Brief Communication

Telerehabilitation Needs: A Bidirectional Survey of Health Professionals and Individuals with Spinal Cord Injury in South Korea

Jongbae Kim, Ph.D., Shinyoung Lim, Ph.D., Jayeon Yun, M.S., and Da-hye Kim, B.S.

Department of Rehabilitative and Assistive Technology, Korea National Rehabilitation Research Institute, Seoul, Korea.

Abstract

Objective: To assess multiple facets of awareness, understanding, value, needs, and desirability to resolve issues regarding unmet medical needs of individuals with a disability by adopting telerehabilitation. The survey included collection and analysis of current services as well as of supplementary and future services of rehabilitative interventions in South Korea. **Study Design and Participants:** Thirty-six health professionals who were members of the Korean Academy of Rehabilitation Medicine and 57 individuals with spinal cord injury responded to a survey of those belonging to two non-profit professional groups, one group belonging to the Korean Spinal Cord Injury Association and joining the National Spinal Cord Injury Wheelchair Games and the other group belonging to the Jeong-Sang-Hye (High Quad Spinal Cord Injury Association) and having joined one of the focus groups of the Korea National Rehabilitation Research Institute. The two surveys were designed specifically for investigating each group's perspectives of awareness, understanding, value, needs, and desirability of telerehabilitation. **Results:** The survey responses indicated that there is great interest in the possibility of telerehabilitative services among individuals with spinal cord injury. In particular, there was a strong interest expressed in services that can be used to resolve issues on unmet medical needs of individuals with a disability related to health monitoring, sustaining health, rehabilitation interventions, and independence of activities of daily living. **Conclusions:** Telerehabilitation holds great promise as a bridge to traditional face-to-face clinical service delivery. From the results, there are a few categories in the survey that indicate notable differences between the two groups regarding the awareness, desirability, order of preference in rehabilitation service, and telerehabilitation expenses.

Key words: needs analysis, rehabilitative interventions, telerehabilitation

Introduction

For the first time in South Korea, we have performed two surveys geared toward people with spinal cord injury and health professionals to find a resolution of unmet medical needs of individuals with a disability who specifically need long-term sustainable medical service and secondary complications

management. A few research surveys have been published on the implementation of physical medicine and rehabilitation services for people with disabilities in South Korea.^{1,2} From these preliminary reports, there are notable unmet medical and rehabilitation needs of individuals with a disability.

The motivation for the present survey stems from this finding. To enhance the quality of medical service and rehabilitation interventions for people with disabilities, current issues and barriers recognized by our two groups on accessibility in service and interventions need to be verified to find out relevant methods to resolve these issues.³ In this survey, we have defined telerehabilitation as the application of telecommunication technology to support rehabilitation service remotely.⁴ We asked the respondents to select all preferable types of telerehabilitation because knowledge is needed about which types are more physically requested from the respondents' perspectives. The scope of telerehabilitation service in this survey covers the current, supplementary, and future services of rehabilitative interventions in South Korea.

Subjects and Methods

Prior to the survey, we developed two different types of questionnaires and asked health professionals and other experts for their comments and feedbacks on these documents. With these comments and feedback, we designed a list of 24 survey questions that reflect awareness, understanding, value, needs, and desirability of telerehabilitation geared toward groups of health professionals consisting of medical doctors in physical medicine and rehabilitation, occupational therapists, and physical therapists who are members of the Korean Academy of Rehabilitation Medicine. When inviting them to take the survey, we did not account for their awareness and experience of telemedicine or telerehabilitation. All survey data were analyzed by the frequency analysis method and the multiple response analysis method. The Predictive Analytics Software (PASW) Statistics version 17.0 program was used.

Along with the survey focused on the health professionals about resolving current issues on medical accessibility for individuals with a disability, we also surveyed groups of people with spinal cord injury regarding the multiple facets of telerehabilitation.^{5,6} The survey on telerehabilitation focused on people with spinal cord injury was designed with 37 questions focused on telemedicine, telerehabilitation, and rehabilitation issues.⁷ The authors coordinate two groups of people with disabilities consisting of 60 persons. One group participated in the National Wheelchair Games on May 15, 2010, and individuals belonged to the Korean Spinal Cord Injury Association. Members of the other group belong to the *Jeong-Sang-Hye* (Korea's

High Quad Spinal Cord Injury Association), which means someone with an injury at C1, C2, C3, or C4, and have joined a focus group at the Korea National Rehabilitation Research Institute. These facts reflect their representativeness and professionalism on their disability and its related areas in South Korea. We also did not account for their awareness of and experience with telerehabilitation when they were selected. Members of the second group have joined focus groups on spinal cord injury to contribute to participatory research and development activities in rehabilitation science and technology. The crucial inclusive criterion of selecting respondents is to assure the survey is not influenced by any conflict of interests as well as to collect answers from professionals in rehabilitation science, assistive technology, consumer electronics, and telecommunication technology. Fifty-seven individuals responded the survey, and the analysis methods were the same as those for the health professionals.

The survey questionnaires consist of two types of questions for each group (i.e., people with a disability and health professionals) that focused on "health monitoring" and "remote rehabilitation medicine."⁸ The survey for the people with a disability consists of 37 questions, including those on demographics (10 questions), nature of disability (7 questions), health monitoring (9 questions), and telerehabilitation (11 questions). The survey for the health professionals consists of 24 questions, including those on demographics (7 questions), health monitoring (5 questions), and telerehabilitation and medical services (12 questions).

Results

SURVEY RESULTS FROM PEOPLE WITH SPINAL CORD INJURY

Table 1 comparatively summarizes survey results from the two groups: people with a spinal cord injury and health professionals. Other non-comparable questions are discussed separately in Results.

Of the respondents, 93.0% were male, and 7.0% were female, which is not statistically similar to spinal cord injury patients overall (i.e., about 58% male and 42% female) in South Korea. The age distribution was 36.8% in their 40s, 31.6% in their 30s, and 21.1% in their 50s; the distributions for those in their 10s, 20s, and 60s were 3.5% each. All respondents acquired their disability when they were 20–29 (38.6%), 30–39 (35.1%), 40–49 (12.3%), or 10–19 (10.5%) years old. Of spinal cord injury patients 3.5% had congenital disease. For the other patients the causes of disability were traffic accidents (42.1%), falls (29.8%), accidents during leisure and sports (17.5%), injury (8.8%), and diseases (1.8%).

The locations where respondents were receiving care at present were rehabilitation clinics (38.6%), general hospitals (28.1%), university hospitals (17.5%), private clinics (10.5%), and other type of clinics (1.8%). The location preference was based upon the respondents' ease of approach and access from their residential homes. The survey revealed dissatisfaction with the existence of a mobility barrier due to the spinal cord injury (36.9%), the distance between the clinic and local community (16.9%), accessibility issues on transportation service (15.4%), cost (13.8%), unavailability of caregivers (7.7%), and others (1.5%).

The disease rate (including experience with diseases and secondary complications) by order of prevalence was urinary tract infection (21.6%), pressure ulcers (18.2%), central pain management (15.3%), orthostatic hypotension (10.8%), osteoporosis with pathological fracture (8.0%), weight management (7.4%), depression (5.7%), pneumonia/acute respiratory distress syndrome and paralytic ileus (5.1% each), and other disease (0.6%). Of the respondents, 47.4% were aware of telemedicine service, 52.6% understood the terminology, and 7% had had experience in telemedicine service.

The respondents rated telerehabilitation desirability, from highest to lowest, as "very positive" (45.6%), "positive" (33.3%), "marginal" (12.3%), "negative" (3.5%), "very negative" (3.5%), and "no answer" (1.8%). This survey asked respondents how the nearest estimate of medical expenses in telerehabilitation service from the patient's and the health professional's perspectives will be assumed. It did not discuss the medical costs to those covered by current medical service systems but asked their view of future medical expenses in using telerehabilitation service.

To make a list of services requested and available cost for the telerehabilitation, the order of most required service by disease is urinary tract infection (21.9%), pressure ulcers (19.1%), central pain management (12.9%), orthostatic hypotension (10.1%), depression (10.1%), obesity management (6.2%), paralytic ileus (6.2%), osteoporosis with pathological fracture and pneumonia/acute respiratory distress syndrome (5.6% each), and other areas of service (1.7%).

Respondents are asked to suggest the nearest offer of medical expenses and their preference of hospitals by adequate use of telerehabilitation. The nearest offer of medical expenses, based on frequency of response, was 50% of current medical expenses (45.6%), the same expenses as the current ones (31.6%), and some other level of expenses (10.5%). The location where they would like to receive care, based on frequency of request, was rehabilitation clinics (38.6%), general hospitals (19.3%), senior sanitarium (19.3%), and university hospitals (15.8%). Meanwhile, the order of preferred telerehabilitation service was Internet-connected service (36.8%), videophone or videoconference service (19.3%), Internet protocol television (IPTV) service (15.8%), video system with telemedicine service (12.3%), and mobile or personal digital assistant (PDA) service (3.5%). The order of preferred intervention type was patient (home)-to-clinician (remote) (43.8%), patient (home) with visiting nurses-to-clinician (remote) (36.8%), patient (local hospitals)-to-clinician (remote) (8.8%), and patient (local health offices)-to-clinician (remote) (1.8%).

SURVEY RESULTS FROM HEALTH PROFESSIONALS

Among the 36 health professionals who participated in the survey, 13.9% acquired their M.D. degree in the 1980s, 44.4% in the 1990s, and 38.9% in the 2000s, and 2.8% did not reply. The health professionals' departments consisted of stroke rehabilitation (36.1%), musculoskeletal and pain management (25.0%), spinal cord injury (13.9%), pediatric and geriatric rehabilitation (5.6%), and other areas of rehabilitation (2.8%). Respondents were asked to select secondary complications that should be prevented. The most frequently noted

BIDIRECTIONAL SURVEY OF TELEREHABILITATION NEEDS

Table 1. Summary of Survey Results on Comparable Questionnaires

QUESTION ON	CHOICES	GROUP [N (%)]		QUESTION ON	CHOICES	GROUP [N (%)]	
		A	B			A	B
Telemedicine awareness	No answer	3 (5.2)	3 (8.3)	Telemedicine experience	No answer	—	3 (8.3)
	Yes	27 (47.4)	25 (69.4)		Yes	30 (52.6)	2 (5.6)
	No	27 (47.4)	8 (22.3)		No	27 (47.4)	31 (86.1)
Nearest estimate of telerehabilitation expenses	Half of current expenses	26 (45.6)	2 (5.6)	Hospital(s) where liked to receive care (multiple choice by Group B)	University hospitals	9 (15.8)	23 (25.6)
	Same as current expenses	18 (31.6)	14 (38.9)		General hospitals	11 (19.3)	19 (21.1)
	1.5 times more than current expenses	2 (3.5)	9 (25.0)		Private clinics	—	8 (8.8)
	2 times more than current expenses	2 (3.5)	5 (13.8)		Senior sanitarium	11 (19.3)	6 (6.7)
	Other	6 (10.5)	2 (5.6)		Oriental medicine clinics	—	2 (2.2)
	No answer	3 (5.3)	4 (11.1)		Rehabilitation clinics	22 (38.6)	26 (28.9)
					Others	4 (7.0)	6 (6.7)
Desirability of telerehabilitation	Very positive	26 (45.6)	4 (11.1)	Preference on telerehabilitation platforms and systems	No answer	—	3 (8.3)
	Positive	19 (33.3)	14 (38.9)		Videophone or videoconference service	11 (19.3)	4 (11.1)
	Marginal	7 (12.3)	13 (36.1)		Television or IPTV service	9 (15.8)	2 (5.6)
	Negative	2 (3.5)	2 (5.6)		Internet-connected computer service	21 (36.8)	8 (22.2)
	Very negative	2 (3.5)	—		Mobile (smart-phone or PDA) service	2 (3.5)	1 (2.8)
	No answer	1 (1.8)	3 (8.3)		Video system with telemedicine service	7 (12.3)	17 (47.2)
					Others	7 (12.3)	1 (2.8)
Preference on telerehabilitation services	No answer	—	3 (8.3)	Preference on telerehabilitation services	Visiting local health offices to remote clinicians	1 (1.8)	2 (5.6)
	Home to remote clinicians	25 (43.8)	14 (38.9)		Visiting local hospitals to remote clinicians	5 (8.8)	1 (2.8)
	Home with visiting nurses to remote clinicians	21 (36.8)	12 (33.3)		Others	5 (8.8)	4 (11.1)

Group A included individuals with spinal cord injury, and Group B included health professionals.

IPTV, Internet protocol television; PDA, personal digital assistant.

secondary complications were musculoskeletal system (16.0%), urogenital system (14.2%), neurological and mental systems (12.3% each), respiratory system (11.7%), dermatology system (10.5%), cardiovascular system (9.3%), obesity (6.8%), digestive system (6.2%), and others (0.6%).

Of the respondents, 69.4% were aware of telemedicine, 22.3% were unaware, and 8.3% gave no answer. Responses regarding respondents' telemedicine inexperience were 86.1% yes and 5.6% no. Respondents were asked to rate the desirability of telerehabilitation: 38.9% answered "positive," 36.1% "marginal," 11.1% "very positive," 8.3% "no answer," and 5.6% "negative."

Respondents were asked to rate relevant service cost "based upon nearest offer" of telerehabilitation. This did not include cost analysis for their expected expenses of telerehabilitation services. The order of preference was "same as current expenses" (38.9%), "one and half times more than the current expenses" (25.0%), "two times more than the current expenses" (13.8%), "no answer" (11.1%), and "half times than the current expenses" (5.6%). The results of treatment site by order of preference were rehabilitation clinics (28.9%), university hospitals (25.6%), general hospitals (21.1%), private clinics (8.8%), senior sanitarium (6.7%), other clinics (6.7%), and Oriental medicine clinics (2.2%).

Respondents were asked to list the most physically requested areas of telerehabilitation service. The results by frequency of mention were spinal cord injury rehabilitation (23.4%), stroke rehabilitation (21.0%), geriatric rehabilitation (18.5%), traumatic brain injury rehabilitation (16.9%), pediatric rehabilitation (11.3%), musculoskeletal and pain management (6.5%), and other areas of rehabilitation (2.4%).

The order of preferred type of telerehabilitation service ranked as follows: video system with telemedicine service (47.2%), Internet-connected service (22.2%), videophone or videoconference service (11.1%), no answer (8.3%), IPTV service (5.6%), and mobile or PDA service (2.8%). The preferred intervention types were rated as patient (home)-to-clinician (remote) (38.9%), patient with visiting nurses (home)-to-clinician (remote) (33.3%), others (11.1%), no answer (8.3%), and patient (local health offices)-to-clinician (remote) (5.6%).

Discussion and Conclusions

One of the important goals of this survey was to find out common interests and views as well as different perspectives of the two distinct groups regarding telerehabilitation implementation. From the survey results of the health professionals, we recognized potential risks in telerehabilitation raised by this group. From the survey results of health professionals, the rankings based on order of risks of telerehabilitation service were lawful conflicts in medical responsibility (19.7%), possibility of medical malpractice (18.2%), financial burdens of initial equipment purchase and installation (15.3%), increase in health insurance cost (13.1%), misunderstanding of roles and interests (9.5%), overissuing of electronic prescriptions (8.0%), lack of telerehabilitation professionals and available training programs (8.0%), and technical issues on privacy and security (8.0%).

From the survey data analysis, a few differences were notable between the two groups regarding the awareness, desirability, and order of preference in rehabilitation service, nearest offer of medical expenses because of different perspectives of potential risks, and expectancy in telerehabilitation services. However, the other aspect of our survey results reveals telerehabilitation's role as a bridge to traditional face-to-face clinical service delivery.

Certain potential limitations must be acknowledged. First, the respondents are not entirely representative of the spinal cord injury population in South Korea. However, they have contributed to the participatory research and development activity in rehabilitation science and assistive technology. Second, the needs and issues of patient groups with disabilities other than spinal cord injury were collected from the survey of health professionals. The idea of a bidirectional survey of the two groups is a novel approach to realize each group's view of telerehabilitation. In particular, the notable difference in nearest offer of medical expenses between the two groups is a valuable finding in this survey. It might be referenced to the prospective resolutions of medical expenses for available telerehabilitation services in South Korea. One of the resolutions prior to the prospective conciliations will be providing technical solutions of easy-to-use user interfaces with features of workflow management, customer relationship management, and robust security and privacy. This study leads us to initiate a preliminary field assessment on a pilot scale to limited areas in Seoul, South Korea, and to explore further study of a telerehabilitation service design and survey extension to groups with other disabilities. One of the survey efforts is launching a 3-year government-funded project, which started in December 2011.

Acknowledgments

This work was supported by the Technology Innovation Program (grant 100036459, Development of Center to Support Quality of Life Technology (QoLT) Industry and Infrastructures) funded by the Ministry of Knowledge and Economy (MKE)/Korea Evaluation Institute of Industrial Technology (KEIT), Korea. This work was supported by the National Rehabilitation Center's R&D Program (grant 10-A-03, Preliminary Study of Legislative and Technical Survey on Telerehabilitation Service for Individuals with Disability) funded by the Ministry of Health and Welfare (MHW), Korea.

Disclosure Statement

No competing financial interests exist.

REFERENCES

1. Lim S, Kim S-Y, Kim JI, et al. A survey on ubiquitous healthcare service demand among diabetic patients. *Diabetes Metab J* 2011;35:50-57.
2. Lim S, Kang SM, Shin H, et al. Improved glycemic control without hypoglycemia in elderly diabetic patients using the ubiquitous healthcare service, a new medical information system. *Diabetes Care* 2011;34:308-313.

3. Ricker JH, Rosenthal M, Garay E, et al. Telerehabilitation needs: A survey of persons with acquired brain injury. *J Head Trauma Rehabil* **2002**;17:242–250.
4. Russell TG. Physical rehabilitation using telemedicine. *J Telemed Telecare* **2007**;13:217–220.
5. Palsbo SE. Medicaid payment for telerehabilitation. *Arch Phys Med Rehabil* **2004**;85:1188–1191.
6. Schein RM, Schmeler MR, Saptono A, Brienza DM. Patient satisfaction with telerehabilitation assessments for wheeled mobility and seating. *Assist Technol* **2010**;22:215–222.
7. Chumbler NR, Quigley P, Sanford J, et al. Implementing telerehabilitation research for stroke rehabilitation with community dwelling veterans: Lessons learned. *Int J Telerehabil* **2010**;2:15–22.
8. Muncert ES, Bickford SA, Guzik BL, et al. Enhancing the quality of life and preserving independence for target needs populations through integration of assistive technology devices. *Telemed J E Health* **2011**;17:478–483.

Address correspondence to:

Shinyoung Lim, Ph.D.

Department of Rehabilitative and Assistive Technology

Korea National Rehabilitation Research Institute

58 Samgaksan-ro

Gangbuk-gu, Seoul 142-884

Korea

E-mail: slim.smu@gmail.com

Received: December 26, 2011

Revised: February 22, 2012

Accepted: February 22, 2012