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Original Article

Mobility aids and transport possibilities 10–45 years after spinal cord injury

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Study design: A cross-sectional survey with retrospective data.
Objective: Follow-up information on the use of mobility aids and transportation possibilities in a chronic traumatic spinal cord injury (SCI) population.
Setting: Clinic for Para- and Tetraplegia at Rigshospitalet, University hospital, Denmark (CPT). The uptake area is East Denmark with a population of 2.5 million inhabitants.
Methods: Survey on date of birth, gender, time of SCI, cause of SCI, neurological level and functional classification from medical files were combined with information concerning mobility aids and transport possibilities at the time of follow-up from a mailed questionnaire.
Material: Individuals with traumatic SCI before 1 January 1991 were still in regular follow-up at CPT, and with sufficient medical record. A total of 279 were included, out of which 236 answered the questionnaire. Of the 193 men and 43 women injured from 1956 to 1990 the response rate was 84.6%. Age at the time of follow-up was 50.5 years in mean, and follow-up time was 24.1 years in mean. In all, 126 were paraplegic and 110 tetraplegic. Responders and nonresponders were comparable.
Results: In all, 3.4% used no special mobility aids at all. In total, 49 used crutches or rolling walkers and 26 lower extremities bracing, but mostly in combination with a wheelchair. Standing frame and stand-up wheelchair were used by men only. Manual wheelchair was used by 83.5% and electrical wheelchair by 27%, and the latter more by the tetraplegics. In all, 9.3% had neither a manual nor an electrical wheelchair. Overall, 86.4% had a passenger van or another car. Women used a car less often. Passenger vans were more often used by tetraplegics.
Conclusion: Nearly all SCI participants had mobility aids of some sort, and 90.7% had either a manual or an electrical wheelchair or both. Most had a passenger van or another type of car for transportation. These facilities are important for the individuals to obtain an independent living.
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Keywords: spinal cord injury; mobility aids; transportation; manual wheelchair; electrical wheelchair; car

Introduction

In the recent decades, cost in relation to spinal cord injuries (SCIs) is moving from acute medical care to less acute, community-based care, including the use of various aids, appliances and transportation.[1] Mobility equipment and transport are areas of major need among a large proportion of people with SCI living in the community.[2–4] This is not that different from the situation 20 years ago, when the transportation issue was also an area for dissatisfaction.[5] Particularly for those who are employed, the transportation possibilities are of utmost importance.[6]

Very little is known in this area regarding the kind and amount of mobility aids and transport facilities available for and used by the SCI individuals years after their SCI. This information is also of interest to those who provide and finance the aids and transport facilities.

This paper is part of a larger follow-up study of individuals with traumatic SCI at least 10 years after their SCI at the time of follow-up. The aim of this presentation is to give the information collected on the use of mobility aids and transportation possibilities in the population with chronic traumatic SCI.

Materials and methods

The study included participants from the Clinic for Para- and Tetraplegia at Rigshospitalet, Denmark (CPT). The hospital is a university hospital, with an uptake area corresponding to East Denmark including

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a population of approximately 2.5 million inhabitants. In Denmark, there are only two hospital facilities taking care of the rehabilitation and treatment of SCI individuals for a population of a little more than 5 million. CPT is the only facility for SCI in East Denmark, and all patients with SCI, independent of their socioeconomic status, are referred to this facility, if they are judged to be in need of specialised care. In this facility, the patients receive their initial rehabilitation until they usually are discharged to their home. Afterwards they are, if needed, followed up lifelong in the facility, that is, those with minimal consequences of their SCI may be terminated from the follow-up regimen. Treatment and rehabilitation in Denmark is provided free of charge to all Danish citizens, and paid through taxes.

For inclusion in this study, the SCI individuals should have a traumatic SCI contracted before 1 January 1991, and they should still be alive at the time of mailing a follow-up questionnaire. Furthermore, they should have a normal initial admission at the CPT, still be in regular follow-up at CPT, and their medical record has to be sufficient for retrieval of the historical data necessary for participation in the follow-up study.

In all, 279 participants were included. They all received a questionnaire by mail with a prestamped return envelope. Approximately 2 months after the first mailing, a reminder with a new questionnaire was sent to those participants, who did not answer the first one.

All together 236 participants answered and returned the questionnaire, 193 men and 43 women injured from 1956 to 1990, corresponding to a response-rate of 84.6 %. The age at the time of follow-up was 50.5 years in mean (SD 11.2, median 50.0, range 28.4–84.5), and follow-up time was 24.1 years in mean (SD 8.7, median 23.7, range 10.7–45.1). With regard to the level of injury, 126 participants were paraplegic and 110 tetraplegic, 102 complete and 134 incomplete according to Frankel *et al*.[7] The nonresponder group consisted of 43 participants, 35 men and eight women injured from 1960 to 1990.

Medical record data

Data concerning date of birth, gender, time of SCI, cause of SCI, neurological level (C_2–L_4) and functional classification[7] at the time of discharge from the initial rehabilitation at CPT were collected from the medical files. The neurological level of the SCI is given as the most caudal normal spinal cord segment.

A combined variable, called 'neurofunction' has been created:[8]

'$C_{1–5}$/A–C':	neurological level $C_{1–5}$ and functional class A–C
'$C_{6–8}$/A–C':	neurological level $C_{6–8}$ and functional class A–C
'$T_{1–6}$/A–C':	neurological level $T_{1–6}$ and functional class A–C
'$>T_6$/A–C':	neurological level T_6–L_4 and functional class A–C
'D':	all with functional class D
'E':	all with functional class E

This division gives high and low tetra- and paraplegics with no useful motor function below the level of lesion. Class D represents a very heterogeneous group,[9] which is why it was kept separately. Finally, the individuals in class E are nearly physical normal.

The follow-up questionnaire

Data used from the follow-up questionnaire concern mobility aids and transport possibilities at the time of follow-up. The questions used for this presentation are given in Figure 1.

The questionnaire was developed with assistance of different professionals working for the rehabilitation of SCI patients. Further, it was important that the questionnaire was easy to answer and easy to transfer into the database for further analyses.

Before the questionnaires were mailed to the participants in the main study, a pilot study was carried out including seven SCI individuals (four tetraplegic and three paraplegic). The results of the pilot study showed that the questionnaire was comprehensive and easy to answer. Owing to experience from the pilot study, minor adjustments were made before sending the questionnaire out to all participants.

To test the validity of the process of transferring the answers to the questionnaire into the database, 10% ($N=24$) of the questionnaires were checked thoroughly a second time. The results showed that all data entries ticked in the questionnaire concerning data included in the present publication were correct.

To investigate the reproducibility of the questionnaire, 38 participants received a second identical questionnaire 2 years after the initial emission. A total of 33 participants returned this second questionnaire (86.8%). The two questionnaires were analysed to understand as to what extent the answers were the same on both occasions. For the mobility aids questions, 97% gave exactly the same answer or the same answer with extra information; the same occurred for 94% with regard to the transport questions. One participant did not answer the questions at both occasions. In each category of questions, only one person (3%) gave different answers. Therefore, the reproducibility of the questions used in this article was concluded to be satisfactory.

Statistical methods

Tables were tested with χ^2 tests (df = degrees of freedom). Means were compared with Student's *t*-test. The level of significance was chosen as 5%.

Results

Responders and nonresponders were not significantly different with regard to gender, age at SCI, cause of SCI,

Aids:

Here is a list over aids. Tick off the aids you use. You are welcome to tick off more aids.

Mobility:

☐ Crutch(es)
☐ Rolling walker
☐ Sliding board
☐ Wheel protector
☐ Manual Wheelchair
☐ Electrical Wheelchair
☐ Electrical scooter
☐ Hand cycle
☐ Standing frame
☐ Stand-up wheelchair
☐ Arm braces
☐ Lower extremity braces incl. ankle foot orthosis
☐ Electrical stimulation used to improve walking
☐ Something else: _____
_____.

Transport:

☐Passenger van ☐ + power steering
☐Other type of car ☐ - power steering
Other special adaptations of the car: _____
_____.
☐Handicap-transport, HT, DSB or similar
☐Something else (other transport) _____

Figure 1 Questions in the follow-up questionnaire regarding mobility aids and transportation. Translated from Danish. HT: abbreviation for the public transport system in and around metropolitan Copenhagen; DSB: abbreviation for the Danish train cooperation

neurological level, functional classification, years since SCI or age at the time of follow-up.

Mobility aids

Only eight SCI participants (3.4%) used no special mobility aids at all, that is, three of functional class E and five class D.

Table 1 shows the mobility aids reported used 10–45 years after SCI, divided by gender and neurofunction classification. With regard to gender, the only noteworthy difference is that only men used standing frame and stand-up wheelchair (taking these two equipments groups together – no one had both – and testing against the remaining participants: $\chi^2 = 4.94$, df = 1, $P = 0.026$).

The manual wheelchair was used by 83.5%, and equally in all the neurofunction groups. The electrical wheelchair was used by 27% of all the SCI individuals, and not surprisingly more among the tetraplegic functional class A–C (tested against the remaining participants with exclusion of functional class E: $\chi^2 = 54.11$, df = 4, $P < 0.0001$). In all, 22 SCI individuals (9.3%) had neither a manual nor an electrical wheelchair. Of the 22, 11 individuals used crutches, four additionally a rolling walker, one lower extremity brace and one functional electrical stimulation. All were participants with cervical SCI except one.

In Table 2, the mobility aids are divided by time at injury and age at follow-up. The rolling walker was reported significantly more in the oldest age group (60–84 years) compared to the rest of the participants ($\chi^2 = 9.48$, df = 1, $P = 0.0021$), but only 10 individuals in all used rolling walker. Electrical scooter tended to be utilised more among the older ones (t-test, $P = 0.053$ (two-tailed)). Hand cycle on the other hand tended to be used more among younger participants (t-test, $P = 0.089$ (two-tailed)).

The combined use of mobility devices is illustrated in Tables 3 and 4. As regards Table 3, it is to be commented that another six participants used lower extremity braces but neither crutches nor rolling walker, and in addition, all had a manual wheelchair. The majority of those who use their walking ability also use manual or electrical wheelchair or scooter. This is because they need these mobility aids for longer distances. Likewise, 32% of those with a manual wheelchair had either an electrical wheelchair or scooter (Table 4).

Transport possibilities

Table 5 gives information on transport possibilities including use of power steering reportedly used 10–45 years after SCI, divided by gender and neurofunction

Table 1 Mobility aids reported use 10–45 years after SCI, divided by gender and neurofunction classification[a] (per cent and numbers in brackets)

		Gender		*Neurofunction classification*[a]					
	Number	*Female*	*Male*	*C_{1-5}/A–C*	*C_{6-8}/A–C*	*T_{1-6}/A–C*	*$>T_6$/A–C*	*D*	*E*
Crutch(es)	48	23% (11)	77% (37)	—	—	2% (1)	29% (14)	65% (31)[b]	4% (2)
Rolling walker	10	40% (4)	60% (6)	—	—	10% (1)	—	80% (8)[c]	10% (1)
Lower extremity braces incl. AFO[d]	26	23% (6)	77% (20)	—	4% (1)	—	54% (14)	42% (11)	—
Standing frame	21	—	100% (21)	5% (1)	19% (4)	33% (7)	33% (7)	10% (2)	—
Stand-up wheelchair	4	—	100% (4)	—	25% (1)	25% (1)	—	50% (2)	—
Manual wheelchair	197	17.8% (35)	82.2% (162)	11.7% (23)	17.8 (35)	15.2% (30)	34.0% (67)	20.3% (40)	1.0% (2)
Sliding board	23	26% (6)	74% (17)	4% (1)	30% (7)	13% (3)	39% (9)	13% (3)	—
Wheel protector	11	27% (3)	73% (8)	9% (1)	27% (3)	27% (3)	27% (3)	9% (1)	—
Electrical wheelchair	63	24% (15)	76% (48)	35% (22)	27% (17)	8% (5)	8% (5)	21% (13)	2% (1)[e]
Electrical scooter	18	22% (4)	78% (14)	6% (1)	—	11% (2)	44% (8)	39% (7)	—
Hand cycle	17	12% (2)	88% (15)	6% (1)	18% (3)	35% (6)	24% (4)	18% (3)	—
Arm braces	8	25% (2)	75% (6)	63% (5)	—	—	—	38% (3)	—
All participants	236	18.2% (43)	81.8% (193)	12.7% (30)	16.9% (40)	13.6% (32)	29.2% (69)	25.0% (59)	2.5% (6)

[a]Neurofunction classification (cf. text[8]) is based on a combination of the neurological level and the functional class[7]
[b]In this category, 15 had cervical, seven thoracic and nine lumbar lesions
[c]In this category, three had cervical, one thoracic and four lumbar lesions
[d]This also includes one male participant with a C_6 functional class D using functional electrical stimulation for walking. AFO: ankle foot orthosis
[e]This man was discharged with a T_{12}/E, but developed post-traumatic syringomyelia and 16 years postinjury, he became a C_7/A[10]

Table 2 Mobility aids reported use 10–45 years after SCI, divided by time at injury and age at follow-up (per cent and numbers in brackets)

		Time at injury			*Age at follow-up (years)*				
	Number	*01.01.56–31.12.70*	*01.01.71–31.12.80*	*01.01.81–31.12.90*	*Average*	*28–39.9*	*40–49.9*	*50–59.9*	*60–84*
Crutch(es)	48	31% (15)	21% (10)	48% (23)	54.5	17% (8)	25% (12)	27% (13)	31% (15)
Rolling walker	10	20% (2)	20% (2)	60% (6)	61.6	10% (1)	20% (2)	10% (1)	60% (6)
Lower extremity braces incl. AFO[a]	26	35% (9)	27% (7)	38% (10)	54.0	15% (4)	23% (6)	35% (9)	27% (7)
Standing frame	21	10% (2)	29% (6)	62% (13)	50.8	19% (4)	33% (7)	29% (6)	19% (4)
Stand-up wheelchair	4	50% (2)	25% (1)	25% (1)	58.4	—	—	50% (2)	50% (2)
Manual wheelchair	197	27.4% (54)	33.0% (65)	39.6% (78)	50.5	17.8% (35)	31.0% (61)	34.0% (67)	17.3% (34)
Sliding board	23	22% (5)	39% (9)	39% (9)	53.1	9% (2)	35% (8)	26% (6)	30% (7)
Wheel protector	11	9% (1)	45% (5)	45% (5)	44.3	9% (1)	82% (9)	9% (1)	—
Electrical wheelchair	63	30% (19)	32% (20)	38% (24)	51.5	16% (10)	32% (20)	30% (19)	22% (14)
Electrical scooter	18	28% (5)	22% (4)	50% (9)	55.4	11% (2)	22% (4)	33% (6)	33% (6)
Hand cycle	17	41% (7)	35% (6)	24% (4)	46.0	41% (7)	12% (2)	35% (6)	12% (2)
Arm braces	8	25% (2)	38% (3)	38% (3)	46.7	25% (2)	50% (4)	25% (2)	—
All participants	236	25.8% (61)	31.8% (75)	42.4% (100)	50.5	18.6% (44)	31.4% (74)	31.8% (75)	18.2% (43)

[a]This includes one participant using functional electrical stimulation for walking. AFO: ankle foot orthosis

classification. No one was reported as having both a passenger van and an other type of car, that is, 85.2% of all participants reported having their own car. Women less often used another type of car ($\chi^2 = 3.98$, df = 1, $P = 0.046$). Tetraplegics with no useful motor function below the level of lesion more often used passenger vans (tested against the remaining participants with exclusion of group E, $\chi^2 = 18.53$, df = 4, $P = 0.001$). This corre-

Table 3 The combined use of crutch(es)/walker and other mobility devices (numbers are given)

	No other mobility devices	*Lower extremity braces incl. AFO*[a]	*Manual wheelchair*	*Electrical wheelchair*	*Electrical scooter*	*Handcycle*
1–2 crutch(es)	6	20	31	2	7	—
1–2 crutch(es) and rolling walker[b]	3	—	5	2	—	1

[a]This includes one participant using functional electrical stimulation for walking. AFO: ankle foot orthosis
[b]One had a rolling walker only in combination with an electrical wheelchair
Comments: Two participants using crutches, the one with lower extremity braces had both a manual and an electrical wheelchair. One participant using crutches and rolling walker had both a manual and an electrical wheelchair

Table 4 Combined use of manual and electrical wheelchairs and other mobility aids (numbers are given)

	All	*Only*	*In combination*	*Electrical scooter*	*Hand cycle*	*Standing frame*	*Stand-up wheelchair*
Manual wheelchair	197	103	47	17	16	21	3
Electrical wheelchair	61	15		1	—	2	1

Comments: Three participants had manual wheelchair in combination with electrical scooter and a standing frame. Two participants had a manual wheelchair in combination with a hand cycle and a standing frame. One participant had a manual wheelchair in combination with a hand cycle and a stand-up wheelchair. One participant had a manual wheelchair in combination with an electrical scooter and a hand cycle. Two participants had a manual as well an electrical wheelchair in combination with a standing frame. One participant had a manual as well an electrical wheelchair in combination with an electrical scooter

Table 5 Transport possibilities including use of power steering reported use 10–45 years after SCI, divided by gender and neurofunction classification[a] (per cent and numbers in brackets)

		Gender		*Neurofunction classification*[a]					
	Number	*Female*	*Male*	C_{1-5}/A–C	C_{6-8}/A–C	T_{1-6}/A–C	$>T_6$/A–C	*D*	*E*
Passenger van	78	17% (13)	83% (65)	26% (20)	22% (17)	12% (9)	24% (19)	15% (12)	1% (1)[b]
Other type of car	123	13% (16)	87% (107)	6.5% (8)	15.4% (19)	13.8% (17)	33.3% (41)	28.5% (35)	2.4% (3)
+power steering	165	10.9% (18)	89.1% (147)	11.5% (19)	18.8% (31)	15.2% (25)	29.7% (49)	22.4% (37)	1.8% (3)
−power steering	15	27% (4)	73% (11)	13% (2)	13% (2)	7% (1)	40% (6)	20% (3)	7% (1)
No car[c]	32	41% (13)	59% (19)	6% (2)	13% (4)	19% (6)	22% (7)	34% (11)	6% (2)
Handicap-transport	39	28% (11)	72% (28)	10% (4)	26% (10)	13% (5)	18% (7)	31% (12)	3% (1)
Other transport	14	43% (6)	57% (8)	7% (1)	14% (2)	14% (2)	14% (2)	36% (5)	14% (2)
All participants	236	18.2% (43)	81.8% (193)	12.7% (30)	16.9% (40)	13.6% (32)	29.2% (69)	25.0% (59)	2.5% (6)

[a]Neurofunction classification (cf. text[8]) is based on a combination of the neurological level and the functional class[7]
[b]This man was discharged with a T_{12}/E, but developed post-traumatic syringomyelia and 16 years postinjury, he became a C_7/A[10]
[c]Excluding three participants who had ticked boxes regarding power steering without indicating the type of car

sponded to significantly more participants using electrical wheelchair having a passenger van (37) than another type of car (16) in comparison with those not using an electrical wheelchair (41 *versus* 107) ($\chi^2 = 27.39$, df = 1, $P < 0.0001$). Except for three participants, all those with an electrical wheelchair, who had another type of car, rather than a passenger van, also had a manual wheelchair. This is because, it is not possible to have an electrical wheelchair in a vehicle, if is it not a van, unless one uses a trailer.

Among those using a passenger van, 11 (14%) did not tick that they had power steering of their van. The same was true for 27 (22%) of those using another type of car. Women ticked the box regarding use of power steering significantly less often than men ($\chi^2 = 18.08$, df = 1, $P < 0.0001$). It should be noticed that three participants actually ticked boxes with relation to power steering without reporting to have a car, which is considered to be a mistake, indicating that at least 204 (86.4%) had a passenger van or other type of car. Significantly less women had a van or car ($\chi^2 = 10.79$, df = 1, $P = 0.001$).

Regarding other special transport adaptations, it was clear that most had hand-operated breaks and accelerators. In addition, 46 reported having lifts to their cars, while four used manual ramps. Special seats were reported for 21 cars, that is, seats, which could rotate,

come out sideways or were adjustable up and down. Special heaters in the cars or heated seats were reported for 14 cars.

Seven individuals informed that the car was driven by persons, other than themselves. 'Handicap transport' include special arrangements with a public or private passenger transportation service, which is most often transportation in (mini)bus, but also special service in using train.

Table 6 shows the transport possibilities divided by time at injury and age at follow-up. Significantly more among those injured in the latest period 1981–1990 did not have a van or car compared with those injured in earlier years ($\chi^2 = 10.61$, df = 2, $P = 0.005$). In addition, those with no passenger van or car were older than the others (*t*-test, $P = 0035$ (two-tailed); $\chi^2 = 8.51$, df = 3, $P = 0.037$). For the group of SCI individuals who had no van or car, the alternative outdoor transportation possibilities were analysed (Table 7). Among those who used manual wheelchair only two did not report any alternative; in particular, it is seen that all but five reported that they used handicap transportation.

Discussion

This study includes nearly all SCI individuals, who at least 10 years postinjury in regular control in East Denmark, and there were no significant differences between the responders and nonresponders. These results can probably be generalised to the whole Danish SCI population with significant consequences of their injury, because the population of SCI in East Denmark is not considered to be different from the SCI population in West Denmark. Since the mobility aids and transport facilities are provided in negotiation with the local municipalities, there may be certain regional differences in the possibilities to obtain the devices.

The questionnaire used was found reproducible over a period of 2 years. This indicates stability in the population answering the questionnaire, which may even increase the validity of the information included.

As expected are crutches/walker and lower extremity braces primarily used by paraplegics and those in functional class D, which is a very heterogeneous group.[9] In the questionnaire, the kind of lower extremity bracing used was not asked specifically. But according to previous experiences, it is most probably not long-leg calipers or the like, as this type of bracing is discouraged by most SCI individuals due to inconvenience, troublesome donning and doffing, fear of falling and the large amount of energy consumed while 'walking', etc.[11–14] Already 40–50 years ago, it was stated: 'prescription of ambulation for paraplegics must be tempered with common sense',[11] and supported ever since.[15,16] This means those using bracing are mostly likely to be those who can benefit in their daily life by using it for

Table 6 Transport possibilities including use of power steering reported 10–45 years after SCI, divided by time at injury and age at follow-up (per cent and numbers in brackets)

		Time at injury			*Age at follow-up (years)*				
	Number	*01.01.56–31.12.70*	*01.01.71–31.12.80*	*01.01.81–31.12.90*	*Average*	*28–39.9*	*40–49.9*	*50–59.9*	*60–84*
Passenger van	78	31% (24)	31% (24)	38% (30)	47.7	24% (19)	36% (28)	29% (23)	10% (8)
Other type of car	123	26.8% (33)	35.0% (43)	38.2% (47)	50.8	19% (23)	28% (35)	34% (42)	19% (23)
+power steering	165	27.9% (46)	32.1% (53)	40.0% (66)	49.3	22% (36)	31% (51)	32% (53)	15% (25)
−power steering	15	27% (4)	60% (9)	13% (2)	51.1	—	40% (6)	47% (7)	13% (2)
No car[a]	32	13% (4)	19% (6)	69% (22)	55.8	6% (2)	31% (10)	28% (9)	34% (11)
Handicap-transport	39	21% (8)	18% (7)	62% (24)	53.0	15% (6)	31% (12)	28% (11)	26% (10)
Other transport	14	36% (5)	29% (4)	36% (5)	46.9	21% (3)	43% (6)	29% (4)	7% (1)
All participants	236	25.8% (61)	31.8% (75)	42.4% (100)	50.5	18.6% (44)	31.6% (74)	31.8% (75)	18.2% (43)

[a]Excluding three participants who had ticked boxes regarding power steering without indicating the type of car

Table 7 Alternative outdoor transportation possibilities for those individuals without a passenger van or another type of car, divided by their use of a manual wheelchair

	Electrical wheelchair	*Electrical scooter*	*Handicap transportation*	*Hand cycle other means of transport*[a]	*No specific outdoor transportation mentioned*
Use manual wheelchair ($n = 21$)	6	5	16	2	2
Do not use manual wheelchair ($n = 11$)	4	0	3	2	5

[a]One in each group used hand cycle, while one among those using manual wheelchair had a 4-wheel cycle, and one in the other group mentioned a cycle

functional or community walking, or who may need it for specific purposes as in socialising, at work or for use in public transportation.[12] It is also our experience with functional electrical stimulation, that the SCI individuals will only use this technology if they find it practical. Therefore, we are in line with Jaeger *et al*[13] when they write: '… perhaps standing is a more realistic goal than walking for the majority of paraplegic individuals'. We did also find available standing frames being used regularly.[14] We have no explanation for the present finding, that standing frames and stand-up wheelchairs were used by men only. It would probably be worth trying to have more SCI individuals to use standing frames during the day primarily for the prevention of spasticity and contractures in the lower extremities.[17,18] Those participants who have some walking ability with lower extremity bracing, crutches or rolling walker did mostly in addition have a wheelchair, and in general this is the preferred equipment for mobility, as previously found.[12] According to the consumers, the primary priorities for mobility technology, particularly wheelchairs, are effectiveness, operability, dependability, affordability, personal acceptance, ease of maintenance and flexibility.[19] Manufacturers try to live up to these criteria and the demand of the individual user, because each individual may require different adjustments or combination of mobility aids to be optimal for their daily life. Here, it is comforting to see the variety and combination of mobility aids used by the participants in the present study; further, most of the possibilities seem to be available to a broad spectrum of the SCI participants independent of gender, age, and time of injury. Individual preferences are most likely to also be the reason for electrical scooters being used a little more by the older generation and handcycles more by young men.

In a study in the Netherlands, most SCI individuals between 18 and 65 years of age had more than one wheelchair,[20] which to a certain extent can be confirmed in our study although we did not ask if they had more than one manual wheelchair, which is a common situation. It is a little surprising that only 23 reported using sliding board and 11 wheel protector for manual wheelchair. These are important for the prevention of shear during transfer and ought to be used by a larger proportion of SCI individuals. This may of course be because of under-reporting.

Owing to the fact that most SCI individuals either use a wheelchair or have a decreased walking ability, they do frequently have their own mostly hand-operated or otherwise specially adapted passenger van or another type of car for transportation. If they have no car, most use the possibility for some sort of public or private handicap transportation. These transportation possibilities are to a certain extent provided by the municipalities. In the Netherlands, it seems that fewer are provided with an adapted car, as they reported only so for 51% SCI individuals aged 18–65 years.[20] The finding that more men than women are driving has previously been indicated.[5] It may not be surprising that older SCI participants to a greater extent prefer other means of transportation than their own van or car.

Power steering has been an issue in Denmark for some years, because it has been advised to have power steering in all cars for SCI individuals, in particular for those using hand-operated break and accelerator. Today, probably all the passenger vans and many of the other cars have power steering although some participants did not tick the appropriate box. That women have less power steering is most likely due to under-reporting. SCI individuals have a great risk of upper extremity overuse problems due to the sometime extreme load they were exposed to in their daily life, during use of manual wheelchair, transfers to/from bed, toilet, car, etc. Development of degenerative changes,[21] shoulder impingement,[22] nerve entrapment,[23] and even neuroarthropathy[24] are seen. Therefore, it is important to decrease the load on the upper extremities whenever possible, which include power steering, lifts for the passenger van or car, special adapted seats, and even simple equipment like a sliding board may be valuable in decreasing the load.

Conclusion

The majority of SCI individuals at least 10 years postinjury in regular follow-up have a variety of mobility aids and transportation facilities included in several combinations and seem to be individually equipped. This is important for the SCI individuals to be able to live independently and thereby attain high life satisfaction. To be able to live up to the users demand for individual optimisation of mobility aids and transportation facilities, it is also necessary to be aware of the potential costs. This study gives providers a possibility to have an impression on what may be necessary for SCI individuals at various function levels.

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