three goals. The mode and median of the ratings indicated that these goals were generally “met” (for telerehabilitation and in-region, client ratings were same as therapist ratings: mode = 3.0, median = 3.0; for out-of-region face-to-face client ratings: mode = 2.58, median = 3.0; therapist ratings: mode = 2.67, median = 3.0).

CLIENT AND THERAPIST SATISFACTION

An overall QUEST 2.0 score was attained by dividing the total of item scores by the total number of items scored. The mean of overall QUEST 2.0 scores for each group as rated by the clients and therapists are listed in Table 3. Tests of between subject effects indicate there were no significant differences between the ratings of the three groups for the client ratings, ($F(2,26) = .53, p = .59$) nor for the therapist ratings ($F(2,21) = .06, p = .95$).

TABLE 3

*Comparison of QUEST 2.0 scores**

Client ratings	n	Mean (SD)	95% Confidence Interval
Telerehabilitation	9	4.18 (.73)	3.62 – 4.74
Out-of-region, face-to-face	10	3.89 (.57)	3.48 – 4.30
In-region, face-to-face	10	4.03 (.56)	3.63 – 4.43
Therapist ratings			
Telerehabilitation	9	4.12 (.68)	3.77 – 4.47
Out-of-region, face-to-face	7	4.08 (.25)	3.69 – 4.48
In-region, face-to-face	8	4.17 (.42)	3.80 – 4.54

*1=very dissatisfied; 2=dissatisfied; 3=somewhat satisfied; 4=satisfied; 5=very satisfied

CLIENT TRAVEL COSTS

We used the costing method outlined in the methods section to estimate travel costs of the two out-of-region groups. Costs that telerehabilitation clients saved, and costs incurred by clients who travelled to receive services face-to-face, were averaged and compared (see Table 4).

TABLE 4

Estimated client travel costs (in Cdn\$)

Group (n=10 for each)	Mean \$ (SD)	Min-Max
Telerehabilitation (costs saved)	324.96 (268.68)	85.44 - 804.00
Out of region, face-to-face (costs incurred)	293.63 (136.19)	48.00 - 604.16

THERAPIST TIME SPENT

Total time spent by all therapists and their assistants involved in the provision of seating assessment, treatment and follow-up was calculated with the average for each group represented in Table 6. Despite the marked difference in the mean time spent by therapists/assistants with clients seen by telerehabilitation ($M=19.2$ hours, $SD=9.7$), the difference between the time spent with out-of region clients ($M=12.5$ hours, $SD=5.6$) and in-region clients ($M=12.2$ hours, $SD=4.1$) was not statistically significantly different ($F(2,24)=2.88, p=0.76$). To better understand the amount of time therapists spent, this data was separated by therapist category (seating therapists versus referring and assessing therapists), for each of the three client groups (see Table 5).

Therapists accounted for time spent related to each client. Referring therapists also included at a minimum the time taken to complete the referral form. It may also have included trialing wheelchair frames and cushions and forwarding the feedback to the seating team, and if they were involved in the assessment or evaluation of the seating components during the trial period. Those involved in telerehabilitation had to arrange the assessment room (i.e. mat and transfer device present), and organize patient transportation if they needed to travel to the broadcast site. The remote assessing

therapists would include the assessment and travel time, but some assessing therapists preferred to meet and do a preliminary visit with the client before the telerehabilitation session. The seating therapist time included the screening of the referral, determining which type of seating intervention was needed, communicating with the seating technician about what seating components needed to be available on assessment/fitting day, communicating with Telehealth staff to set up the telerehabilitation session or with booking staff for face-to-face clinic booking, the assessment time of both seating therapists present at the assessment, follow-up to determine the success of the intervention, and all documentation required, including that for funding sources. Our telerehabilitation assessment/fitting session was usually booked for 90 minutes. Our commercial face-to-face assessment/fitting sessions were usually 90 – 120 minutes, and custom face-to-face seating assessments were usually 60 minutes. Custom fittings and follow-up sessions (if needed) were more variable in length.

TABLE 5

Therapist time – Breakdown by therapist and group

Group	Seating Service Therapists (n=10) Mean hours (SD) Min-Max	Remote Therapist(s) (n) Mean hours (SD) Min-Max		
		Referring Therapist*	Assessing Therapist§	Total
Telerehabilitation	6.7 (2.6) 3.8-12.1	(9) 9.7 (6.0) 4.5-19	(6) 4.4 (1.9) 1.5-6.0	(9) 1.2 (7.4) 5.0-25.0
Out-of-region, face-to-face	9.6 (5.7) 5.1-20.8	(7) 4.2 (3.6) 1.0-10.2	N/A	N/A
In region, face-to-face	6.8 (1.8) 5.0-11.2	(8) 5.2 (2.8) 1.6-11	N/A	N/A

* Includes therapist and assistant time

§ required if referring therapist has not met Seating Education Standards

LENGTH OF TIME FOR ASSESSMENT AND INTERVENTION

There was a statistically significant difference in the mean wait times between the groups ($F(2,27)=3.90$, $p=.033$). Post-hoc comparisons using the Tukey a test indicated that the mean wait time for the out-of-region group ($M=57.5$ days, $SD=12.36$) was significantly different from the in-region group ($M=29.2$ days, $SD=24.63$) but neither were found to be significantly different from the telerehabilitation group ($M=31.8$ days, $SD=24.63$).

Despite the apparent difference in the number of days to complete seating interventions between the in-region, face-to-face group and the two out-of-region groups (see Table 6), completion times between the three groups were not found to be significantly different; $F(2,27)=1.94$,

$p=0.16$). This lack of statistical significance is due to the broad variability within the groups.

TABLE 6

Length of time to complete seating intervention

Group, n=10	Mean days (SD)	95% Confidence Interval	Min - Max
Telerehabilitation	116.8 (119.9)	31.0 – 202.6	0-304
Out-of-region, face-to-face	114.4 (79.3)	57.7 – 171.1	13-251
In-region, face-to-face	50.8 (31.7)	28.1 – 73.5	10-99

COMMENTS AND RESPONSES TO OPEN-ENDED ITEMS ON QUEST 2.0

Clients and therapists were generally pleased with the expertise and professionalism of the seating therapists regardless of the group they were in. Clients appreciated that their concerns were heard and identified as goals for seating intervention. The majority of clients and therapists said that the seating components improved their clients' functioning in activities of daily living and mobility. Some caregivers were concerned that the seating components would require more effort on their behalf, but because the role the components played in ensuring comfort and proper positioning was conveyed clearly, they were willing to put in the extra effort. Therapists in all groups voiced opinions on the quality of communication and follow-up between themselves and the seating therapists. Some complained of difficulty contacting a seating therapist after assessments and they were unclear about who was supposed to do what in follow-up. Others praised the therapists for their thoroughness and emphasized the value of the written service summaries. The telerehabilitation clients and therapists were generally pleased with the services received from the seating therapists and vendors who were present, and caregivers were grateful that clients did not have to travel, or if they did, the distance was not far. This suggested that they would not have otherwise been able to tolerate a trip and, thus, would not have benefitted from the seating service. One caregiver of a telerehabilitation client questioned the burden on the health system, and queried the efficiency when so many health professionals were required to be present. On the other hand two telerehabilitation clients were grateful that their own therapist was present with them during the assessment as a liaison and advocate. These same therapists said their caseloads were too demanding and they would not have accompanied their client if travel was required. Another telerehabilitation client and a separate therapist stated they believed their needs and those of their client would have been better served if the seating assessment had occurred face-to-face. The majority of therapists were pleased with how quickly their clients were able to be seen either in clinic or via telerehabilitation. However, many clients differed,

reporting that the wait was too long. Three out-of-region, face-to-face clients complained of the distance they needed to travel. There were numerous comments (mostly negative) about wait times for vendor equipment, delivery of incorrect equipment for trial, and wrong equipment present for the telerehabilitation session. Opinions about vendor services varied from extreme disappointment to extreme praise.

DISCUSSION

This is one of the first studies in wheelchair prescription and seating which examined outcomes from the clients' perspectives. Prior to this, studies have examined therapist recommendations for equipment (Cooper et al., 2002; Lemaire et al., 2001; Malagodi et al., 1998), comparability of assessments of pelvic position and lower limb range of motion, (Allegretti et al., 2003) and therapist perceptions of the role of telerehabilitation in the provision of seating services (Khoja et al., 2005).

The small sample size was a limitation of this study. To help address the large variation between groups, systematic sampling was used to try to make the groups as comparable as possible in the proportion of clients in the two age groups (pediatric and adult), diagnostic categories, and types of seating intervention. Most (n=7 to n=0) clients in each of the three groups had a neurological condition of either progressive or acquired origin. Comparison clients based on level of disability may be more meaningful in future studies because seating needs depend on disability, rather than diagnosis. The two year duration needed for data collection posed a challenge in this study and contributed to the removal of the criteria for all clients to have a referring therapist. The time required for recruiting participants, and for providing seating assessment and intervention was considered typical in this area of practice. Other factors that contributed to delays in data collection were challenges in recruitment, delays in equipment delivery and funding approval, and turnover in rural therapist staff.

CLIENT-CENTERED GOAL ATTAINMENT

With regard to goal attainment, telerehabilitation clients and their referring therapists rated that the goals were, on the whole, met. This result was no different from the two comparison groups of clients seen face-to-face.

CLIENT AND THERAPIST SATISFACTION

Many of the studies of client satisfaction with telehealth refer to clients' perceptions of how the telehealth session went. This study examined their satisfaction with the outcome of the seating intervention, (i.e. the seating components or wheelchair provided). The telerehabilitation clients were just as satisfied as both groups of clients who received seating services face-to-face.

In a study reported by Nesbitt, Marcin, Daschbach, & Cole (2005), researchers reported that when rural residents in Northern California had access to telerehabilitation services, they rated their satisfaction with services more positively. Although not statistically significantly different, the mean satisfaction ratings in our study were slightly lower for clients and referring therapists of clients who lived out-of-region, but received face-to-face services. Some out-of-region clients preferred to drive into the city but some also complained of the need to travel and wished that they could access these specialized seating services closer to home. Three of these out-of-region clients did not have a community therapist. It is possible that if they had a community therapist, they may have learned about and chosen the option to receive seating assessment and intervention via telerehabilitation. Maintaining trained staff capacity to offer telerehabilitation in all regions proved challenging due to frequent staff turnover and lack of training opportunities for rural therapists. These factors have been found to negatively impact implementation of telerehabilitation programs (Broens et al., 2007; Nesbitt, Cole, Pellegrino & Keast, 2006).

Based on the QUEST 2.0, 28 of 29 client respondents chose comfort as one of the three most important satisfaction items. The mean rating among clients who chose comfort as one of the 3 most important items was 4.4 (telerehabilitation, n=8); 3.6 (out-of-region, face-to-face, n=10); and 4.3 (in-region, face-to-face, n=10). In another study, comfort was identified as the "most important consumer criterion," however, participants evaluated it as the least satisfying (M=3.38) (Weiss-Lambrou, et al., 1999). In the current study, safety (14 of 29) and effectiveness (13 of 29) were the next most frequently selected items.

CLIENT TRAVEL COSTS

The calculation to standardize costs was derived due to many of the expense tracking forms being returned with incomplete data, and those with data had broad ranges of charges such as choice of hotel which ranged from \$60-\$150/night. As well, during the data collection period from July 2006 - January 2008, the price of gasoline fluctuated greatly from \$0.78(Cdn) per litre to \$1.17 per litre (retrieved 13 July 2007 from <http://www.albertagasprices.com/>)

retail_price_chart.aspx). Other studies used similar methods for standardizing mileage and nights of accommodation (Hassall, Wootton, & Guilfoyle, 2003; Schaafsma, Pantazi, Moehr, Anglin, & Grimm, 2007). This simplified method is an underestimate of actual costs because it assumes that a client is travelling in a private vehicle. If a handi-bus or ambulance was required, costs would be substantially higher, from \$809 to \$2550 for the distances these clients would have had to travel. As well, it does not include the costs incurred if a hired caregiver was required to accompany the client, or for cost of time lost by a family member to accompany a client. Although health economists advise against imprecise measurement of costs incurred or saved by users of telehealth (Jennett et al, 2003), the consistent method of calculating potential travel costs saved for telerehabilitation clients and incurred for out-of-region, face-to-face clients, allows for a conservative but valid comparison between the two groups.

The goal of implementation of many telerehabilitation programs in Canada is not solely to reduce costs but also to provide more equal access to health services for all Canadians regardless of where they reside. Some of the telerehabilitation clients in this study admitted that without telerehabilitation, they would not have been able to access seating clinic services due to an inability to tolerate travel to the urban site, i.e., frailty, sitting intolerance due to pain or pressure sores, caregiver stress or illness). Their comments did not elaborate on how they would have traveled, (i.e., by ambulance, with caregivers, etc.); they were simply grateful that they did not have to travel. Referring therapists, many with diverse and large caseloads, commented that they would not have attended a seating clinic appointment with their client if travel was required. Stalfors, Bjorholt, and Westin (2005) found the same result among physicians and clients who needed to attend multidisciplinary oncology rounds. The responsible physician was present at 100% of the telerehabilitation sessions but only 15% of face-to-face sessions.

THERAPIST TIME SPENT

The out-of-region therapists, and likely the vendors, spent more time dealing with the seating issues of the telerehabilitation clients. This increase in the amount of time required to complete a telerehabilitation consultation with a rehabilitation specialist (before, during, and after the telerehabilitation session) was also found by Lemaire et al. (2001). It is also necessary to take into consideration that when a referring therapist had not taken the Alberta Seating Education Course, another therapist who had taken the course performed the assessment. This meant that there could be as many as four therapists present for an assessment where there would normally only be two. Knowing that not one of the referring therapists would have been able to attend a face-to-face session

with their client, the presence of a familiar therapist in the telerehabilitation assessment was valuable both for their client and for the seating therapists. One region commented that although they were investing extra time, they felt that it was developing their therapists' skill sets, and helped to maintain capacity in their region.

LENGTH OF TIME FOR ASSESSMENT AND INTERVENTION

The mean wait time for out-of-region clients who travelled for face-to-face assessment was almost twice as long as that of in-region or telerehabilitation clients. The equivalence of in-region and telerehabilitation wait times verifies that the telerehabilitation clients were not necessarily "jumping queue." Instead, out-of-region clients may have experienced other reasons for the delay. The observation that there were no adult clients travelling to seating clinic assessments between November 21, 2006 and March 8, 2007 suggests that clients did not want to travel in the winter months and were delaying appointments due to inclement weather conditions.

The similar mean time to complete seating interventions for telerehabilitation and out-of-region face-to-face clients suggests that vendors experienced challenges in delivering equipment or supplies to clients who lived in rural areas. In addition, a large proportion of the telerehabilitation clients in this study were older (M age=72.2 years), more frail, and unable to tolerate travel. The commercial vendor had to travel to the clients for follow-up of equipment provision. Both the telerehabilitation and out-of-region face-to-face clients were from diverse areas around central and northern Alberta creating a logistical challenge for vendors who were trying to balance customer service with efficiency and cost-minimization. The clients who had custom seating still had to travel to Edmonton to receive their fabricated components, and faced the same challenges organizing their transportation.

USE OF THE ALBERTA SEATING TELEHEALTH PROTOCOL IN OTHER REGIONS

The province of Alberta may differ from other jurisdictions in that health regions directly hire homecare therapists, and continuing care facilities are funded to have occupational and physical therapy. Clients then have access to a local therapist services without additional cost. In other health jurisdictions where these services are privately contracted, only one therapist would typically get funded for completing a seating assessment, which would pose a barrier to this model of service delivery.

Trained professionals at either end may have played a role in our findings of equivalency and should be considered in future studies that do not use this model of practice. Previous seating studies that had a therapy assistant at the remote site performing the assessment met with limited success (Allegretti, et al., 2003; Malagodi et al., 1998). Malagodi (1999) recommended that more complex seating assessments would be best performed with professional staff at either end.

CONCLUSION

Clients who received their seating assessment via telerehabilitation were as satisfied with the outcomes of the recommended interventions, and their goals were as likely to be met as clients who were assessed face-to-face. They were assessed sooner than a group of out-of-region clients who travelled to a specialized seating service. Naturally, the technology could not substitute for travel required by vendors in order to provide the required seating components. Thus, out-of-region clients seen face-to-face and via telerehabilitation required, on average, twice as long to complete their seating interventions compared to the within-region clients. This difference between the groups was not statistically significant and should be verified in future research with larger samples.

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¹ Face-to-face consent is considered implied if the client comes to the appointment, so our facility does not require signed consent. Since the telerehabilitation client only presented themselves at their local facility, the consent cannot be implied, and must be obtained in writing.

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