

Functional outcomes in a lower limb amputee population

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Abstract

This paper reports an evaluation of 132 patients seen at the Nova Scotia Rehabilitation Centre amputee programme during a 24-month period, carried out to evaluate the programme's effectiveness. In addition to a review of charts, a questionnaire was used (85% return rate) to help determine functional outcomes. The patient profile revealed a 3.4:1 male-to-female ratio and an average age of 64.8 ± 13.0 years. The average overall training time was 44.0 ± 26.5 days. Of the respondents, 65.5% wore their prosthesis at least 9 hours/day, 11.5% wore it at least 4 hours/day, and only 16.1% were no longer using their prosthesis. The programme's effectiveness appears to compare well with that of others reported in the literature.

Introduction

As part of an ongoing effort to improve the quality of patient care at the Nova Scotia Rehabilitation Centre, the services being provided to the public are being examined more closely. This paper focuses on the amputee population within Nova Scotia, as the Centre serves the entire province. The incidence of amputation in 1992 has been reported to be 43/100,000 per year. Approximately 380 amputations are performed each year in Nova Scotia; these include hemipelvectomy, hip disarticulation, trans-femoral (above-knee), knee disarticulation (including Gritti-Stokes), trans-tibial (below-knee), Syme, transmetatarsal, toe, and upper limb amputations. This yearly figure includes any revisions necessary within

the amputee population in both upper and lower limbs.

The focus of this study is on trans-femoral and trans-tibial amputees, as these constitute the majority of patients seen at the Nova Scotia Rehabilitation Centre. Of these, the Centre sees approximately 90 new amputees per year, 83.8% of whom are 60 years of age or older. The feasibility of fitting patients in this age group with prostheses has been questioned frequently (Anderson *et al.*, 1987; Davis *et al.*, 1967; Holden and Fernie, 1987).

The purpose of this study was to test the hypothesis that the amputee services and the functional outcome provided at the Nova Scotia Rehabilitation Centre are comparable to other centres described in the literature. Prosthetic use after completion of the entire rehabilitation process may be a good indicator of functional outcome and may provide further justification for including patients in the process.

Methods

At the Centre, patients enter the programme as a result of referral to the interdisciplinary amputee clinic for assessment. Depending on their medical status and level of independence, patients begin prosthetic training either as an inpatient or outpatient. The treatment regime consists of an initial phase of prosthesis fitting, followed by a schedule of group exercises and gait training in the physiotherapy department. The exercise regime includes: mat work focusing on cardio-pulmonary conditioning, trunk and limb stretching, strengthening of specific muscle groups involved in ambulation, and balancing activities in both sitting and standing. Gait training begins with the general principles of ambulation and carries through to such specific activities as transfers, stair

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Table 1. Sex, age, and level of amputation of 132 lower limb amputees treated during 24 months by the Nova Scotia Rehabilitation Centre's amputee programme

Level of Amputation	Men (n = 102)			Women (n = 30)			Total (n = 102)		
	No	Mean Age (years)	SD	No	Mean Age (years)	SD	No	Mean Age (years)	SD
trans-femoral	55	64.3	9.9	12	65.7	12.4	67	65.5	12.0
trans-tibial	47	64.5	14.9	18	63.9	14.0	65	64.1	14.1

Patients with trans-femoral amputations ranged in age from 23 to 81 years; those with trans-tibial amputations were from 30 to 85 years old.

climbing, practice on various terrains and where appropriate, practice with recreational activities. Ongoing medical care is provided in consultation with the attending physical medicine specialist. Decision for discharge is based on the following criteria: independence for ambulation on gravel, stairs, incline, and carpet. The ability to get down to the floor and rise independently was an important safety requirement. Upon discharge, a routine three-month follow-up appointment is arranged.

The charts of 132 patients who had a trans-femoral or trans-tibial amputation and had completed the amputee programme in a 24-month period were reviewed. From the chart review, was obtained the patient's age and sex, the date and level of the amputation, the date of the patient's initial visit to the amputee clinic, whether the patient was referred from a hospital

in metropolitan Halifax or from one elsewhere in the province, and the length of the patient's training time.

In order to determine the patients' functional outcome over a period of 6-24 months after discharge from the programme a questionnaire was sent to all 132 patients, requesting information pertaining to use of their prostheses, ambulation aids, and wheelchairs and to their avocational activity level. Usable data were received from 103 (78%) of the patients. Some 112 returned their questionnaires – an 85% return rate – but nine questionnaires (8% of those returned) were unusable.

Results

The patient population consisted of 102 men and 30 women with approximately 3.4 men for every woman in the total population. The ratio was 4.6:1 among trans-femoral (above-knee) amputees and 2.6:1 among trans-tibial (below-knee) amputees (Table 1). The patients' ages ranged from 23 to 85 years, but whereas the average age of the patient population was 64.8 years, 75% of all patients were at least 60 years old, and the age distribution peaked in the seventh decade (Table 1 and Fig. 1) Referral time (the difference between the date of the amputation and that of the patient's first visit to the clinic) was 70 ± 73 days and 45 ± 33 days respectively for trans-femoral and trans-tibial amputees referred to the clinic from Halifax hospitals and 112 ± 87 days and 112 ± 79 days for patients referred from other hospitals. The average training time was 44.0 ± 26.5 days for all patients.

Sixty-seven (65%) of the 103 respondents reported that they wore their prosthesis at least nine hours per day. Another 12% wore their prosthesis at least half of the day, and only 16.1% reported that they were no longer

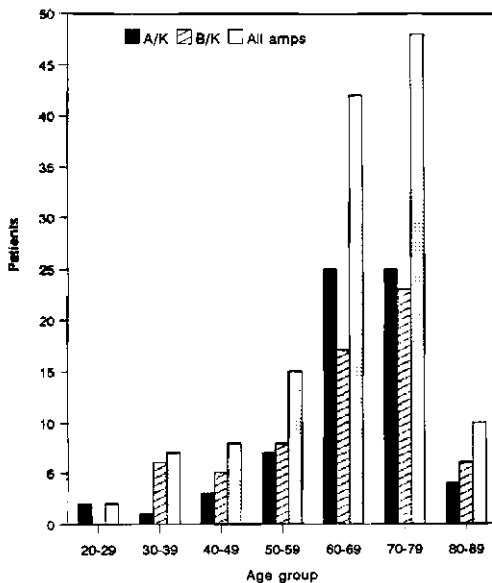


Fig. 1. Age groups of all amputees.

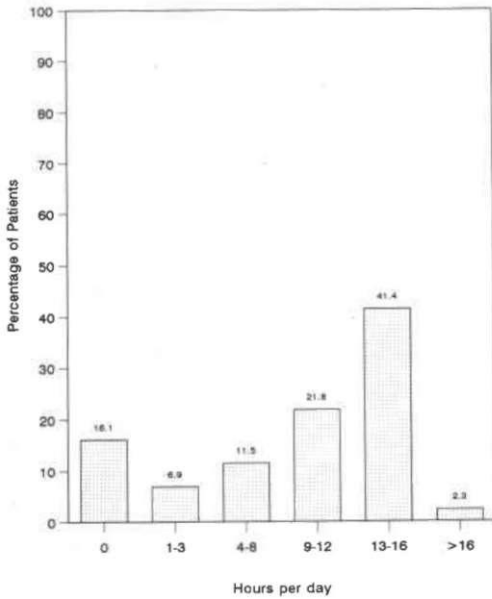


Fig. 2. Prosthetic utilization.

wearing their prosthesis at the time of the survey (Fig. 2). Most respondents reported using some type of ambulation aid (Table 2); however, nearly 75% did not use a wheelchair, whereas 18.6% reportedly used one as their only means of mobilization and 9.3% used one occasionally. Respondents reported that they regularly participated in a wide variety of activities (Table 3), with only 12.8% reporting that they had no regular activity. A comparison of functional outcome criteria from various studies is depicted in Table 4.

Discussion

The adult amputee clinic at the Nova Scotia Rehabilitation Centre is the sole provider of prosthetic services within the province. The study group has therefore a broad-based representation of the adult population.

The male:female ratio is similar to other studies (Kegel *et al.*, 1978; Pohjolainen *et al.*,

Table 2. Use of ambulation aids

Type	Inside (%)	Outside (%)
no aid	42.9	28.6
1 cane	26.0	35.7
2 canes	28.6	28.6
quad cane	1.3	1.4
crutches	2.6	2.9
forearm crutches	1.3	0
walker	19.5	7.1

Table 3. Activities reported

Type	N	%
daily walk	35	44.9
travel	45	57.7
shopping	42	53.8
driving car	40	51.3
housework	41	52.6
gardening	19	24.4
woodworking	14	17.9
cooking	30	26.8
fishing	13	16.8
camping	10	12.8
chopping wood	8	10.3
hunting	8	10.3
swimming	3	3.8
miscellaneous*	18	23.0
none	10	12.8

* Miscellaneous activities include dancing, archery, boating, lifting weights, golfing, tennis, baseball, farming, latch hooking, driving an all-terrain vehicle, using a stationery bicycle, and making bicycle repairs.

1990; Reyes *et al.*, 1977; Weaver and Marshall, 1973).

According to current demographics, the number of older persons has increased rapidly, and this increase is projected to continue (Perreault, 1990). It is from this group that the major proportion of the amputee population comes. The average age of the subjects in this study compares with those in other studies (De Luccia *et al.*, 1992; Moore *et al.*, 1989; Pohjolainen *et al.*, 1990; Reyes *et al.*, 1977; Weaver and Marshall, 1973)

Patients should be introduced into the rehabilitation process as quickly as possible. The differences in the referral times from hospitals outside metropolitan Halifax and those from hospitals in Halifax indicate a need for further education of care-givers to refer patients early. The large standard deviation for the mean referral times in all groups reflects the multiple medical problems with which this patient population presents, and which may delay their entry into the programme. Upon entrance to the programme, after the initial amputee clinic visit, the average training time was similar for all amputees at 44.0 ± 26.5 days. The overall time from surgery to the end of training time was 127 days. There is a wide discrepancy in the literature, with published values ranging from 95 to 189 days (Katrak and Baggott, 1990; Kerstein *et al.*, 1974; Pohjolainen *et al.*, 1989;

Table 4. Interstudy comparison of functional outcome criteria.

	Present	Kegel	Reyes	Pohjolainen
no use	16.1%	10.0%	5.4%	10.6%
1-3 hrs.	6.9%	—	—	5.0%
2-4 hrs.	—	—	4.5%	—
4-6 hrs.	—	—	—	16.3%
4-8 hrs.	11.5%	—	—	—
6-8 hrs.	—	—	49.1%	—
7-11 hrs.	—	—	—	7.8%
9-12 hrs.	21.8%	—	—	—
>12	43.7%	—	—	60.3%
no assistive device*	42.9%	55.9%	2.7%	16.3%
1 cane	26.0%	10.4%	40.2%	—
2 canes	28.6%	2.2%	5.4%	—
quad cane	1.3%	—	—	—
crutches	2.6%	10.7%	—	—
forearm	1.3%	—	—	—
walker	19.5%	0.7%	5.4%	—

* inside only.

Pohjolainen *et al.*, 1990). This may be related to such factors as the availability of health facilities and services or varying approaches to provision of prostheses.

The evaluation of functional outcomes is based on responses to the questionnaire distributed. Of the total responses, 8% were unusable with a net response rate of 77% exceeding the norm based on any homogeneous population (Dillman, 1978).

Comparing functional outcome between centres was difficult. The review of the literature revealed a great discrepancy with respect to the criteria used to determine functional outcome within the amputee population. Various centres used such activities as ambulation on stairs, ramps, public transportation, distances walked, wearing time (hours) (Pohjolainen *et al.*, 1990), driving, housekeeping chores (Reyes *et al.*, 1977), sexual activities, getting up from the floor, and living arrangements (Narang *et al.*, 1984). Our use of ambulatory aids and prosthetic wearing time is similar to the practice in several other centres (Table 4) to measure functional outcome (Kegel *et al.*, 1978; Narang *et al.*, 1984; Reyes *et al.*, 1977).

In conclusion, although the results of this two-year review reflect that similar patterns of programme effectiveness are occurring

internationally, discrepancies have been identified in the literature (Table 4). The development of standardised criteria to determine functional outcomes would allow better comparisons to be made between various programmes in various geographical locations.

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