

Adherence to the Clean Intermittent Catheterization Following a Customized Intensive Education Program for Patients with Emptying Failure

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Purpose: The purpose of this study is to investigate adherence to the clean intermittent catheterization (CIC) and influencing factors on the adherence following a customized intensive education program (CIEP). **Methods:** This work is a retrospective descriptive study. The subjects were 226 emptying failure patients who learned in a CIEP from January 2012 to July 2014. The program developed in 2011 and consisted of 1) customized theoretical education; based on the results of urologic tests, underlying disease, or surgery of the patients, 2) hands-on practice until the trainees were able to master the techniques, 3) questions about the process of catheterization and what he/she needs to know. 4) at follow-up, the survey about adherence and barrier to CIC. Clinical characteristics; the level of satisfaction, understanding, and self-confidence; the barrier in medical records were reviewed. **Results:** The short-term adherence rate (median 22 days) is 87.6% and the long-term adherence rate (median 112 days) is 50.4%. The biggest obstacle is time management. The levels of satisfaction, understanding, and self-confidence are very high. The variable of Income is the only factor that has influence on adherence. **Conclusion:** Despite the CIEP, the adherence rate is relatively low. In addition to the education, emotional and psychological supports and regular follow-up are needed to improve long-term adherence.

Key Words: Intermittent urethral catheterization; Education; Patient compliance

INTRODUCTION

A complex mechanism of the bladder, urethra, and nervous system is involved in the storage of urine and micturition [1]. Therefore, incomplete bladder emptying can result from a wide variety of neurological and urological disorders [2,3]. In the event of bladder emptying failure, catheterization, bladder expression, reflex voiding, and clean intermittent catheterization (CIC) can be utilized to eliminate urine [4]. Among them, it is known that CIC introduced by Lapides et al. [5] is the gold standard treatment due to a markedly lower incidence of complications such as urinary tract infections and kidney damage compared to all the other treatments [6-8]. Moreover, CIC is known to be so easy that anyone can perform [9].

However, in spite of benefits, the adherence rate isn't high, variously reported from 20~81% [10-13]. Hence, many studies have been conducted to improve adherence. Some researchers tried to make use of a new catheter, but neither a compact catheter to reduce the burden of carrying nor a lubricated catheter to reduce pain made any differences in the compliance [14,15]. Other researchers recommended educational contents and teaching methods [16-20]. Some of them argued that CIC instructor should evaluate patients' conditions and provide customized education [21]. However, previous studies have only reported the adherence rate related to a disease without mentioning the education contents or methods [10,13,22] or satisfaction with the education program, or whether the patients could perform CIC shortly after the education [16,17]. There has

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been little research about the adherence following the education which contained suggestions and recommendations mentioned above. In the present study, we investigated the adherence to CIC following a CIEP for patients with emptying failure.

METHODS

1. Study Design

This study was a retrospective descriptive study. The purpose of this study was to investigate the adherence to CIC following a CIEP and influencing factors on compliance.

2. Study Participants

We retrospectively reviewed the data in November 2016. The inclusion criteria were as follows: (1) patients aged over 15 years with emptying failure. Emptying failure patients were defined as those who couldn't void at all or could partially void with a large amount (>100 cc) of residual urine. (2) All patients who revisited the CIC clinic for follow up between January 2012 and July 2014. This study was undertaken in a tertiary referral center, and all patients in need of CIC were referred to the CIC clinic in the hospital.

3. Study Protocol

The CIEP on CIC was created at the research hospital in 2011. Since then, all patients who were prescribed CIC have learnt the procedure through the program. It was based on previous protocol [16]. Some of the protocol has been modified on the basis of many research findings. It was made up of theoretical knowledges and hands-on practice. Total education time was approximately one hour, and the education was provided one-on-one in a separate space.

The nurse in charge of education completed a Ph.D. program and had more than 15 years of clinical experience. She has attended a conference with peer group and of physicians every month; and lectured as an expert in the urology academic society every year.

The program consisted of watching video, customized theoretical knowledges instruction, and hands-on practice (Table 1). Before education, the nurse checked a medical record such as results of urodynamic study, ultrasonography, and underlying disease or surgery record.

At first, a patient watched a video for an overview of

CIC. The video lasted for 7 minutes.

After watching the video, customized theoretical knowledges instruction was provided based on the disease states and test results individually. The nurse explained the patient's underlying disease and how the underlying disease cause the emptying failure in detail. In addition, the nurse stressed the advantage of CIC and disadvantage of other methods including the mechanism which complications occur. The patient was educated about the CIC thoroughly.

The next course was a hands-on practice. Before practice education, the nurse checked the patient's physical condition and the structure of the toilet of the patient's house. The nurse explained the process as simply as possible in order not to make it strike the patients as a cumbersome technique. They were taught differently depending on the sex: man in the standing position and a woman in the sitting position on a toilet, respectively. The nurse found the most appropriate posture for the catheterization with the patient and taught various ways to locate the urethra. If the patient had poor vision, she taught the ways to locate the urethra by touch. Except for the patients who were bed-ridden and quadriplegic, she encouraged them to catheterize themselves. The practice session continued until the trainee was able to master the technique.

When the education was over, each patient received a questionnaire about the degree of understanding, satisfaction with the education, and degree of confidence that he/she could catheterize alone; and the most inconvenient procedures. Additionally, the nurse asked the patient about the process of catheterization and what he/she needs to know using short answer questions; if the patient answered incorrectly, the nurse explained it again. At the end of the program, the nurse encouraged the patient to express his/her feelings freely and consulted. If the patient wanted additional counselling after returning home, the patient could call the nurse during office hours.

To check the patients' voiding conditions and compliance, the urologist advised them to revisit the urology clinic no later than one month after the completion of the education. When they revisited, the interview was done via a questionnaire. It included questions about who performed the catheterization, how it was done, or what made the subjects compliant or noncompliant. If the CIC method was not correct, re-education was provided.

4. Data Collection

We collected clinical characteristics of patients such as age, sex, income, education level, occupation, hand dex-

Table 1. Contents of Customized Intensive Education Program

Time	Category	Material	Topic	Contents
0~7 min (Introduction)	Overview	Video	Anatomy	Urologic anatomy
			Pathophysiology	Processes of the production and elimination of urine, the cause and complication of emptying failure
			CIC	Brief process and complications of CIC Coping method, the precautions
~25 min	Customized theoretical instruction	Medical record	Causing the emptying failure	Underlying disease, test result, Mechanism causing the emptying failure
		Teaching materials	Method to resolve emptying failure	Disadvantage of Valsalva maneuver or reflex voiding (mechanism which complications occur), advantage of CIC, criteria for stopping CIC
~50 min	Hands-on practice	Teaching materials	Check patient's condition/environment	Visual acuity, obesity, hand dexterity, performance status The structure of the toilet of the patient's house
			CIC process	Verbal explanation the CIC process
		Catheter/toilet	Practice	Proper posture, tip to identifying urethra
~70 min (Closing)	Survey	Questionnaire	Education method	The degree of satisfaction, confidence
			Theoretical-instruction	The degree of understanding
			Practice	The degree of confidence, the most inconvenient procedures, his/her feelings
	Quiz	Test paper	Theoretical instruction	Normal bladder capacity, the number of catheterizations, fluid intake, complications, criteria for stopping catheterization, how to cope with complications, and the cause of emptying failure.
	Counselling		Encouraged the patient to express his/her feelings freely and consulted.	
F/U (after 1 month)	Survey	Questionnaire	Adherence	Who performed the catheterization, how it was done
			The barrier	Why cannot perform the catheterization
		Teaching materials		Re-education: If the CIC method was not correct,

CIC=clean intermittent catheterization; F/U=follow up.

terity, performance status, primary reasons for emptying failure and voiding status. Among the primary reasons for emptying failure, hysterectomy and low anterior resection was categorized as peripheral nerve injury, and diabetes and peripheral neuropathy were categorized as systemic disease. The voiding status was divided into partial emptying failure and complete emptying failure.

For the short-term adherence rate, answers to the questionnaire and voiding diary in medical records on the second visit were analyzed. The question of questionnaire was "Did you perform CIC as the doctor ordered?" Of the 6 scale answer to the question, 'somewhat yes', 'almost yes', 'completely yes' were categorized as adherent. The

medical records and voiding diary in medical record on the last follow-up day were analyzed for the long-term adherence rate. We reviewed the medical record in November 2016. The case that self-voiding was restored and regular catheterizing was performed until the last visit were categorized as adherent. If the last follow-up day was over 6 months, they are categorized follow-up loss and non-adherent.

The level of understanding, satisfaction, and confidence after first education and barrier to CIC were also collected. Finally, we investigated the influencing factor on adherence.

We obtained approval from institutional review board

of Seoul National University Hospital (No: H-1408-002-596). This study was exempted from receiving consent because it is unlikely to cause harm to subjects

5. Data Analysis

Descriptive analysis was conducted for description. For the difference in urologic anatomy and urination process by sex, we classified the subjects into male and female groups. Chi-square or Fisher's exact test for categorical variable and student's t-test for continuous variable were used to compare differences between groups. We evaluated potential influencing factors on the adherence: adherent and non-adherent. These variables were sex, age, the level of education, income, occupation, primary reason for emptying failure, the level of understanding, the level of satisfaction, the level of confidence. Statistical analyses were done with the SPSS software (Statistical Package for the Social Sciences, version 21.0, SPSS Inc.), and a p -value of < 0.05 with a 95% confidence level was considered statistically significant.

RESULTS

1. Characteristics of Patients

The average age was 65.25 ± 14.18 years and the man was older ($p = .002$). 62.4 % of patients were men. Unemployment (51.1%) in male and housewives (68.2%) in female were the most common. About 72% of the male and 64.7% of the female patients had a good dexterity of the hand. 56.6 % of patients could walk without help. 77.0% of patients could perform self-catheterization after the first session of education. The most common primary reasons for emptying failure were urologic disease (32.6%) in male and spinal cord lesions (30.6%) in female. Most of the patients with unknown etiologies were in a bedridden state. Demographic and clinical characteristics of the patients are presented in Table 2.

2. Response to Initial CIC Education

Most of the patients showed a high level of understanding, satisfaction, and confidence. The level of confidence of male was higher than female ($p = .014$). The most uncomfortable process was significantly different depending on the gender ($p < .001$). The male patients thought cleaning the perineum caused the most discomfort while the female patients thought identifying the urethra caused the most discomfort. The male patients complained about a sense of

discomfort during the insertion of the catheter much more than the female patients (Table 3).

3. Adherence Rate and Barrier

At the second visit, the median duration was 22 days, adherence rate was 87.6% (198 of the 226). 28 patients were non-adherent and 16 of 28 did not performed CIC at all. The degree of short term adherence was different by gender ($p = .031$). The major barrier was time management (44.7%), followed by none (24.8%). Although the number decreased, male still had difficulty inserting the catheter and female patients had difficulty identifying the urethra. The number of people who said there was no difficulty has grown from 23 to 56.

The long-term, the median time was 112 days, adherence rate was 50.4%. Ten of the 30 patients who stopped catheterization on their own authority were too seriously ill to perform CIC and had to switch to indwelling catheterization. And nine of the 51 follow-up loss patients were stable, so referred to the primary clinic where the patient lived (Table 4).

4. The Influencing Factor on Compliance

According to univariate logistic regression analysis, only income variable was associated with adherence (OR: 3.08 [95% CI=1.58~5.99], $p = .001$), so we couldn't perform multivariable logistic regression analysis. The other variable did not show any significant difference between the two groups (Table 5).

DISCUSSION

We evaluated the adherence to the CIC following the CIEP and influencing factors on the adherence. The short-term adherence rate (median 22 days) was 87.6% and the long-term adherence rate (median 112 days) was 50.4%. The biggest obstacle was the time management. Only income variable differed significantly between the two groups.

The ongoing CIEP of our clinic were devised by adopting the recommendations suggested by other studies [18-20]: providing an overview of the anatomy using educational materials, voiding symptoms, underlying disease and identification of psychological issues, physical problems and consult about them. Additionally, we tried to provide education in a silent and low stress setting and not to give up teaching disabled patients. We spent sufficient time trying to educate the subjects completely. Plain ex-

Table 2. Characteristics of Patients

(N=226)

Characteristics	Categories	Male (n=141)	Female (n=85)	χ^2 or t	p
		n (%) or M±SD	n (%) or M±SD		
Age (year)	Overall	67.53±13.47	61.47±14.60	10.08	.002
	23~50	15 (10.6)	18 (21.2)	8.68	.034
	51~65	38 (27.0)	30 (35.3)		
	66~85	81 (57.4)	34 (40.0)		
	86~100	7 (5.0)	3 (3.5)		
Education level	Uneducated	9 (6.4)	4 (4.7)	4.62	.202
	Elementary/middle school	28 (19.8)	27 (31.8)		
	High school	45 (31.9)	26 (30.6)		
	≥College	58 (41.1)	27 (31.8)		
	No response	1 (0.8)	1 (1.1)		
Occupation	Primary industries	9 (6.4)	2 (2.4)	120.41	< .001
	Secondary industries	21 (14.9)	4 (4.7)		
	Tertiary industries	35 (24.8)	15 (17.6)		
	Housewife	4 (2.8)	58 (68.2)		
	Unoccupied	72 (51.1)	6 (7.1)		
Income per month (10,000 won)	<100	41 (29.1)	19 (22.4)	1.98	.576
	100~300	53 (37.6)	32 (37.6)		
	301~500	27 (19.1)	15 (17.6)		
	>500	16 (11.3)	14 (16.5)		
	No response	4 (2.9)	5 (5.9)		
Hand dexterity	Good	102 (72.3)	55 (64.7)	14.97	.001
	Poor	20 (14.2)	3 (3.5)		
	Incapable	19 (13.5)	27 (31.8)		
Performance status	Normal gait	81 (57.4)	47 (55.3)	2.24	.525
	Gait disturbance	49 (34.8)	28 (32.9)		
	Paraplegia	7 (5.0)	4 (4.7)		
	Bedridden	4 (2.8)	6 (7.1)		
Primary reason for emptying failure	Brain lesion	39 (27.7)	18 (21.2)	34.80	< .001
	Spinal lesion	26 (18.4)	26 (30.6)		
	Peripheral nerve injury	10 (7.1)	22 (25.9)		
	Systemic disease	9 (6.4)	5 (5.9)		
	Urologic disease	46 (32.6)	5 (5.9)		
	Others	11 (7.8)	9 (10.5)		
Voiding status	Partial emptying failure	66 (46.8)	40 (47.1)	< 0.01	.971
	Complete emptying failure	75 (53.2)	45 (52.9)		

planations for information on emptying failure and the CIC process that fits the intellectual level of each patient using various audiovisual aids may be helpful. Using various methods to teach how to resolve difficulties in finding the urethra enabled patients to perform the catheterization. Consequently, the level of understanding, satisfaction, and confidence was very high.

Parsons et al.[23] reported that the short term (6 weeks) adherence rate of 309 patients with non-neurogenic bladder was 84%. This is similar to the result of this research. The long-term adherence rate of existing studies was varied [6,24-26]. The research of Bolinger & Engberg [24] re-

ported that after 60 months, the compliance rate was 76.9%. However, only 10.2% of the patients performed CIC according to the doctor's prescription, the remainder catheterized relying on their perception. In presenting study, 50.4% patients performed CIC according to the doctor's prescription. In another study which the study participants were children (60 boys), the long term adherence (9.9 years) was 82%. They claimed that their high adherence rate was due to the constant involvement of an experienced nurse [25]. In this study setting, tertiary hospitals, referral to the primary clinic where the patient lived was common. These feature may influence the low long-term

Table 3. Patient's Response to Initial CIC Education

(N=226)

Variables	Categories	Male (n=141)	Female (n=85)	χ^2 or t	p
		n (%) or M±SD	n (%) or M±SD		
The level of understanding	Overall	5.55±0.69	5.52±0.71	0.09	.771
	Very high	93 (66.0)	53 (63.9)	0.10	.950
	High	32 (22.7)	20 (24.1)		
	Somewhat high	16 (11.3)	10 (12.0)		
The level of satisfaction	Overall	5.79±0.46	5.80±0.46	0.03	.984
	Very high	115 (81.6)	68 (81.9)	<0.01	.954
	High	23 (16.3)	13 (15.7)		
	Somewhat high	3 (2.1)	2 (2.4)		
The level of confidence	Overall	5.36±0.79	5.13±0.91	10.66	.014
	Very high	77 (54.6)	40 (48.2)	3.95	.048
	High	39 (27.7)	14 (16.9)		
	Somewhat high	24 (17.0)	29 (34.9)		
	Somewhat low	1 (0.7)	0 (0.0)		
The most discomfort process	Overall			43.07	<.001
	Washing perineum	46 (32.6)	17 (20.0)		
	Identifying the urethra	24 (17.0)	49 (57.6)		
	Inserting pain	23 (16.3)	5 (5.9)		
	Miscellaneous	33 (23.4)	6 (7.1)		
None	15 (10.6)	8 (9.4)			

Table 4. Patient's Adherence and Barrier

Variables	Categories	Male (n=141)	Female (n=85)	χ^2	p
		n (%)	n (%)		
Long term adherence	Self-voiding	49 (34.8)	36 (42.3)	2.93	.569
	Completely	21 (14.9)	8 (74.6)		
	Intermittent	20 (14.2)	11 (12.9)		
	Not at all	17 (12.1)	13 (15.3)		
	Follow-up loss	34 (24.1)	17 (20.0)		
Short term adherence	Completely	81 (57.4)	51 (60.0)	12.33	.031
	Almost	23 (16.3)	19 (22.4)		
	Somewhat	21 (14.9)	3 (3.5)		
	Intermittent	2 (1.4)	2 (2.4)		
	Rarely	7 (5.0)	1 (1.2)		
	Not at all	7 (5.0)	9 (10.6)		
Barrier	Equipment preparation	2 (1.4)	0 (0.0)	18.42	.018
	Washing perineum	4 (2.8)	3 (3.5)		
	Identifying the urethra	2 (1.4)	11 (12.9)		
	Time management	67 (47.5)	34 (40.0)		
	Inserting pain	17 (12.1)	5 (5.9)		
	Disability	7 (5.0)	3 (3.5)		
	None	33 (23.4)	23 (27.1)		
	Do not know (never try)	7 (5.0)	6 (7.1)		
	Worry	2 (1.4)	0 (0.0)		

adherence rate. Motavasseli et al.[26] reported the adherence rate (median 42 weeks) of 35 patients with multiple sclerosis was only 29%. The median Expanded Disability Status Scale, EDSS is a method of quantifying disability in

multiple sclerosis, of the participants was 6.0. The score 6.0 means the condition that the patients requires a walking aid - cane, crutch, etc. - to walk about 100m with or without resting [27]. The performance state of the study partic-

Table 5. The Influencing Factor on Compliance

Characteristics	OR	95% CI	<i>p</i>
Gender	0.79	0.19~3.23	.746
Age	1.01	0.98~1.05	.331
Education	0.68	0.37~1.26	.229
Income	3.08	1.58~5.99	.001
Occupation (Ref: Primary industry)			
Secondary industries	4.77	0.27~83.22	.284
Tertiary industries	0.81	0.09~6.74	.849
Housewife	1.18	0.13~10.84	.880
Unoccupied	2.49	0.33~18.54	.373
Performance status	0.83	0.45~1.50	.541
Voiding status	0.75	0.44~1.26	.286
Primary reason for emptying failure (Ref: Brain lesion)			
Spinal lesion	1.43	0.34~6.01	.624
Urologic disease	2.87	0.42~19.2	.277
Peripheral nerve injury	0.31	0.04~2.26	.251
Systemic disease	0.59	0.15~2.30	.449
Post-operative retention	1.01	0.20~5.15	.982
The level of understanding	0.62	0.27~1.45	.275
The level of satisfaction	1.39	0.44~4.40	.573
The level of confidence	1.61	0.80~3.23	.177

OR=odds ratio; CI=confidence interval.

ipants was worse than this study participants, 56.6% patients could walk without help, so their adherence may be lower than presenting study.

Discomfort due to CIC changed over time; from storage and irrigation of the catheter, washing the urethra and perineum, and identifying the urethral orifice to the time management. In other studies, the most common barriers associated with CIC were the difficulty of using a bathroom; positioning to insert the catheter [24,26]. This means that the vague anxiety about catheterization disappears over time, but having a social life with catheterization, incorporating catheterization into daily routines and being able to perform the procedure properly both outside and inside home are continuous challenges [20,28,29]. So the instructors should provide realistic tips as well as other alternative tips for balancing the catheterization and social life.

The previous literature reported that cost was barrier for CIC [24]. These results are also found in other health behavior-related studies [30]. However, the impact is expected to have been reduced with insurance coverage in 2017.

Girotti et al. [10] reported that the adherence rate (6 month) was 61.7% and higher in women and under the

age of 40; and Motavasseli et al. [26] reported more severe voiding dysfunction measured using the Urinary Symptom Profile was associated with adherence. However, there was no difference in sex, age, voiding status between adherents and non-adherents in this study. They also reported that emotional (depression), psychological status and social relationships were associated with adherence. However, the psychological and emotional factors were not analyzed in this study; this might be why we could not find influencing factor except income variable.

At the first follow-up, 10 patients did not perform catheterization; however, after consultation, they performed catheterization well. On the other hand, 29 patients who could catheterize at the clinic gave up self-catheterization at home and the adherence rate decreased over time. These phenomena are good examples that show the importance of continuing education and consultation [19,20]. Faure et al. [25] reported that contact with the patients and request to visit the clinic regular intervals was very important in increasing adherence. In addition to the education, therefore, other methods such as emotional and psychological support [10,26], and regular follow-up [25] are needed to improve long-term adherence.

This study has a limitation that must be considered. This

study is a retrospective study. However, the analysis data that were prospectively designed for patient education and information on CIC could decrease the limitation for this retrospective study. A prospective study needs conducting in a larger population to identify the overall adherence rate and barrier by periodic checks on the performance of catheterization, voiding status, and reasons for cessation.

CONCLUSION

Although satisfaction with the CIEP for CIC was high, the adherence rate was not high. And we couldn't find the influencing factor on adherence except income. This could be because of the psychological reluctance concerning CIC which intrinsically differ from natural toileting practices. So, it is very necessary to provide constant emotional and psychological support and education until the patient can accept the CIC. For this, a policy to apply insurance to the CIC education must be established.

REFERENCES

- Morrison J, Birder L, Craggs M, Groat WD, Downie J, Drake M, et al. Neural control. In: Abrams P, Cardozo L, Khoury S, Wein A, editors. Incontinence. Paris: Health Publications Ltd; 2005. p. 363-422.
- Harris CJ, Lemack GE. Neurourologic dysfunction: Evaluation, surveillance and therapy. *Current Opinion in Urology*. 2016; 26(4):290-294. <https://doi.org/10.1097/MOU.0000000000000290>
- Yoshimura N, Chancellor MB. Differential diagnosis and treatment of impaired bladder emptying. *Reviews in urology*. 2004; 6 Suppl 1:S24-S31.
- Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, et al. The standardisation of terminology in lower urinary tract function: Report from the standardisation sub-committee of the International Continence Society. *Neurourology and Urodynamics*. 2002;21(1):167-178. <https://doi.org/10.1002/nau.10052>
- Lapides J, Diokno AC, Silber SJ, Lowe BS. Clean, intermittent self-catheterization in the treatment of urinary tract disease. *The Journal of Urology*. 1972;107(3):458-461. [https://doi.org/10.1016/S0022-5347\(17\)61055-3](https://doi.org/10.1016/S0022-5347(17)61055-3)
- Shen L, Zheng X, Zhang C, Zeng B, Hou C. Influence of different urination methods on the urinary systems of patients with spinal cord injury. *Journal of International Medical Research*. 2012;40(5):1949-1957. <https://doi.org/10.1177/030006051204000536>
- Kessler TM, Ryu G, Burkhard FC. Clean intermittent self-catheterization: A burden for the patient? *Neurourology and Urodynamics*. 2009;28(1):18-21. <https://doi.org/10.1002/nau.20610>
- Wyndaele JJ, Maes D. Clean intermittent self-catheterization: A 12-year followup. *The Journal of Urology*. 1990;143(5):906-908. [https://doi.org/10.1016/S0022-5347\(17\)40132-7](https://doi.org/10.1016/S0022-5347(17)40132-7)
- Bahnsen E, Mahdy A. Clean intermittent catheterization in the elderly. *Current Bladder Dysfunction Reports*. 2015;10(4): 376-380. <https://doi.org/10.1007/s11884-015-0340-5>
- Girotti ME, MacCornick S, Perissé H, Batezini NS, Almeida FG. Determining the variables associated to clean intermittent self-catheterization adherence rate: One-year follow-up study. *International Brazilian Journal of Urology*. 2011;37(6):766-772. <https://doi.org/10.1590/S1677-55382011000600013>
- Cameron AP, Wallner LP, Tate DG, Sarma AV, Rodriguez GM, Clemens JQ. Bladder management after spinal cord injury in the United States 1972 to 2005. *The Journal of Urology*. 2010; 184(1):213-217. <https://doi.org/10.1016/j.juro.2010.03.008>
- Afsar SI, Yemisci OU, Cosar SN, Cetin N. Compliance with CIC in spinal cord injury patients: A long-term follow-up study. *Spinal Cord*. 2013;51(8):645-649. <https://doi.org/10.1038/sc.2013.46>
- Perkash I, Giroux J. Clean intermittent catheterization in spinal cord injury patients: A follow up study. *The Journal of Urology*. 1993;149(5):1068-1071. [https://doi.org/10.1016/S0022-5347\(17\)36298-5](https://doi.org/10.1016/S0022-5347(17)36298-5)
- Chartier-Kastler E, Amarenco G, Lindbo L, Soljanik I, Andersen HL, Bagi P, et al. A prospective, randomized, crossover, multicenter study comparing quality of life using compact versus standard catheters for intermittent self-catheterization. *The Journal of Urology*. 2013;190(3):942-947. <https://doi.org/10.1016/j.juro.2013.04.026>
- Birmingham SL, Hodgkinson S, Wright S, Hayter E, Spinks J, Pellowe C. Intermittent self catheterisation with hydrophilic, gel reservoir, and non-coated catheters: A systematic review and cost effectiveness analysis. *British Medical Journal*. 2013; 346:e8639. <https://doi.org/10.1136/bmj.e8639>
- Oh SJ, Ku JH, Lim SH, Jeon HG, Son H. Effect of a 'centralized intensive education system' for clean intermittent self-catheterization in patients with voiding dysfunction who start catheterization for the first time. *International Journal of Urology*. 2006;13(7):905-909. <https://doi.org/10.1111/j.1442-2042.2006.01438.x>
- Cobussen-Boekhorst HJ, Kuppenveld Van JH, Verheij PP, Jong De LL, Gier De RR, Kortmann BB, et al. Teaching children clean intermittent self-catheterization (CISC) in a group setting. *Journal of Pediatric Urology*. 2010;6(3):288-293. <https://doi.org/10.1016/j.jpuro.2009.09.002>
- Newman DK, Willson MM. Review of intermittent catheterization and current best practices. *Urologic Nursing*. 2011;31

- (1):12-28. <https://doi.org/10.7257/1053-816X.2012.31.1.12>
19. Logan K, Shaw C, Webber I, Samuel S, Broome L. Patients' experiences of learning clean intermittent self-catheterization: A qualitative study. *Journal of Advanced Nursing*. 2008;62(1):32-40. <https://doi.org/10.1111/j.1365-2648.2007.04536.x>
20. Van Achterberg T, Holleman G, Cobussen-Boekhorst H, Arts R, Heesakkers J. Adherence to clean intermittent self-catheterization procedures: Determinants explored. *Journal of Clinical Nursing*. 2008;17(3):394-402. <https://doi.org/10.1111/j.1365-2702.2006.01893.x>
21. Le Breton F, Guinet A, Verollet D, Jousse M, Amarenco G. Therapeutic education and intermittent self-catheterization: Recommendations for an educational program and a literature review. *Annals of Physical and Rehabilitation Medicine*. 2012;55(3):201-212. <https://doi.org/10.1016/j.rehab.2012.01.006>
22. Neel KF, Salem MA, Soliman SM, Al-Hazmi H, Gomha AB, Khatab AA. Acceptance and compliance of clean intermittent catheterization among Saudi patients. *Saudi Medical Journal*. 2008; 29(7):1014-1017.
23. Parsons BA, Narshi A, Drake MJ. Success rates for learning intermittent self-catheterisation according to age and gender. *International Urology and Nephrology*. 2012;44(4):1127-1131. <https://doi.org/10.1007/s11255-012-0136-x>
24. Bolinger R, Engberg S. Barriers, complications, adherence, and self-reported quality of life for people using clean intermittent catheterization. *Journal of Wound, Ostomy and Continence Nursing*. 2013;40(1):83-89. <https://doi.org/10.1097/WON.0b013e3182750117>
25. Faure A, Peycelon M, Lallemand P, Audry G, Forin V. Pro and cons of transurethral self-catheterization in boys: A long-term teaching experience in a pediatric rehabilitation centre. *Urology Journal*. 2016;13(2):2622-2628.
26. Motavasseli D, Chesnel C, Charlanes A, Menoux D, Charoenwong F, Le Breton F, et al. Adherence to anticholinergic therapy and clean intermittent self-catheterization in patients with multiple sclerosis. *International Neurourology Journal*. 2018;22(2):133-141. <https://doi.org/10.5213/inj.1836054.027>
27. Kurtzke JF. Rating neurologic impairment in multiple sclerosis: An expanded disability status scale (EDSS). *Neurology*. 1983;33(11):1444-1452.
28. Shaw C, Logan K, Webber I, Broome L, Samuel S. Effect of clean intermittent self-catheterization on quality of life: A qualitative study. *Journal of Advanced Nursing*. 2008;61(6):641-650. <https://doi.org/10.1111/j.1365-2648.2007.04556.x>
29. Wilde MH, Brasch J, Zhang Y. A qualitative descriptive study of self-management issues in people with long-term intermittent urinary catheters. *Journal of Advanced Nursing*. 2011;67(6):1254-1263. <https://doi.org/10.1111/j.1365-2648.2010.05583.x>
30. Katz D, Tengekyon AJ, Kahan NR, Calderon-Margalit R. Patient and physician characteristics affect adherence to screening mammography: A population-based cohort study. *PloS one*. 2018;13(3):e0194409. <https://doi.org/10.1371/journal.pone.0194409>