Research article

Management of bladder dysfunction and satisfaction of life after spinal cord injury in Norway

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Background: There is limited knowledge about bladder dysfunction and bladder management in persons with spinal cord injury (SCI) after discharge from the hospital in Norway. The impact of bladder dysfunction on satisfaction of life has been rarely explored.

Setting: Community-based survey from Norway.

Methods: An anonymous cross-sectional postal survey. A questionnaire was sent to the registered members of the Norwegian Spinal Cord Injuries Association. A total of 400 participants, with traumatic or non-traumatic SCI, received the questionnaire.

Results: A total of 248 subjects (62%), 180 men and 68 women, answered the questionnaire. Mean age was 54 years and mean time since injury 13.4 years. A total of 164 participants (66.1%) used intermittent catheterization for bladder emptying (48.5% women versus 72.8% men); more paraplegics than tetraplegics (77.2% versus 55.7%). Recommendations given at the Spinal Cord Units were thoroughly followed by persons who had used catheters more than 5 years. Use of incontinence pads were associated with reduced satisfaction of life.

Conclusions: The most common method of management of bladder dysfunction is clean intermittent catheterization in Norway. Recommendations were followed more thoroughly by persons who have used intermittent catheterization for more than 5 years. Spinal Cord Units are important source for information and guidance.

Keywords: Spinal cord injury, Bladder management, Neurogenic bladder dysfunction, Bladder catheterization, Life satisfaction

Introduction

Dysfunction of bladder is a potentially fatal complication after spinal cord injury (SCI). Intermittent catheterization is recommended as the standard management of bladder dysfunction.^{1–3} However, so far different catheter policies have been used without clear evidence of favorable outcome.^{4,5}

In Norway little is known about how patients with SCI manage their bladder dysfunction after discharge from hospital. Only one study has been performed in the Nordic countries regarding bladder management after discharge from primary rehabilitation.⁴ Acute rehabilitation in Norway is located in three spinal cord units (Trondheim, Oslo-Sunnaas, and Bergen), which have a unified policy for rehabilitation of patients with

SCI. Patients with SCI are closely monitored regarding bladder function during primary rehabilitation and individually recommendation regarding optimal management is proposed upon discharge. However, it is unknown whether the recommendations are followed after discharge from the hospital.

In Norway, Social Security Service covers the expenses for bladder management and therefore there are no financial incentives for patients with SCI to change the recommended catheter procedures. However, practical reasons, such as busy time-schedules and insufficient time to visit toilets, may force patients to change their pattern of learned bladder management.

The aim of this study was to examine methods of bladder management among patients with SCI after discharge from hospital. Due to lack of systematic follow-up routines in Norway, we explored the sources of knowledge of bladder management after SCI. In

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addition, we wanted to explore the impact bladder management had on satisfaction of life.

Methods

A postal survey to members of the Norwegian Spinal Cord Injuries Association was conducted in 2010. The Norwegian Spinal Cord Injuries Association includes persons with traumatic as well as non-traumatic SCI. Medical personnel, family members and persons who are interested in SCI may also join the association. There are more than 1000 members of the Norwegian Spinal Cord Injuries Association, of which four hundred are persons with spinal cord injuries.

Only persons with SCI were invited to participate in the survey. The questionnaire was anonymous. No reminders were sent to the participants.

Questionnaire

The participants were asked to record their age, sex, cause of injury (traumatic, non-traumatic, or unknown), and time since SCI. The patients were asked to report hand function (normal, reduced until, or more than 50% of function) and type of functional loss (paraplegia versus tetraplegia). Bladder emptying procedures were recorded and categorized as (i) normal or reflex voiding, (ii) using bladder tapping, (iii) abdominal pressure, (iv) clean intermittent catheterization (CIC), (v) indwelling or permanent catheters, (vi) suprapubic drainage, (vii) use of urine bags related to condom catheters and urostomy, (viii) use of incontinence pads, and (ix) voiding after Mitrofanoff uroplasty. The duration of catheterization, need for personal assistance, and number of catheters used the day before answering the survey was examined. The sources for information regarding bladder management, i.e. specialists at the Spinal Cord Unit, urologist, neurologist, general practitioner or nurse, were recorded. The patients also assessed their own satisfaction of life as "very good", "good", "pretty good", or "poor".

Statistical analysis

Data were analyzed using the SPSS for Windows version 20.0 (IBM Corp., Armonk, NY, USA). Demographic data were analyzed using one-sample *t*-test and analysis of variance. Other results from questionnaire were analyzed using the Pearson's χ^2 test or the Fisher's exact test. A *P* value of <0.05 was considered to be statistically significant.

Ethics

The study was initiated and conducted by the Norwegian Spinal Cord Injuries Association with support from Coloplast Norway. Ethical considerations were made prior to start by the Norwegian Spinal Cord Injuries Association.

Results

Responses were received from a total of 248 (62%) patients. The demographic data are presented in Table 1. Mean age of respondents was 54.9 years, ranging from 15 to 93 years.

Table 1 Demographic and injury characteristics of 248 patients with spinal cord injury

Characteristics	No. = 248 (%)	P value
Time since injury (year), mean (SD)	12.9 (8.5)	
Age at interview (year), mean (SD)		0.02*
Total	54.9 (14.3)	
Male	56.2 (14.0)	
Female	51.4 (15.2)	
Age according to level of injury (year), mean (SD)		
Paraplegia	55.4 (14.2)	
Tetraplegia	50.3 (13.4)	
Unknown	65.0 (13.0)	
Sex, <i>n</i> (%)		<0.01**
Male	180 (72.6)	
Female	68 (27.4)	
Level of injury, <i>n</i> (%)		<0.01**
Paraplegia	161 (64.9)	
Tetraplegia	70 (28.2)	
Unknown	17 (6.9)	
Cause of injury, <i>n</i> (%)		<0.01**
Traumatic	210 (84.7)	
Non traumatic	25 (10.1)	
Unknown	13 (5.2)	
Age-groups at time of interview, <i>n</i> (%)		<0.01**
10–19 years	2 (0.8)	
20–29 years	9 (3.6)	
30–39 years	23 (9.3)	
40–49 years	56 (22.6)	
50–59 years	58 (23.4)	
60–69 years	61 (24.6)	
70–79 years	28 (11.3)	
80+ years	7 (2.8)	
Unknown	4 (1.6)	
Time since injury, <i>n</i> (%)		<0.01**
0–5 years	40 (16.1)	
6–10 years	42 (16.9)	
11–15 years	40 (16.1)	
16–20 years	27 (10.9)	
21–25 years	20 (8.1)	
26–30 years	22 (8.9)	
Unknown	57 (23.0)	
Hand function, <i>n</i> (%)		<0.01**
No or little impaired hand function	165 (66.5)	
< 50% impairment in both hands	21 (8.5)	
> 50% impairment in both hands	56 (22.6)	
Unknown	6 (2.4)	
Clean Intermittent catheterization, <i>n</i> (%)		<0.01**
Yes	164 (66.1)	
No	84 (33.9)	
Patient's assessment of their own health, <i>n</i> (%)		<0.01**
Very good	50 (20.2)	
Good	108 (43.5)	
Pretty good	73 (29.4)	
Bad	11 (4.4)	
Unknown	6 (2.4)	

*Analysis of variance (ANOVA).

**One-sample *t*-test.

Table 2 Information regarding bladder emptying among 248 persons with spinal cord injuries according to sex, level of injury, cause of injury and time since injury

Methods for bladder emptying*	Male (no. = 180)	Female (no. = 68)	P value	Tetraplegic (no. = 70)	Paraplegic (no. = 161)	P value	Traumatic (no. = 210)	Non-traumatic (no. = 25)	P value**
Normal control of bladder emptying	3 (1.7%)	4 (5.9%)	0.07	1 (1.4%)	3 (1.9%)	<0.01	4 (1.9%)	1 (4.0%)	0.02
Bladder tapping	24 (13.3%)	3 (4.4%)	0.05	13 (18.6%)	13 (8.1%)	0.05	23 (11.0%)	1 (4.0%)	0.20
Abdominal pressure	22 (12.2%)	9 (13.2%)	0.83	10 (14.3%)	18 (11.2%)	0.65	26 (12.4%)	3 (12.0%)	0.95
Intermittent catheterization	131 (72.8%)	33 (48.5%)	<0.01	39 (55.7%)	117 (72.2%)	0.01	148 (70.5%)	13 (52.0%)	<0.01
Permanent catheter	7 (3.9%)	3 (4.4%)	0.85	1 (1.4%)	9 (5.6%)	0.23	9 (4.3%)	1 (4.0%)	0.75
Supra pubic catheter	13 (7.2%)	8 (11.8%)	0.25	14 (20.0%)	7 (4.3%)	<0.01	15 (7.1%)	6 (24.0%)	0.01
Mitrofanoff uroplasty	3 (1.7%)	5 (7.4%)	0.02	3 (4.3%)	5 (3.1%)	0.66	7 (3.3%)	0 (0.0%)	0.43
Use of urine bags related to condom catheter and urostomy	62 (34.4%)	2 (2.9%)	<0.01	26 (37.1%)	37 (23.0%)	0.12	58 (27.6%)	5 (20.0%)	0.22
Incontinence pads	15 (8.3%)	24 (35.3%)	<0.01	7 (10.0%)	29 (18.0%)	0.30	30 (14.3%)	7 (28.0%)	0.21
Methods for bladder emptying*	0–5 years (no. = 47)	6–10 years (no. = 42)		11–15 years (no. = 40)	16–20 years (no. = 27)		21–25 years (no. = 20)	26–30 years (no. = 22)	P value**
Normal control of bladder emptying	6 (12.8%)	7 (16.7%)		5 (12.5%)	3 (11.1%)		0 (0.0%)	0 (0.0%)	0.22
Bladder tapping	4 (8.5%)	3 (7.1%)		1 (2.5%)	4 (14.8%)		5 (25.0%)	2 (9.1%)	0.11
Abdominal pressure	5 (10.6%)	3 (7.1%)		4 (10.0%)	1 (3.7%)		4 (20.0%)	4 (18.2%)	0.40
Intermittent catheterization	21 (44.7%)	10 (23.8%)		12 (30.0%)	8 (29.6%)		9 (45.0%)	7 (31.8%)	0.31
Permanent catheter	1 (2.1%)	4 (9.5%)		2 (5.0%)	1 (3.7%)		0 (0.0%)	0 (0.0%)	0.35
Supra pubic catheter	12 (25.5%)	4 (9.5%)		1 (2.5%)	2 (7.4%)		0 (0.0%)	1 (4.5%)	<0.01
Mitrofanoff uroplasty	2 (4.3%)	1 (2.4%)		0 (0.0%)	3 (11.1%)		0 (0.0%)	0 (0.0%)	0.12
Use of urine bags related to condom catheter and urostomy	8 (17.0%)	11 (26.2%)		15 (37.5%)	5 (18.5%)		8 (40.0%)	2 (9.1%)	0.05
Incontinence pads	7 (14.9%)	8 (19.0%)		4 (10.0%)	5 (18.5%)		4 (20.0%)	4 (18.2%)	0.87

*Many patients used more than one method for bladder emptying.

**Pearson's χ^2 test.

Statistically significant P-values in bold.

Methods for bladder emptying were analyzed according to sex, level of injury, and cause of injury (Table 2). A total of 164 participants used CIC for bladder emptying at the time of the survey. Significantly more men, patients with paraplegia and traumatic SCI used CIC (Table 2). Seven respondents reported normal present bladder emptying. Eight people (five women and three men) had Mitrofanoff uroplasty. A total of 20 respondents needed help from other persons to empty their bladder; 14 were patients with tetraplegia, all due to a traumatic SCI. There were no statistical differences with regard to sex, age, and time since injury. Incontinence pads were used significantly more frequently by women, while urine bags were used more frequently by men (Table 2).

Table 3 shows both the mean number of catheters used the previous day among persons using CIC ($n = 145$) and the mean number of catheters they had been recommended to use. There were no statistical differences with regard to sex, level of injury, age, and time since injury. Fig. 1 shows mean number of catheters used the day before survey according to time since injury. There is a trend of stronger adherence to the recommendations with increasing time since injury; however, this trend is not statistically significant.

Table 4 explores the reasons for using CIC and why the participants did not follow the recommendations for catheterizations, according to sex and level of injury. There were no statistical differences with regard to age and time since injury.

For most respondents, the specialist in the spinal cord unit, followed by general practitioners and specialists in urology were the source of the current recommendations of bladder management (Table 5). Persons with tetraplegia were more often informed by the specialist at the Spinal Cord Unit compared to persons with paraplegia (Table 5).

Table 6 explores the relationship between methods for bladder management and satisfaction with life ($n =$

Figure 1 Mean number of catheters used the day before survey according to time since injury.

242). The use of different bladder emptying methods did not influence the respondents' perception of satisfaction with life, with the exception of the seven people who reported normal bladder function, but scored low on satisfaction with life.

Discussion

This study shows that CIC is the most common bladder emptying method in Norway after SCI. This method is recommended as the first choice, in line with other countries for all types of bladder dysfunction after SCI.^{1,3-8} The mortality due to complications in the urinary system is low in Norway in contrast to other countries.^{9,10}

Intermittent catheterization was mostly used by persons with paraplegia, and supra pubic catheter by persons with tetraplegia. Supra pubic catheter was more frequently used by persons who have been injured for less than five years, probably reflecting change of practice among urologists.

Table 3 Numbers of catheters used for clean intermittent catheterization among spinal cord injured persons according to sex and level of injury

	No. catheters used yesterday (no. = 145*)	Recommended no. of catheters (no. = 55**)
Sex		
Male	5.0	5.0
Female	5.4	5.8
Level of injury		
Paraplegia	5.3	5.1
Tetraplegia	4.5	5.1

No statistical differences were found (Pearson's χ^2 test).

*Only 145 reported number of catheters used the previous day.

**Only 55 reported the recommended number of catheters.

Table 4 Information about the use of clean intermittent catheters among spinal cord injured persons*

	No.	%	Sex [†] P value [‡] (No. = 248)	No.	%	Level of injury [§] P value [‡] (No. = 231)
<i>The main reason why I use other methods to empty my bladder than disposable catheter is because</i>						
It gives me flexibility with more options	51	20.6	0.73	47	20.3	<0.01 [¶]
It enables me to use fewer catheters per day	12	4.8	0.04**	12	5.2	0.52
It doesn't constrain my daily activities	34	13.7	0.54	30	13.0	<0.01 [¶]
It's less time consuming	25	10.1	1.00	24	10.4	<0.01 [¶]
I follow the recommendations I received from the doctor/nurse	38	15.3	0.20	33	14.3	0.23
It suits me best	58	23.4	0.06	53	22.9	0.01[¶]
It makes me feel safe	34	13.7	0.04**	32	13.9	0.21
<i>I have increased the number of catheterizations because</i>						
I have got more experience	90	36.3	1.00	82	35.5	0.07
My health care provider recommended me to increase the frequency per day	81	32.7	0.65	75	32.5	0.36
I had previously recurrent urinary tract infections	85	34.3	0.88	79	34.2	0.07
The current catheters are easier to use	76	30.6	0.12	68	29.4	0.12
I understand the importance of emptying my bladder frequently	89	35.9	0.66	81	35.1	0.23
Recommendations from others spinal cord injured	64	25.8	0.42	60	26.0	0.01[¶]
<i>I have reduced the number of catheterizations because</i>						
I feel I need to empty my bladder less frequently per day	103	41.5	0.67	97	42.0	0.03[¶]
I use other methods to empty my bladder	77	31.0	0.65	71	30.7	0.01[¶]
I don't remember to empty my bladder as often as recommended	73	29.4	0.54	68	29.4	0.06
It doesn't fit into my daily routine	84	33.9	0.55	79	34.2	0.01[¶]
I follow the advice I have received from healthcare providers	93	37.5	0.19	85	36.8	0.01[¶]
It's too many transfers from wheelchair to toilet	63	25.4	0.25	59	25.5	0.01[¶]
Recommendations from others spinal cord injured	64	25.8	0.42	60	26.0	0.01[¶]
The health care provider don't have time to do it as often as recommended	61	24.6	0.32	57	24.7	0.01[¶]
The lack enough information from healthcare providers	63	25.4	0.41	59	25.5	0.01[¶]

There was no significance between answers and time since injury.

*The patients could choose multiple answers to each question.

[†]Men versus women.

[‡]Pearson's χ^2 test (2-sided).

[§]Tetraplegics versus paraplegics.

[¶]More tetraplegic than paraplegic.

**More men than women.

Statistically significant P-values in bold.

While men used intermittent catheterization and urine bags related to condom catheter and urostomy, more women used Mitrofanoff uroplasty or incontinence pads. There was a trend of increasing use of Mitrofanoff uroplasty in order for the women to become more independent in daily life. There was no correlation, however, between the use of Mitrofanoff uroplasty and time since injury. In Norway, the

recommended catheterization frequency is between three and eight times per day. This study shows that the recommendations are followed by the majority of patients, also after discharge from the hospital. There was a trend of a stronger adherence to the recommendations with increasing time since injury. This might be due to experience of urological complications, especially urinary tract infections after patients had

Table 5 Sources of current bladder management recommendations among patients with spinal cord injuries (n = 159)

	Women (n = 37)	Men (n = 121)	Paraplegia (n = 112)	Tetraplegia (n = 38)
GP	11 (29.7%)	39 (32.2%)	38 (33.9%)	9 (23.7%)
Specialist at Spinal Cord Unit	17 (45.9%)	51 (42.1%)	48 (42.9%)	20 (52.6%)
Urologist	9 (24.3%)	24 (19.8%)	21 (18.8%)	7 (18.4%)
Nurse	–	4 (3.3%)	2 (1.8%)	2 (5.3%)
Neurologist	–	1 (0.8%)	1 (0.9%)	–
Nurse – Urotherapist	–	2 (1.7%)	2 (1.8%)	–

Table 6 Relationship between methods of bladder management and satisfaction with life* (no. = 242)**

	Very good (%)	Good (%)	Pretty good (%)	Poor (%)	P value
Normal control (no. = 7)	28.6	14.3	42.9	14.3	0.31
Bladder tapping (no. = 26)	23.1	53.8	19.2	3.8	0.60
Abdominal pressure (no. = 30)	26.7	46.7	23.3	3.3	0.74
Clean intermittent catheterization (no. = 161)	19.9	45.3	31.1	3.7	0.79
Permanent catheter (no. = 10)	20.0	50.0	30.0	0.0	0.91
Suprapubic catheter (no. = 21)	9.5	47.6	38.1	4.8	0.59
Mitrofanoff uroplasty (no. = 8)	25.0	37.5	37.5	0.0	0.87
Condom catheter and urine bags (no. = 63)	25.4	44.4	28.6	1.6	0.45
Incontinence pads (no. = 38)	13.2	50.0	31.6	5.3	0.66

*The patients could choose more than one method of bladder management.

**Six patients did not rate their quality of life.

reduced or changed the recommended frequency of catheterization. After some time with fewer CIC, persons with SCI return to the recommended frequency. Previous studies have shown the superiority of CIC in order to prevent urinary tract infections.^{11–13} Previous studies have shown that bladder dysfunction is closely related to quality of life as well as depression after SCI.^{14–17} Our data show that different bladder emptying methods does not influence self-reported satisfaction with life. Thus, optimal individual management is more important than choice of catheterization versus other methods in general, as previously stated by Pannek and Kullik.¹⁸ Seven patients reported having normal control of bladder, although scoring low on satisfaction with life. This group consisted of four women and three men, mean age 63.4 years (35–94 years). Three had paraplegia, one had tetraplegia, and the level of injury of the remaining three is unknown. Possible confounding factors like age and other chronic diseases may have contributed to the low score on quality of life.

A study by Sanchez *et al.*¹⁹ indicated that use of condom catheters in men was connected to better quality of life. We did not observe such a connection. However, our data indicate that use of incontinence pads may correlate to reduced satisfaction of life in both sexes. A previous study showed the intermittent catheterization had the best long-term outcome among female patients with spinal cord injury.²⁰

The main source of information regarding management of bladder dysfunction after discharge from hospital was the specialist at a Spinal Cord Unit. The second source of knowledge was a general practitioner. General practitioners are always geographically the closest physicians in Norway. For many patients, there is a long distances between their home and the Spinal Cord Unit. The GP will usually be the one that follows them closely after returning home from primary rehabilitation. The results also indicate that persons with SCI expect

that GPs have sufficient knowledge about optimal management of neurogenic bladder dysfunction.

We do not know whether it makes a difference from whom the patients get their recommendations. Under-recognition of chronic kidney disease by primary care physicians has been suggested as an important cause of late or absent nephrology referral.²¹ A previous study from Norway found that patients with incomplete SCI were least satisfied probably because their physicians do not acknowledge their complicated medical complaints and do not meet the patient's expectations.²²

This survey was, however, not powered to answer whether it makes a difference from where the patients get their information, and there is a lack of published studies on this topic.

Limitations

Since the study was anonymous, and the information is based on the self-report only, it was impossible to post reminders. Anonymity, however, allowed the respondents to be honest in their answers and contributed to a realistic overview of bladder management in persons with spinal cord injury after discharge from hospital in Norway. Anonymous approaches have previously been recommended when investigating the suitability of medical interventions.²³

The response rate of 62% was good with regard to the how this study was carried out. The age of the respondents was similar to previous demographic reports of spinal cord population in Norway,²⁴ with a slightly higher percentage of women and lower percentage of tetraplegics.

Thus, we cannot claim that the respondents are completely representative for the Norwegian population with SCI.

The data were provided by the Norwegian Spinal Cord Injuries Association and did not cover information regarding pharmacological treatment or intravesical botulinum toxin which the patients may use concurrently.

The satisfaction with life tool used in this study is not bladder specific, and the ratings mirror other factors which influence individual satisfaction with life.

Conclusions

CIC is the most common method of management of bladder dysfunction among persons with SCI in Norway. Most patients follow the recommendation to use between three and eight catheters daily, especially persons who have used catheters more than 5 years. Incontinence pads contribute to reduced satisfaction of life and should be avoided. Spinal Cord Units are an important source for information and guidance.

Acknowledgements

We thank Coloplast Norway and the Norwegian Spinal Cord Injuries Association for initiation and conduction of the study, i.e. information about the study as well as distribution and collection of questionnaires.

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