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Original Article

Bowel management in patients with spinal cord injury – a multicentre study of the German speaking society of paraplegia (DMGP)

U Haas[1,3], V Geng[1,3], GCM Evers[2,*] and H Knecht*[,1]

[1]*Department in Nursing Science, Institute for Clinical Research, Swiss Paraplegic Center, Nottwil, Switzerland;*
[2]*Clinical Nursing Research, Institute of Nursing Science, Private University, Witten/Herdecke, Germany*

Study design: A descriptive, cross-sectional, multicentre design was used.
Objective: To analyse bowel management in patients with spinal cord injury (SCI) especially the occurrence of unplanned bowel evacuations and duration of planned bowel evacuation.
Setting: In total, 29 rehabilitation facilities for SCI patients in Austria, Germany, the Netherlands and Switzerland, with a total of 837 hospitalized SCI patients.
Method: Data were collected by nurses within 1 week in November 2001 using a quantitative questionnaire containing 14 questions. For data analysis, a χ^2-test was used for differences in the outcome of bowel evacuation procedures associated with different interventions. Stepwise multiple logistic regression was used to analyse the relationship between the outcome of bowel management and the interventions as well as intervening factors.
Results: More unplanned bowel evacuations were associated with usage of oral laxatives ($n=444$, $P<0.001$) as well as bowel evacuation every day ($n=270$, $P<0.05$) or every second day ($n=368$, $P<0.05$). The outcome of less unplanned bowel evacuations was associated with manual removal of stool combined with digital stimulation ($n=35$, $P<0.05$) and spontaneous bowel evacuations ($n=104$, $P<0.001$). Short duration of bowel evacuation (<60 min) was associated with manual removal of stool ($n=64$, $P<0.05$), the sitting position at defecation ($n=494$, $P<0.001$) and low frequency of bowel evacuation ($\geqslant 3$ days) ($n=638$, $P<0.05$). Duration >60 min was associated with the use of oral laxatives ($n=444$, $P<0.001$) and complete loss of sensory function ($n=349$, $P<0.05$). Stool of hard consistency was associated with the manual removal of stool ($n=64$, $P<0.001$), the manual removal of stool in combination with digital stimulation ($n=53$, $P<0.001$) and the sitting position at defecation ($n=494$, $P<0.05$). Stool of soft consistency ($n=341$) was associated with the complete motor lesion ($n=443$, $P<0.05$).
Conclusion: Manual removal of stool was combined with low risk of unplanned bowel evacuations and short duration of evacuation time. These results are useful to improve the outcomes of bowel management in SCI patients.
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Keywords: spinal cord injury; bowel management; manual removal of stool; unplanned bowel evacuation; nursing interventions

Introduction

Spinal cord injury (SCI) has functional impacts on multiple organs and in particular on bowel movements.[1] The neurological lesion interfering with the cortical interrelationships and the postulated pontine defecation centre causes a dysfunction of peristaltic movement and defecation.[2] Clinically relevant signs and symptoms as well as complications reported in the literature are prolonged colonic transit time,[2–4] faecal impaction,[2,5–7] abdominal distension,[2,8,9] colonic dilatation,[2,8,9] and megacolon.[10]

Concerning everyday life, patients with SCI suffer from partial or complete loss of ability to consciously feel stool in the rectum or to initiate or delay defecation.[2,11,12] They do not feel a normal desire to defecate.[13] As a result there is a high prevalence of faecal incontinence[8,13–15] or constipation.[15–17] Patients report

*Correspondence: H Knecht, Department in Nursing Science, Institute for Clinical Research, Swiss Paraplegic Center, CH-6207 Nottwil, Switzerland
[3]These authors contributed equally to this work
*Deceased

difficulties with bowel evacuation,[18,19] a prolonged bowel management time,[8,14,15,18,19] a reduced frequency of bowel evacuation,[6,8,17,20] and stool of hard consistency.[8]

Special interventions are needed to care for an adequate bowel evacuation.[8,15] In rehabilitation centres, nurses care for the bowel management of patients with SCI and initiate a bowel management program.[21] The aim of such programs is to eliminate faecal incontinence or other complications[3,19] and to evacuate stool at a regular, predictable time[14,19] within 60 min.[7] The interventions include the manual removal of stool[11,15,17,19,22] for patients with an areflexic bowel as well as techniques like digital stimulation[11,15,22] and suppositories[11,15,22] for patients with a reflexic bowel to initiate reflex peristalsis,[14] frequency,[14] timing of bowel evacuation,[11,22] and the usage of oral laxatives.[9,11,14,15,18,22]

Objective

The objectives of this study were to uncover associations between the outcome of bowel evacuation procedures and interventions used for bowel management programs. The outcome of the bowel evacuation was defined by the incidence of unplanned bowel evacuations within the last 4 weeks, the duration of the bowel evacuation procedure and the amount and consistency of stool.

Methods

The study design is descriptive, cross-sectional and multicentre. It was conducted in 29 rehabilitation centres in Austria, Germany, the Netherlands and Switzerland. The sample consisted of 837 patients with SCI. The response rate was 89.6%. In-patients with SCI or myelomeningocele were included in the study. Patients in the stage of spinal shock as well as patients suffering from diseases of the bowel were excluded.

Data collection took place over a week in November 2001 using a quantitative questionnaire comprising 14 questions (Appendix A). The questionnaire was completed by nurses. The nurses used patient records for information about patient characteristics and interventions for bowel management program and observed the outcome of bowel evacuation at one point of time within the data collection period. The inter-rater reliability of the questionnaire was 96%. It was tested by rating 24 patients by two different nurses independently and at the same bowel management procedure. The agreement between the two ratings was estimated using the Kappa coefficient.[23] Ethical approval for the study was given by the local ethical committee of each country. Informed consent was obtained from each patient after he/she was informed about the purpose of the study, the procedure and the confidentiality of the information given.

For data analysis the χ^2 test was used for differences in the outcome of bowel evacuation procedures associated with different interventions and patient characteristics. Stepwise multiple logistic regression was used to assess the likelihood of unplanned evacuations, the duration of the bowel evacuation for more than 60 min and a small amount of stool of hard consistency.[24] The dependent variables were used dichotomous. Patient characteristics (age, sex, cause and localization of injury, sensory and motor functions) and interventions (techniques of bowel evacuation, position at defecation, regulation of frequency and timing of bowel evacuation and oral laxatives) were included in the regression as predictive variables. Some of these variables were dichotomous (sex, sensory and motor functions, techniques of bowel evacuation, the use of oral laxatives and the position at defecation), others were used categoreal (regulation of timing and frequency of bowel evacuation, age, cause and localization of injury). The dependent variables included in the multiple logistic regression are presented in Table 3, the predictor variables in Table 1 (patient characteristics) and Table 2 (interventions). The outcome of bowel evacuation was adjusted for the patient characteristics. Regression results are expressed as odd ratios and approximate 95% confidence intervals (Table 3).

Results

Unplanned bowel evacuations

The stepwise multiple logistic regression was performed on 594 patients. The outcome variable was unplanned

Table 1 Patient characteristics

Characteristics	n	*%*	*Total*
Age			
12–29 years	150	17.9	$n=835$
30–49 years	342	41.0	
50–69 years	272	32.6	
70–89 years	71	8.5	
Sex			
Male	642	77.5	$n=828$
Female	186	22.5	
Cause of injury			
Traumatic	605	76.7	$n=789$
Medical	163	20.7	
Congenital	21	2.7	
Localisation of the lesion			
Cervical	334	42.0	$n=795$
Thoracic	360	45.3	
Lumbar	101	12.7	
Sensory function			
Complete	349	46.8	$n=745$
Incomplete	396	53.2	
Motor function			
Complete	443	59.5	$n=745$
Incomplete	302	40.5	

Table 2 Interventions for bowel management

Interventions	n	*%*	*95% CI*[a] *total*
Techniques			
Suppositories	201	24.0	21–26
Spontaneous bowel evacuation	104	12.4	9–14
Suppositories plus digital stimulation plus manual removal of stool	98	11.7	8–13
Suppositories plus digital stimulation	65	7.8	5–8
Manual removal of stool	64	7.6	5–8
Suppositories plus manual removal of stool	55	6.6	3–7
Enemas	48	5.7	4–6
Digital stimulation plus manual removal of stool	35	4.2	2–5
Regulation of frequency			
One or more evacuation/day	270	32.4	$n=833$
Every second day	368	44.2	
Every third day, once or twice a week	125	15.0	
Irregular	70	8.4	
Regulation of timing			
Morning, midday	516	62.6	$n=824$
Evening	189	22.9	
Irregular	119	14.4	
Application of oral laxatives			
Application	444	55.1	$n=806$
No application	362	44.9	
Agents of the used oral laxatives in groups			
Peristaltic stimulants	186	42.3	$n=440$
Osmotic laxatives	168	38.2	
Bulk forming agents (swelling agents or fibres)	32	7.3	
Stool softeners (lubricants)	29	6.6	
Others	25	5.7	

[a]Confidence interval. Interventions for bowel management program (techniques of bowel evacuation, regulation of frequency and timing of defecation and the application of oral laxatives). Oral laxatives, which were consumed by the patients of the sample, were specified for the agents

Table 3 Outcome of bowel management

Outcome of bowel evacuation	n	*%*	*Total*
Unplanned bowel evacuations			
Planned	404	50.8	$n=798$
Unplanned	392	49.2	
Duration of bowel evacuation			
<60 min	664	81.2	$n=818$
>60 min	154	18.8	
Amount of stool			
Small	104	13.0	$n=803$
Medium	515	64.1	
Large	184	22.9	
Consistency of stool			
Soft	443	56.5	$n=784$
Hart	341	43.5	

bowel evacuations and patient characteristics as well as interventions were included as predictors. Four predictor variables were significantly related to the likelihood of having unplanned evacuations: The spontaneous bowel evacuation ($P<0.001$), the manual removal of stool in combination with digital stimulation ($P<0.05$), the use of oral laxatives ($P<0.001$) and frequency of bowel evacuation ($P<0.05$). Patients with spontaneous bowel evacuation and manual removal of stool in combination with digital stimulation were about 70% less likely to suffer from unplanned bowel evacuations than patients who did not use these interventions. Patients who used oral laxatives were 1.8 times more likely to experience unplanned bowel evacuations compared to those who did not use oral laxatives. Patients who evacuated their bowel daily ($P<0.05$) or every second day ($P<0.05$) were two to three times more likely to have unplanned bowel evacuations, compared to patients with an irregular frequency as a result of some control of their bowel. In total, 71% of the patients who had unplanned bowel evacuations were classified correctly by the model. The percentage of the patients who had no unplanned bowel evacuations and who were classified correctly was 52. The overall rate of correct classification was 61% (Table 4).

Table 4 Multiple logistic regression: unplanned bowel evacuations

Variables	*Coefficient*	*Odd ratios*	*95% CI*[a]
Spontaneous bowel evacuation	−1.156	0.315	0.173–0.572
Digital stimulation plus manual removal of stool	−1.214	0.297	0.119–0.739
Frequency of bowel evacuation			
Daily	1.165	3.207	1.540–6.680
Every second day	0.867	2.379	1.158–4.889
Use of oral laxatives	0.639	1.895	1.336–2.688

[a]Confidence interval. Predictor variables included in the regression: patient characteristics: age, sex, cause and localization of injury, sensory and motor function. Interventions: techniques, position at defecation, regulation of frequency and timing, oral laxatives. Outcome: frequency of unplanned bowel evacuations, duration of bowel evacuation, amount and consistency of stool

Table 5 Multiple logistic regression: duration of bowel management

Variables	*Coefficient*	*Odd ratios*	*95% CI*[a]
Manual removal of stool	−2.766	0.063	0.008–0.481
Frequency of bowel evacuation			
Daily	−1.210	0.298	0.114–0.780
Every second day	−0.933	0.393	0.165–0.939
Use of oral laxatives	0.721	2.057	1.249–3.387
Sitting position at defecation	−1.132	0.323	0.204–0.509
Complete lesion in terms of sensory function	0.647	1.909	1.197–3.045

[a]Confidence interval. Predictor variables included in the regression: patient characteristics: age, sex, cause and localization of injury, sensory and motor function. Interventions: techniques, position at defecation, regulation of frequency and timing, oral laxatives. Outcome: frequency of unplanned bowel evacuations, duration of bowel evacuation, amount and consistency of stool

Duration of bowel management

The stepwise multiple logistic regression analysis was performed on 605 patients. The outcome variable was the duration of bowel evacuation, and patient characteristics as well as interventions were included as predictors. Five predictor variables were significantly related to the duration of the bowel evacuation procedure: the manual removal of stool ($P<0.05$), the frequency of bowel evacuation ($P<0.05$), the use of oral laxatives ($P=0.005$), the position of the body during bowel evacuation ($P<0.001$) and the loss of sensory function ($P<0.05$). Patients who performed their bowel evacuation using the manual removal of stool were 40% less likely to need more than 60 min than those who did not use this intervention. Patients who evacuated their bowel every day or every second day were 60–70% less likely to need more than 60 min compared to patients who evacuated their bowel irregularly. Patients who used oral laxatives were twice as likely to need more than 60 min, than those who did not use oral laxatives. Patients who performed their bowel evacuation in a sitting position were 70% less likely to need more than 60 min compared to patients lying while evacuating their bowel. Patients with a complete sensory lesion were 1.9 times more likely to need more than 60 min for bowel evacuation compared to patients with an incomplete sensory lesion. In total, 97% of patients who needed less than 60 min for bowel evacuation procedure were classified correctly by the model. The percentage of the patients who needed more than 60 min and who were classified correctly was 9. The overall rate of correct classification was 80% (Table 5).

Amount of stool

There was no significant regression model for the independent variables, which were related to a small amount of stool.

Consistency of stool

The stepwise multiple logistic regression was performed on 582 patients. The outcome variable was the consistency of stool, and patient characteristics as well as interventions were included as predictors. Four predictor variables were significantly related to the likelihood of a hard stool: The manual removal of stool ($P<0.001$), the manual removal of stool in combination with digital stimulation ($P<0.001$), the position of the body during bowel evacuation ($P=0.05$) and the

Table 6 Multiple logistic regression: consistency of stool

Variables	*Coefficient*	*Odd ratios*	*95% CI*
Manual removal of stool	1.716	5.565	2.654–11.668
Digital stimulation plus manual removal of stool	1.8634	6.441	2.327–17.827
Sitting position at defecation	0.371	1.449	1.006–2.086
Complete lesion in term of motor function	0.365	0.694	0.487–0.990

[a]Confidence interval. Predictor variables included in the regression: patient characteristics: age, sex, cause and localization of injury, sensory and motor function. Interventions: techniques, position at defecation, regulation of frequency and timing, oral laxatives. Outcome: frequency of unplanned bowel evacuations, duration of bowel evacuation, amount and consistency of stool

complete motor lesion ($P=0.05$). Patients who used manual removal of stool were 5.5 times more likely to have stool of hard consistency compared to patients who did not use this technique. Patients performing bowel evacuation with manual removal of stool in combination with digital stimulation were 6.4 times more likely to experience hard stool. Patients who evacuated their bowel in a sitting position were 1.4 times more likely to have stool of hard consistency compared to patients lying while evacuating their bowel. Patients with a complete motor lesion were 30% less likely to experience hard stool than those with an incomplete motor lesion. In total, 95% of the patients who experienced soft stool are classified correctly by the model, but only 20% of the patients with stool of hard consistency were classified correctly. The overall rate of correct classification was 62% (Table 6).

The main results of the study show a reduced incidence of unplanned bowel evacuation associated with manual removal of stool in combination with digital stimulation and spontaneous bowel evacuation procedure. An increased occurrence of unplanned bowel evacuations was associated with the use of oral laxatives. A short duration of bowel evacuation (<60 min) was related to manual removal of stool and a long duration (>60 min) with the use of oral laxatives and completeness of sensory function. Stool of hard consistency was associated with manual removal of stool also in combination with digital stimulation and with the sitting position.

Discussion

The objectives of this study were to uncover associations between the outcome of bowel evacuation procedures, interventions used for bowel management programs and patient characteristics. The results of this study showed that there are associations between the outcome of bowel evacuation and manual removal of stool, oral laxatives and spontaneous bowel evacuation procedures. Manual removal of stool is associated with few unplanned bowel evacuations, short duration of bowel evacuation (<60 min) and stool of hard consistency. Unplanned bowel evacuations were identified as a major problem of patients with SCI and have been rated as serious as the inability to walk or loss of sexual function.[15] The application of manual removal of stool is recommended for patients with lower motor neuron lesion and an areflexic bowel.[25] This technique is also described as dangerous and a bad habit with a potential to damage the anal sphincter and the anorectal tissue.[8] To our knowledge, no evidence for this assumption is presented in the international literature. Our results suggest that manual removal of stool in combination with digital stimulation enables the bowel to be emptied more complete than other techniques. Manual removal was associated with stool hard consistency. This is in line with our daily experience that stool of hard consistency is much easier to remove. This advantage may result in significantly fewer unplanned bowel evacuations. Although our questionnaire did not answer the question whether upper or lower motor neuron lesion did influence the frequency of unplanned bowel evacuations, we would like to emphasize that 87.3% of our patients had a cervical or thoracic lesion of the spinal cord usually not associated with an areflexic bowel.

Manual removal of stool was also identified as a factor influencing evacuation time favourably. Glickman and Kamm[15] found that the length of time taken for the whole defecation procedure in patients with SCI was significantly associated with anxiety and depression. The time spent using the toilet is significantly higher for patients with SCI than for controls.[26]

Oral laxatives are associated with a prolonged duration of bowel evacuation procedures and a frequent occurrence of unplanned bowel evacuation. This finding refers to stimulant agents rather than to osmotic agents. The influence of oral laxatives on increased duration of bowel management procedure was already identified in other studies.[16,22] Their regular use leads also to more difficulties in bowel evacuation[9] and to an increased consumption over the course of time.[26] The high incidence of unplanned bowel evacuation and the prolonged duration of bowel evacuation might be due to the softer consistency of the stool, which seems to lower the reflex activity and make it harder to empty the rectum.

This study also shows that patients with spontaneous bowel evacuations, who are able to control their bowel to some extent, are not suffering from unplanned bowel evacuation. They evacuate their bowel at irregular

frequency according to the desire to defecate. Patients with spontaneous bowel evacuations were also described in other studies, where 55% of the SCI patients evacuated their bowel almost normally,[27] 19% reported a normal desire to defecate[13] and 42% were able to identify a beginning defecation.[7] It is not clear from our results if the desire to defecate is physiological or an altered sensation as a result of the SCI. However, it can be assumed that bowel function has improved in the course of time and that the patients have learned to cope with bowel dysfunctions.

Conclusion

In SCI, gastrointestinal problems have an adverse impact on the activities of daily living[18,22] and cause restrictions on social activities.[7,13] The results of this study are beneficial for caregivers and enable SCI patients to cope better with these problems in daily life. The findings show that the manual removal of stool is a technique, which is associated with positive outcomes of bowel evacuation in terms of a short duration of bowel evacuation procedure and reduced incidence of unplanned bowel evacuations. Therefore, it can be assumed that the use of this technique might result in more adequate outcomes of bowel evacuation, which allow a more independent lifestyle. The findings of the study also show that the use of oral laxatives is associated with the increased incidence of unplanned bowel evacuation and the duration of bowel evacuation for more than 60 min. It seems therefore useful to carefully prove the necessity of laxatives for their use may lead to inadequate outcomes of bowel evacuation. Finally, the findings of the study also show that spontaneous bowel evacuation is associated with few unplanned bowel evacuations. Therefore, patients may be trained to pay attention to an upcoming desire to empty their bowel and to initiate bowel evacuation accordingly to this sensation.

Direct benefit for individual patients from these results might be greater when the exact level of injury and differentiation between lower and upper motor injury lesions is taken in account. The discrimination between lower and upper motor neuron lesion should be addressed in further studies. Prevention of unplanned bowel evacuation and reduction of duration of bowel evacuation would increase quality of life for patients with SCI.

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Appendix A

Questionnaire

Patient characteristics	
Age	12–29/30–49/50–69/70–89 years
Sex	Male/female
Cause of injury	Traumatic/medical/congenital
Localization of the lesion	Cervical/thoracal/lumbar
Sensory function	Complete/incomplete
Motor function	Complete/incomplete
Interventions	
Techniques	Suppositories/enemas/digital stimulation Manual removal of stool/spontaneous bowel evacuation Others
Position at defecation	Sitting/lying
Regulation of frequency	Daily/every second day/every third day/others
Regulation of timing	Morning/evening/others
Application of oral laxatives	Agent and dosage
Application of rectal laxatives	Agent and dosage
Outcome	
Frequency of unplanned bowel evacuations	During the last 4 weeks
Duration of bowel evacuation	<30 min/30–60 min/60–120 min/>120 min
Amount of stool	Small/medium/large
Consistency of stool	Very hard/formed/soft/watery