Functional Skills After Rehabilitation for Patients with Spinal Cord Injury†

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Abstract

This follow-up study evaluated the functional skills of 151 spinal cord injury persons after comprehensive in-patient rehabilitation. The mean age of subjects was 34.1 years, consisting of 132 males and 19 females. The results indicated that the level of self-care achieved after rehabilitation was maintained by the majority of rehabilitants. The ability of quadriplegics to eat demonstrated the most deterioration, while the ability of quadriparetics and paraparetics to ambulate significantly improved. However, rehabilitants with complete thoracic cord injury were unable to maintain functional ambulation.

Spinal cord injury (SCI) can be one of the most devastating calamities in human life both for the patient and his or her family and friends[1]. The main objective of SCI rehabilitation is to maximize the physical and psychological potential of an individual to achieve independence. Prediction of functional ability after SCI is based on the degree of motor functions[2-4]. Skills learned in the rehabilitation ward often require modification after discharge due to environmental obstacles. Many authors[5-8] have reported that SCI persons can maintain or improve their functional ability post discharge. However, these studies originated from more affluent societies which do not face many of the constraints found in Thailand. Here, there is a lack of feedback on the persons' ability once assimilated into the community, therefore, it has been difficult to assess the effectiveness of rehabilitation.

The aim of this study was to compare the functional ability of SCI persons post rehabilitation and then after discharge. From correlation of the

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data, critical factors affecting outcome can be recognized and SCI rehabilitation modified accordingly.

MATERIAL AND METHOD

A questionnaire was sent to each subject and its findings correlated and compared with that subject's status prior to discharge. This information was obtained from standard performance testing. Norris-Baker[9] has demonstrated the reliability of self-reporting and independent observation, such as that used in this study.

The questionnaire (based on the work of Welch et al[10]) had two parts. The first part concerned the degree of integration into the community, living situation, domestic adaptation, number of associated complications and adequacy of medical service. In the second part, the subjects had to self-rate their ability to carry out the following functional skills: walking, sitting up ability, eating, dressing, bathing ability; and bowel and bladder care.

Subjects rated their ability on a four point scale; (I) Independent, (A) Assisted, (D) Dependent completely on a task and (N) indicated that skill was not performed. Data was then scrutinized and each category compared to see whether there was maintenance, improvement or regression of function.

Following common practice,[6,7,10] an improvement or regression of self care capabilities of a minimum of 20 per cent of the rehabilitants is arbitrarily established as significant. If 50 per cent of the rehabilitants achieve or maintain a level of independence in an activity, this is regarded as a realistic goal for all rehabilitants in the same group. According to walking status, improvement or regression was considered when there was some change in the level of ambulation. Significant change was established when it occurred in minimum of the 20 per cent rehabilitants. The levels of ambulation were devided into four categories according to the Rancho Los Amigos Hospital criteria[11] : community ambulation, household ambulation, exercise ambulation and non-ambulation. Frequency tallies and gross tabulations were determined by chi-square at an acceptance level of 0.05.

RESULTS

One hundred and eighty-three (53%) questionnaires were completed and returned. Thirty-two had to be excluded due to inadequate medical records. Of the 151 remaining, the average age was 34.1 years (SD = 12.4 years) ranging from 14-78 years. (SD = 12.4 years) Male to female ratio

Table 1. Group profiles at discharge and follow-up.

Self care categories	group	Discharge (n) D	SD	I	N	Follow-up (n) D	SD	I	N
Eating	1	6	4	8	0	9	3	6	0
	2	1	0	23	0	1	1	22	0
Upper extremity dressing	1	12	5	1	0	13	2	3	0
	2	1	1	22	0	1	4	19	0
Lower extremity dressing	1	12	6	0	0	13	2	3	0
	2	2	1	21	0	3	2	19	0
Bathing	1	12	5	1	0	14	4	0	0
	2	1	5	18	0	2	4	18	0
Sitting up	1	11	5	2	0	13	5	0	0
	2	1	5	18	0	1	17	6	0
Transfer	1	13	4	1	0	15	1	2	0
	2	1	4	6	13	1	2	3	18
Sitting	1	9	6	3	0	7	5	6	0
	2	1	1	22	0	0	1	23	0
Bowel care	1	13	5	0	0	13	5	0	0
	2	2	4	18	0	1	4	19	0
Bladder care	1	15	3	0	0	10	5	3	0
	2	2	1	21	0	2	1	21	0

group 1 = quadriplegic, group 2 = quadriparetic
D = dependent ; SD = semidependent ; I = independent ; N = skills not performed

was 9 : 1. At discharge, 18 (12%) were quadriplegic, 24 (30%) were quadriparetic, 46 (30%) were paraplegic and 63 (42%) were paraparetic. At the time of survey, average time since injury was 4.0 years (SD = 1.4 years).

Results regarding group profiles of quadriplegics and quadriparetics are summarized in Table 1. Fifty-four per cent (8 cases) of quadriplegics were independent with respect to eating at discharge and the percentage decreased to 33 per cent at follow-up. According to other self-care skills, almost all of the quadriplegics were dependent at discharge and at follow-up. At discharge, 75 per cent of quadriparetics were independent in all activities except for transferrring (54%). At follow-up there was minimal change in independence except in sitting ability. At discharge, 18 quadriparetics could sit independently whereas at follow-up only 6 could: the percentage of independence was decreased from 75 per cent to 25 per cent

Table 2 is a summary of changes in self care ability of quadriplegics and quadriparetics between discharge and follow-up. There is a significant regression (greater than 20% of subjects) in the eating capability of quadriplegics. Four (80%) were in the C_{4-5} subgroup, of which all subjects were totally dependent in all activities at follow-up. This regression in eating capability was statistically analyzed in terms of age, sex, average time since injury and number of complications. There was found to be no difference between those that maintained their ability and those who regressed.

At discharge only 4 subjects with cervical cord injury used universal cuffs. None had hand surgery. At follow-up only one was still using a universal cuff.

Results were not shown between paraplegic and paraparetic subjects as almost all maintained independence. However, 10 paraparetic subjects (17%) regressed in their bathing. There is no established signifecance.

The subjective assessments of attendant care indicated that all of the quadriplegic persons needed assistance from their families; one half of the subjects said that they needed only a few hours a day and the other half needed assistance day and night. Thirty-seven percent of quadriparetic, 50 per cent of paraplegic and 30 per cent of paraparetic persons needed help a few hours per day. The remainder needed no help. Most persons needed assistance with bowel emptying, bathing, homemaking and daily physical exercise.

Table 2. Changes in self-care abilities from discharge to follow-up.

Self care categories	group	Maintenance	Improvement	Regression
Eating	1	11	1	5*
	2	23	0	1
Upper extremity dressing	1	12	3	3
	2	21	0	3
Lower extremity dressing	1	15	1	2
	2	22	0	2
Bathing	1	16	1	1
	2	22	1	1
Sitting up	1	14	2	2
	2	21	2	1
Transfer	1	15	1	2
	2	20	2	2
Sitting	1	15	3	0
	2	21	3	0
Bowel care	1	17	1	0
	2	21	0	0
Bladder care	1	16	2	0
	2	24	0	0

group 1 = quadriplegic, group 2 = quadriparetic
x* shows significant change

Table 3. Group profiles of walking status of discharge and follow-up.

Level and completeness of injury		Discharge				Follow-up			
		N	E	H	C	N	E	H	C
C_{4-8}	complete	18	0	0	0	18	0	0	0
	incomplete	5	1	6	12	3	2	0	19
T_{1-6}	complete	21	1	0	0	18	4	0	0
	incomplete	2	0	4	1	1	0	0	6
T_{7-12}	complete	12	7	11	0	20	9	0	1
	incomplete	0	1	4	2	1	0	0	6
L_1 and below	complete	3	0	6	2	5	3	1	2
	incomplete	1	0	18	13	4	4	3	21

N = non ambulation ; E = exercise ambulation ;
H = household ambulation ; C = community ambulation

Table 4. Change in walking status from dischar ge to follow-up.

Level and completeness of injury		Maintenance	Improvement	Regression
C_{4-8}	complete	18	0	0
	incomplete	15	9*	0
T_{1-6}	complete	19	3	0
	incomplete	2	5*	0
T_{7-12}	complete	17	1	12*
	incomplete	2	4*	1
L_1 and below	complete	5	1	5*
	incomplete	18	8*	6

N = non ambulation ; E = exercise ambulation ;
H = household ambulation ; C = community ambulation
x* shows significant change

Table 3 is an analysis of walking ability at discharge and follow-up. More than 70 per cent of persons with incomplete spinal cord injury were functional ambulators (household or community ambulators) at discharge. At follow-up, all quadriparetics and thoracic paraparetics who were classified as household ambulators had improved to become community ambulators. There were no functional ambulators in the complete T_{1-6} cord injury group. However, 1 patient (5%) could walk a little for exercise purposes at discharge. This number increased to 4 (18%) at follow-up.

Of the persons with complete T_{7-12} injury, eighteen (60%) were able to walk independently at discharge. All of them used knee-ankle-foot orthosis and axillary crutches. Seven walked for exercise purposes. The remaining eleven subjects were household ambulators. At the time of the survey, the number of independent walkers decreased to nine (33%). Almost all of the subjects (90%) who could maintain walking activity did so for exercise purposes. The subjects (all groups) who were previously functional ambulators but were not so at follow-up gave us many reasons : it was easier to get around in a wheelchair ; walking with braces used too much energy ; it was difficult to put the braces on and to take them off and it disturbed some of the activities of daily living.

Table 4 shows a significant improvement in the walking status of quadriparetics and paraparetics. On the other hand there is a significant regression in complete lower thoracic (T_{7-12}) and lumbar paraplegia. When utilizing the aforemen-

tioned criteria (50% of rehabilitants were able to maintain the level of activity), there is a strong possibility that quadriparetic and paraparetic persons can achieve functional walking. Likewise, persons with complete cord injury whether cervical, thoracic or lumbar could not achieve functional walking.

DISCUSSION

The data regarding self-care performance between hospital discharge and follow-up 1-6 years later indicate that the level of independence of quadriplegics achieved during therapy by rehabilitants with spinal cord injury was generally maintained after discharge. The results of this study agree with prior findings(6,7). However, the functional ability of quadriplegics in this report was lower than mentioned in previous studies (6,7,9). Two reasons may be postulated for this. First of all, relatively few assistive devices were available. Second, cultural factors may play a role, as caregivers for disabled persons feel sympathy towards them, fostering dependent behavior and discouraging the development of skills leading to independence.

Almost all of SCI persons expected to walk again during the admission period. They usually acquired lower extremity braces which would assist them with standing and walking. Most persons with complete lower thoracic or lumbar cord injury were prescribed long leg braces and were trained to stand or walk. This study shows that after they returned to their environment, the percentage of subjects who maintained walking status had diminished as reported in previous studies(12-14).

It is particularly important to emphasize, as many SCI persons and family members often place a high value on walking to the exclusion of other important activities provided in rehabilitation.

In conclusion, this study analyses maintenance, improvement and regression of self-care and mobility activities after the rehabilitants were discharged from rehabilitation centres in Thailand. Persons with incomplete SCI were discharged with higher functional abilities. Most of the subjects could maintain their self-care skills. The only one skill that SCI subjects might loose after discharge is eating capability in C_{4-5} quadriplegic subjects. Assistive devices should be utilized to increase independence. Eighty-six per cent (62 cases) of incomplete SCI persons could walk functionally at discharge. There was significant improvement of this ability on follow-up. However, in cases of complete paraplegia there was a remarkable decrease in ambulation. Many rehabilitants with lower thoracic and lumbar cord injury were not able to walk as expected.

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การติดตามการคงความสามารถของผู้มีไขสันหลังบาดเจ็บ ภายหลังเสร็จสิ้นการฟื้นฟูสมรรถภาพ

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การศึกษานี้เป็นการติดตามระดับความสามารถของผู้ป่วยไขสันหลังบาดเจ็บ เมื่อกลับไปอยู่บ้านหลังจากเสร็จสิ้นการฟื้นฟูสมรรถภาพที่โรงพยาบาล จำนวนผู้บาดเจ็บที่ศึกษาทั้งหมดมี 151 ราย แบ่งเป็นชาย 132 ราย หญิง 19 ราย อายุเฉลี่ย 34.1 ปี พบว่า เมื่อเปรียบเทียบกับช่วงก่อนกลับบ้าน ส่วนใหญ่คงความสามารถในการช่วยเหลือตนเองในชีวิตประจำวันไว้ได้ ระดับความสามารถที่ลดลงมากที่สุดคือการรับประทานอาหารของผู้ป่วย quadriplegia ระดับความสามารถในการเดินของผู้ป่วย quadriparesis และผู้ป่วย paraparesis เพิ่มขึ้นอย่างมีนัยสำคัญ แต่ผู้ป่วย thoracic paraplegia เกือบทั้งหมด ที่เคยเดินได้ระยะทางที่คาดว่าน่าจะเดินได้ในบ้าน เมื่อกลับไปอยู่บ้าน พบว่าไม่สามารถเดินได้ถึงระดับดังกล่าว

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