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Providing continence care for stroke patients in an acute phase general hospital using continuous ultrasound device monitoring to measure bladder urine volume.

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KEY WORDS

stroke patient, continence care, acute phase, bladder urine volume, ultrasound device

Introduction

Stroke patients generally experience lower urinary tract symptoms (LUTS) and impaired motor function due to central nervous system disorders. In the acute phase, 21% of patients are reported to have urinary retention[1)]. In the post-stroke phase, LUTS often manifest as frequent urination and urinary incontinence, affecting return home rates at discharge[2)]. Stroke patients may also suffer from movement disorders (e.g., hemiplegia, consciousness disorders, and higher brain dysfunctions) that make toileting difficult. For these reasons, acute stroke patients often are managed using indwelling urinary catheters. Unfortunately, indwelling catheterization carries the risk of catheter-associated urinary tract infection, bladder atrophy symptoms, and disuse syndromes such as muscle weakness. Moreover, it is important to remove urinary catheters no longer needed for treatment early in the recovery process to support urination independence in multiple occupations from early treatment[3)]. Since 2016, multidisciplinary continence care teams have become increasingly accepted by the health insurance system, resulting in comprehensive continence care-in collaboration with ward nurses-being offered in most acute phase general hospitals in Japan[4)].

As a result of impaired consciousness or aphasia, many acute stroke patients cannot express their urinary intentions immediately after catheter removal. Although nurses routinely try to determine patients' urinary intervals by observing incontinence in diapers, the results often are unclear. However, observing the bladder urine volume for 24 hours can give an accurate picture of patients' incontinence volume, residual urine volume, and urination interval. To date, the continuous measurement of bladder urine volume using an ultrasound device has been an effective method to assess bladder function during sleep in healthy adults[5)] and inducing toileting in elderly patients with dementia[6)]. Although a review of acute stroke nursing suggests using a bladder scanner for LUTS assessment, there is a lack of evidence supporting this practice[7)].

The authors hypothesized that in a sample of acute stroke patients after catheterization, the continuous monitoring of bladder urine volume by nurses, using an ultrasound device, could help promote accurate bladder function evaluations, appropriate patient support, and patient independence in urination.

Objective

We aimed to clarify LUTS in a sample of acute stroke patients after indwelling catheterization through the continuous monitoring of bladder urine volume by nurses, using an ultrasound device. In addition, we sought to learn the effects on patients who received comprehensive continence care through the collaboration of multidisciplinary continence care

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team members and nurses during the acute phase of hospitalization in a general hospital.

Methods

1. Study design and protocol

A retrospective observational survey was conducted. The participants-all patients admitted to one neurosurgery ward in a Japanese acute-care general hospital from May to September 2019- received 24-hour continuous monitoring of their bladder urine volume using an ultrasound device, as well as support from nurses and multidisciplinary continence care team members. The criteria for using continuous monitoring were stroke patients who were unable to express urinary intentions due to impaired consciousness or aphasia.

2. Measurements

The following data were collected from participants' electronic medical records: demographics (age, gender, and medical history), bladder function, and continence care. The continence care team evaluated participants' urinary function and toileting independence using an index that yields a total score of 0-10 points, with lower scores indicating higher functioning levels[4]. The participants' level of consciousness was determined using the Japan Coma Scale (JCS).

Participants' urinary intentions, urinary volume by clean intermittent catheterization (CIC), and incontinence volume in diapers were recorded in a bladder diary[4]. As acute stroke patients often cannot express their urinary intentions verbally, this study included nurse observations of participants' facial expressions and gestures.

Lilliam® α-200 portable ultrasound bladder devices (Lilliam Otsuka Co., Ltd.) were used for this study. The bladder urine volume is measured by ultrasonic waves, and the measurement accuracy is ± 15% + 20 ml (Lilliam Otsuka instruction manual).

The nurses attached a device to each participant after urinary catheter removed and then monitored them continuously for 24 hours. As this device had data errors due to improper probe placement[8], the nurses received manuals and training from specialists.

3. Statistical analysis

Descriptive statistics and case studies were used in this study. Before and after supporting from nurses and the continence care team, toilet activity independence and the degree of lower urethral function were compared using the paired Wilcoxon test. Statistical analyses were performed using JMP version 15 (SAS Institute Japan). A p-value < 0.05 was considered statistically significant.

4. Ethical considerations

This retrospective study was approved by the ethics committee of the participating research hospital. Opt-out information was posted on the hospital website and bulletin boards.

Results

1. Participant characteristics (Table 1)

The mean ± standard deviation age of the eight participants was 76.4 ± 6.7 (range, 68-85) years. Five were male (62.5%) and three were female (37.5%). Participants had either a hemorrhagic or ischemic stroke, and most experienced hemiplegia and a language disorder. Their length of stay in the acute phase general hospital was 62.1 ± 27.8 (range, 30-121) days.

All participants were independent using the toilet before hospitalization.

Table 1. Participant characteristics. N=8

ID	Age (yr)	Gender[1)]	Type of stroke	Disorders	Long-term care level	Length of hospital stay (d)
A	83	F	Hemorrhagic and ischemic	Diplegia	2	56
B	72	M	Ischemic	Hemiplegia	None	54
C	85	M	Hemorrhagic	Hemiplegia, Aphasia, Dysphagia	1	121
D	68	F	Ischemic	Hemiplegia, Dysarthria	None	44
E	77	M	Hemorrhagic			30
F	76	M		Hemiplegia, Aphasia, Dysphagia	2	47
G	68	M		Hemiplegia, Aphasia	None	76
H	82	F	Ischemic		2	69
76.4 ± 6.7						62.1 ± 27.8

Mean ± SD, 1) F: Female, M: Male

2. Participants' urinary condition after catheterization with support from nurses and the continence care team (Table 2)

The urinary catheterization period was 36.0 ± 16.8 (range, 11-57) days. The level of consciousness was JCS I (75.0%) in six participants and JCS I-II (25.0%) in two participants.

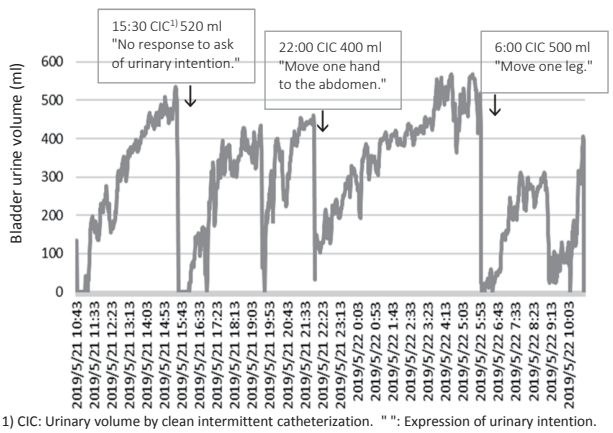
Continuous ultrasound monitoring indicated that one participant had complete urinary retention (12.5%), four had incontinence with residual urine (50.0%), and three had incontinence (37.5%).

Table 2. Participants' urinary condition after catheterization with support from nurses and the continence care team.

ID	Urinary catheterization period (d)	JCS[1]	Method of urination after catheterization	Support[2] period (d)	Method of urination at discharge	Transfer destination
A	43	I - II	CIC[3]	13	Catheter[4]	Hospital
B	11	I	CIC/ Diapers	43	Diapers	
C	55	I		66	Catheter	Nusing home
D	23	I		21	Diapers	Hospital
E	19	I - II		11		
F	38	I	Diapers	9		
G	42	I		34		
H	57	I		12	Toilet/ Diapers	
36.0 ± 16.8				26.1 ± 20.2		

Mean ± SD
1) JCS: Japan coma scale. 2) Support: Support from nurses and the continence care team.
3) CIC: Clean intermittent catheterization. 4) Catheter: Catheterization replacement.

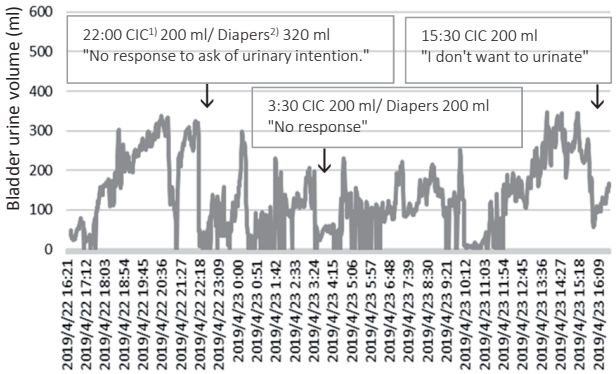
For the participant with complete urinary retention, nurses used CIC, with 400 ml of bladder urine volume as a guide. Nurses also tried to ascertain participants' urinary intentions from gestures (Fig. 1).



1) CIC: Urinary volume by clean intermittent catheterization. " ": Expression of urinary intention.

Figure 1. Changes in bladder urine volume (ID. A)

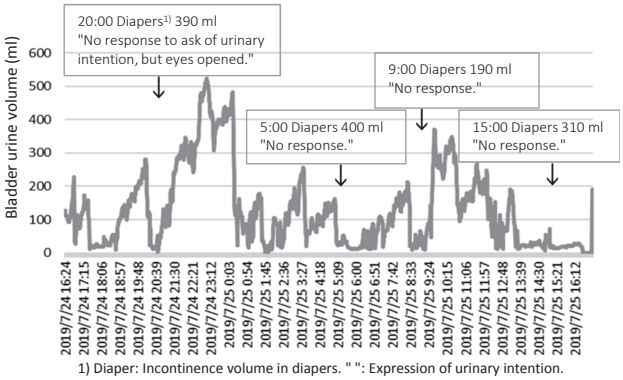
For the participants who had incontinence with residual urine, nurses used CIC and diaper changes, with a one-time urination volume of 200-400 ml and a residual urine volume of less than 100 ml. Next, the nurses compared the participants' expression of urinary intention with their incontinence level (Fig. 2).



1) CIC: Urinary volume by clean intermittent catheterization.
2) Diaper: Incontinence volume in diapers. " ": Expression of urinary intention.

Figure 2. Changes in bladder urine volume (ID. B)

For the participants experiencing incontinence, nurses confirmed that the bladder urine volume was 200 ml or more and then changed their diapers while asking them about their urinary intentions. Nurses also tried to ascertain participants' urinary intentions from eye opening (Fig. 3).



1) Diaper: Incontinence volume in diapers. " ": Expression of urinary intention.

Figure 3. Changes in bladder urine volume (ID. G)

The support period from nurses and the continence care team was 26.1 ± 20.2 (range, 9-66) days. After supporting from nurses and the continence care team, five participants used diapers (62.5%), one participant used the toilet (12.5%), and two participants were catheterization replacements (25.0%).

3. Effects of support from nurses and the continence care team on toileting independence and lower urinary tract functioning (Table 3)

The median (interquartile range; Q) of participants' toileting independence ranged from 7.0 (Q1.0) to 6.0 (Q1.0) points. Only the lower urinary tract function improved significantly, from 6.0 (Q2.0) to 5.0 (Q1.0) points.

Table 3. Effects of support from nurses and the continence team on toileting independence and lower urinary tract function. N=8

Scores		Before Supporting[1)]	After Supporting	p-value
Toileting independence	(points)	7.0 (1.0)	6.0 (1.0)	0.102
Lower urinary tract function	(points)	6.0 (2.0)	5.0 (1.0)	0.034

Median (interquartile range). The paired Wilcowon test.
1) Supporting: Support from nurses and the continence care team.

Discussion

This retrospective study revealed that nurses could use continuous ultrasound device monitoring to detect bladder urine volume, complete urinary retention, and incontinence with residual urine in acute stoke patients after catheterization. Although the participants' lower urinary function improved with the support of the continence care team members and nurses, they still experienced problems (e.g., the need for catheter repositioning and lack of toileting independence).

Of the participants with acute cerebral infarction, 19% had complete urinary retention, whereas those with urinary incontinence and 100 ml or more of residual urine overlapped[9)]. Study participants with cerebral infarction and cerebral hemorrhage had similar LUTS patterns and rates. These results suggest that it is important for nurses to detect urinary retention and residual urine in acute stroke patients at an early stage to prevent urinary tract infections and bladder hyperextension.

In previous study, nurses catheterized acute stroke patients with impaired consciousness at bladder urine volume of 200-400ml, a level that usually causes urinary intention[10)]. When patients did not respond to questions about their urinary intentions, the nurses' practice of continuing to ask while observing their facial expressions and gestures led to the recovery of urinary intention.

Another study showed that although patients with cerebrovascular disease had significant improvements in their lower urinary tract function after a continence care team intervention, their toilet activity independence did not differ from those who did not receive the intervention[11)]. Those results were similar to the current study results. As the current study participants had movement problems, communication disorders, and lower urinary tract function, the support they received in the acute phase was found to be insufficient for the optimal long-term recovery of toileting independence. Therefore, these results suggest that such patients required long-term evaluations of and seamless support for toilet activity independence, from the acute phase to the recovery phase. Previous study results indicated that the risk factors of urinary catheter repositioning among acute stroke patients were ADL at discharge, higher brain dysfunction, and advanced age[9)]. The current study's results were similar to those of the previous study and was a condition accepted by the institution. To extend continence care beyond the acute phase into the recovery phase-including when patients return home-it will be necessary to build a wide-area network of support in each region. We would like to contribute to urination independence among stroke patients by promoting continuous continence care through the stroke medical network[12)].

This study's small sample size limits the generalization of its results. However, the results can be used by similar hospitals in comparable regions.

Conclusion

In this study, continuous ultrasound monitoring allowed nurses to observe participants' urinary condition after the catheter removal. Combined with support from the continence care team, this practice contributed to the participants experiencing improvements in lower urinary tract function during the acute phase of their care.

These results suggest that two strategies—continuous bladder function assessment using an ultrasound device and cooperation between continence care team members and nurses-can be useful for this patient population. Furthermore, we posit that continuing support after the acute phase might help stroke patients achieve further urination independence.

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