Original Article

Urological Management and Long-Term Complications in Patients with Spinal Cord Injury and Neurogenic Lower Urinary Tract Dysfunction in Thailand: A Retrospective Study

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ABSTRACT

Objectives: To describe urological assessment, management and long-term complications in patients with spinal cord injury (SCI) and neurogenic lower urinary tract dysfunction (NLUTD) in Thailand.

Study design: Retrospective study.

Setting: Two university hospitals and three A-level hospitals in Thailand.

Subjects: Patients with SCI and NLUTD.

Methods: Medical records of patients with traumatic and non-traumatic SCI and NLUTD from five tertiary/A-level hospitals were obtained and manually reviewed to evaluate urological assessment, management and related complications. Descriptive statistics were used for the evaluation.

Results: Among the 5,822 medical records retrieved, 1,066 cases had been diagnosed with SCI and NLUTD. In the initial NLUTD assessment, it was found that 51.9% of the patients had undergone urodynamic study (UDS). The last bladder emptying techniques included indwelling transurethral catheter (38%), reflex voiding (30.1%), and self-catheterization (clean intermittent catherization) (20.3%). Approximately 40% of patients had had no regular urological follow-up. Among the 760 patients who had undergone imaging, 36.9% had upper urinary tract complications. There were significant differences between the university hospitals and the Ministry of Public Health hospitals in terms of urological assessment, management and follow-up protocol.

Conclusions: There were differences in methods of initial assessment, management, and surveillance follow-up protocol for SCI and NLUTD patients in university hospitals and those in MOPH hospitals in Thailand. Among the patients who underwent surveillance and investigation, a substantial number were found to have upper urinary tract complications.

Keywords: neurogenic lower urinary tract dysfunction, neurogenic bladder, spinal cord injury, rehabilitation, complications

ASEAN J Rehabil Med. 2022; 32(2): 74-81.

Introduction

Neurogenic lower urinary tract dysfunction (NLUTD) or neurogenic bladder is a secondary condition found in various neurological diseases. The condition affects a significant number of people with traumatic and non-traumatic spinal cord injury (SCI), myelomeningocele, and multiple sclerosis.[1,2] Neurogenic detrusor overactivity and detrusor external sphincter dyssynergia can cause upper urinary tract complications, e.g., vesicoureteral reflux (VUR), hydronephrosis, and renal failure.[3,4] Surveillance follow-up to monitor upper urinary tract condition is therefore necessary.[2,5,6]

There are many guidelines offering proposals for the management of NLUTD for specific diseases.[2,5-8] The recommendations can be categorized into the initial evaluation, management (which varies based on the results of the evaluation), and long-term follow-up protocol. Most guidelines agree on the need for early assessment of both upper and lower urinary tract anatomy and function, including renal ultrasonography, intravenous pyelography (IVP), renal scans, creatinine clearance, urodynamic studies, voiding cystourethrography (VCUG), and cystoscopy. One guideline also suggests urine analysis and culture to identify infections.[6] Long-term annual surveillance of detrusor and renal function including potential complications of NLUTD, such as bladder cancer, hydronephrosis, and stones, is also recommended. In summary, there are areas of general agreement regarding the assessment of urinary tract structures and functions, both in the initial phase and the surveillance follow-up protocol; there are, however, minor differences such as the rationale for and recommended frequency of urine analysis and culture.[5,6]

Some studies investigated the NLUTD management practices of physicians in high-income countries.[9-12] In 2004, a study by Bycroft et al. found that the practices in spinal units in the United Kingdom and Ireland, were quite varied; however, long-term annual follow-up was usually scheduled,

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Received: 20th September 2021 Revised: 30th December 2021 Accepted: 11th April 2022

including ultrasonography and urodynamic study.[10] A decade after that study, however, practices of these spinal units tended to be limited to annually upper tract imaging with ultrasonography without routine urodynamics.[12] Surveys among urologists in the Netherlands and the United States found a variety of practices in assessment and surveillance investigations; however, the frequency of follow-up was usually every 6 to 12 months.[9,11] In summary, there have been several proposals regarding the management of NLUTD; the actual practices of physicians, however, are even more varied.

In Thailand, there is no general consensus regarding NLUTD management and surveillance follow-up guidelines. Few studies have been conducted in the country to identify problems related to NLUTD. Studies from a rehabilitation department at a university hospital in the Northeastern region revealed a high prevalence of vesicoureteral reflux (VUR) in SCI and myelomeningocele patients of approximately 20% and 40%, respectively.[13,14] A study of a specialized SCI rehabilitation ward at a university hospital in the Northern region found abnormalities in KUB ultrasonography in 30% of males with SCI who were using a reusable silicone catheter for clean intermittent self-catheterization (CISC).[15] In another study, the prevalence of UTI in SCI patients performing CISC was 15.4%.[16] A study of chronic SCI in Thailand revealed 62% of patients still used CISC as their preferred bladder emptying method.[17]

It is difficult to get an accurate estimate of the magnitude of the urological problems in SCI patients including the number with NLUTD, the treatments received, and post-treatment complications. This study aimed to extensively explore the urological management and long-term complications in SCI patients with NLUTD in Thailand by retrospectively reviewing medical records of five tertiary hospitals in different regions of the country. This review study was designed to reflect the current NLUTD management situation and to offer a portrait of the long-term condition of NLUTD patients in Thailand which could pave the way for the development of a national guideline.

Methods

This research was a part of a three-part research project, 'Access to proper urological care in persons with NLUTD,' which is comprised of three distinct sections: 1) quantitative research on the utilization and urological management in hospitals (the focus of the present project), 2) mixed method research on the availability of urological care resources in hospitals, 3) qualitative research on the perspective of persons with SCI related to accessing urological-related care in a hospital. The same study sites were selected for all three projects. The selection process included the following. First, three to five provinces in each of the five regions; northern, northeastern, central and eastern, southern, and Bangkok and perimeter area; with the highest total number of persons with disabilities were selected and disabled people organizations (DPO) in each of those areas were contacted. One province in each of the five regions with a strong and cooperative disabled people organization was selected to serve as the base for contacting persons with SCI in the community for the third project. The five provinces are Lampang, Khon Kaen, Chonburi, Surat Thani, and Bangkok. Next, the tertiary hospitals, their network hospitals, and medical schools in these five provinces were then invited to participate in the second project. Each of the selected tertiary and medical school hospitals had all professionals necessary to care for persons with SCI, i.e., orthopedists, physiatrists, and urologists. Finally, three of the five locations were purposively selected for a medical record review based on the willingness to cooperate of the provincial coordinator. The three locations are Khon Kaen, Surat Thani, and Bangkok. The researchers in this study then recruited five tertiary/A-level hospitals in these three provinces, including two university hospitals (Srinagarind Hospital and Ramathibodi Hospital) and three Ministry of Public Health (MOPH) hospitals (Khon Kaen Hospital, Surat Thani Hospital, and Rajavithi Hospital), for a medical record review to explore details of the medical services received by patients with SCI and NLUTD.

Search strategy

After receiving approval from the research ethics committee of each hospital, the hospital coordinator was asked to retrieve medical records of patients with the following criteria: patients who had paid a visit to the hospital between October 1st 2015 and September 30th 2016 and whose medical records had one or more of the following ICD-10 codes for diagnoses: neuromuscular dysfunction of bladder (N31.0-9), potential causes of NLUTD, e.g., SCI (S14.0, S14.1, S24.0, S24.1, S34.0, S34.1, T09.3); sequelae of spinal cord injury (T91.3); other diseases of the spinal cord (G95.0-9); paraplegia or tetraplegia (G82.0-5); spina bifida (Q05.0-9); other congenital malformation of spinal cord (Q06.0-9); transverse myelitis (G37.3); neoplasm of the spinal cord (C72.0-1); cauda equina syndrome (G83.4); and multiple sclerosis (G35).

Inclusion-exclusion criteria

The researchers (DS, physiatrist; PW, registered nurse; PS; registered nurse) screened the medical records. Only records with one of the following types of evidence of NLUTD problems were included: 1) diagnosis of NLUTD/neurogenic bladder by a physician, 2) signs/symptoms of voiding dysfunction, e.g., incontinence or inability to void, or 3) use of long-term bladder emptying assistance techniques, e.g., clean intermittent self-catheterization (CISC), indwelling transurethral catheter, using external collecting devices or, 4) having investigations related to NLUTD such as urodynamic study or cystometry. Exclusion criteria were medical records of patients who were referred to other medical facilities at the first visit of diagnosing NLUTD, patients who were denied treatment, and patients who had died.

Data extraction

The researchers created a checklist for NLUTD assessment by combining key features of the two guidelines for urological management prepared by SCI experts in the United Kingdom and in Taiwan.[5,6] Initial NLUTD assessments were categorized into six groups: 1) bladder diary or post-void residual urine (PVR), 2) urine analysis, 3) urine culture, 4) serum creatinine, 5) ultrasonography or intravenous pyelography (IVP) or voiding cystourethrography (VCUG), and 6) cystometry or urodynamic studies (UDS).[5,6] The time from onset to each assessment investigation was recorded. In addition, long-term surveillance investigations, urological complications, the most recent bladder emptying technique used, and medication received for treatment of NLUTD were also recorded. This data, as well as the patients' demographic and clinical characteristics, were extracted and recorded by the researchers (DS, PW, and PS)

Surveillance/follow-up investigations for the five years following initial onset were recorded, including whether there were appointments with physicians as well as any check-ups on upper and lower urinary tract function using serum creatinine, ultrasonography or IVP or VCUG, and cystometry or UDS. The frequency of each type of surveillance investigation was also recorded.

Statistical analysis

The retrieved data were analyzed to identify 1) the type of initial urological assessment and the date of that assessment, 2) what proportion of SCI patients had cystometry or UDS done to diagnose NLUTD and how soon after reporting symptoms the diagnosis was done, 3) the latest bladder emptying techniques used, 4) the types of medications for NLUTD prescribed and how frequently they were used, 5) the prevalence of upper urinary tract complications, 6) the types and frequently of investigations done for urological follow-up surveillance during the first 5 years, and 7) whether there were differences in urological management and outcomes of NLUTD between university hospitals and MOPH hospitals. Descriptive statistics are reported as numbers and percentages; inferential statistics were used to compare MOPH hospitals and university hospitals using chi-square for categorical data and the Mann-Whitney U test for non-parametric nominal data.

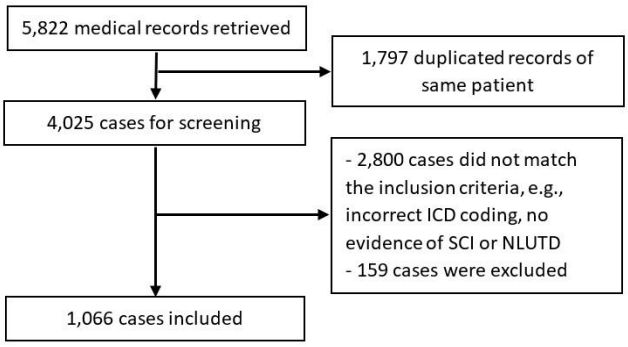

Figure 1. Flow of evaluation of the medical records of recruited cases

Results

Among the 5,822 cases retrieved, 1,066 cases were included in the study (Figure 1). Table 1 shows demographic and clinical characteristics of the included patients. The majority were male (62.6%) and the average age of all patients was 44.9 years.

Table 2 shows the six categories of initial NLUTD assessment. The most frequent was checking serum creatinine (85.9%), followed by urine analysis (75%), USG or IVP or VCUG (71.3%), UDS (51.9%) and bladder diary or PVR (49.1%). There was a statistically significant difference ($p < 0.001$) in the percentage of all categories of the initial NLUTD assessments between the university hospitals and MOPH hospitals. Overall, only 23.8% of patients received all six categories of assessment as part of the initial evaluation. Table

Table 1. Demographic and clinical characteristics of the recruited cases

	Overall (n = 1066)	University hospitals (n = 643)	MOPH hospitals (n = 423)
Demographics			
Gender, male[1]	667 (62.6)	378 (58.8)	289 (68.3)
Age (years)[2]	44.9 (21.5)	42.3 (22.6)	49.3 (18.5)
SCI characteristics			
Cause of SCI[1]			
Traumatic	380 (35.6)	231 (35.9)	149 (35.2)
Non-traumatic			
Congenital diseases	150 (14.1)	124 (19.3)	26 (6.1)
Acquired abnormalities	112 (10.5)	47 (7.3)	65 (15.4)
Neoplastic	123 (11.5)	83 (12.9)	40 (9.5)
Infection	84 (7.9)	58 (9)	26 (6.1)
Unspecified	217 (20.4)	100 (15.6)	117 (27.7)
Severity, paraplegia[1]	646 (60)	461 (71.7)	185 (43.7)
Duration of NLUTD (months)[2]	98.1 (101.3)	111.6 (102.7)	76.8 (95.3)
Duration of NLUTD (months)[3]	62 (27-132)	82 (39-156)	35 (21-88.5)

[1]Number (%), [2]mean (SD), [3]median (IQR)

MOPH, Ministry of Public Health; SCI, spinal cord injury; NLUTD, neurogenic lower urinary tract dysfunction

Table 2. Comparison of initial NLUTD assessments performed at university and MOPH hospitals

Assessment	Overall (n = 1066)	University hospitals (n = 643)	MOPH hospitals (n = 423)	*p*-value*
Bladder diary or PVR	529 (49.6)	440 (68.4)	89 (21.0)	< 0.001
Urine analysis	800 (75.0)	521 (81.0)	279 (65.9)	< 0.001
Urine culture	487 (45.7)	322 (50.0)	165 (39.0)	< 0.001
Serum creatinine	916 (85.9)	587 (91.3)	329 (77.8)	< 0.001
USG or IVP or VCUG	760 (71.3)	577 (89.7)	183 (43.3)	< 0.001
Cystometry or UDS	554 (51.9)	513 (79.8)	41 (9.7)	< 0.001

Number (%); *statistically significant ($p < 0.05$)

IVP, intravenous pyelography; MOPH, Ministry of Public Health; NLUTD, neurogenic lower urinary tract dysfunction; PVR, post-void residual urine; UDS, urodynamic study; USG, ultrasonography; VCUG, voiding cystourethrography

Table 3. Comparison of time since the diagnosis to first urological assessment at university hospitals and at MOPH hospitals (months)

	Months from onset of symptoms to first assessment [mean (range)]			
	Overall	University hospitals	MOPH hospitals	*p*-value*
Bladder diary or PVR assessment	10 (2-40)	10 (2-39.25)	8 (3.5-48)	0.294
Urine analysis	12 (2-50)	15 (3-56)	6 (1-36)	< 0.001
Urine culture	15.5 (3-59)	18 (5-53)	9 (1-71.25)	0.053
Serum creatinine	13 (2-58.5)	17 (4.25-68.75)	5 (1-42)	< 0.001
USG or IVP or VCUG	14 (4.25-60)	13 (4-49)	17 (6-80)	0.019
Cystometry or UDS	16 (4.75-63.25)	16 (4-61.75)	18.5 (7-190.25)	0.032

Median (IQR), *Mann-Whitney U test statistical significance $p < 0.05$

IQR, interquartile range; MOPH, Ministry of Public Health; NLUTD, neurogenic lower urinary tract dysfunction; PVR, post-void residual urine; IVP, intravenous pyelography; VCUG, voiding cystourethrography; UDS, urodynamic studies, USG, ultrasonography

Table 4. Comparison of urological follow-up management during the first five years after onset

	Overall (n = 1,066)	University hospitals (n = 643)	MOPH hospitals (n = 423)	*p*-value*
Complied with annual follow-up	632 (59.3)	461 (71.7)	171 (40.4)	
No appointment given for follow-up	196 (18.4)	59 (9.2)	137 (32.4)	< 0.001
Referred to other hospitals	29 (2.7)	11 (1.7)	18 (4.3)	
Lost to follow-up	209 (19.6)	112 (17.4)	97 (22.9)	

Number (%); *Chi-square statistically significant ($p < 0.05$)

MOPH, Ministry of Public Health

3 shows the time from onset to the initial NLUTD assessment. The median time to UDS/cystometry was 16 months (IQR: 4.75-63.25).

The combined frequency of the most recent bladder emptying techniques used in both types of hospitals were indwelling transurethral catheter (38%), reflex voiding (30.1%), CISC (20.3%), clean intermittent catheterization (CIC) (6.3%), suprapubic cystostomy (2.1%), and others (2.7%). The overall percentage of those who were trained to perform CIC/CISC was 47%. A total of 262 patients (24.6%) experienced urinary incontinence which required the use of external collecting devices. Of these patients, 48% managed their bladder with reflex voiding, 38.9% used CIC, and 8% used an indwelling transurethral catheter.

Of the 1,066 patients, 56.7% had never received an anti-muscarinic agent for detrusor overactivity. Of the 42.5% who had received an agent, only 32.8% still used the medication at their latest visit. Among the 350 patients who still received medication, 90% were followed up at university hospitals. The median duration from onset to the first prescription of an anti-muscarinic agent was 24 months (IQR 8-69.25).

Table 4 compares urological follow-up management during the first five years after the onset of disease. Approximately 60% of patients complied with a regular appointment for urological follow-up, 19.6% were lost to follow-up, and 18.4% did not receive a follow-up appointment. There was a statistically significant difference in the follow-up appointment scheduling and patient compliance between the university and the MOPH's hospitals.

In the analysis of patients with the time from the initial diagnosis of at least 5 years, 574 patients were excluded, leaving 492. Table 5 shows the frequency with which patients received long-term urological follow-up for investigation of upper urinary tract functions and structures. The frequency of annual follow-ups was 49.8% for serum creatinine, 46.7% for USG/IVP/VCUG, and 34.1% for UDS/cystometry. Only 98 patients (19.9%) received all categories of NLUTD assessment annually, all of whom were followed up at a university

Table 5. The frequency of urological investigations during the first 5 years of follow-up

	Frequency of investigations	Overall (n = 492)	University hospitals (n = 360)	MOPH hospitals (n = 132)	*p*-value*
Serum creatinine	Annually	245 (49.8)	190 (52.8)	55 (41.7)	< 0.001
	2 times in 5 years	123 (25.0)	95 (26.4)	28 (21.2)	
	1 time in 5 years	38 (7.7)	27 (7.5)	11 (8.3)	
	Never received	86 (17.5)	48 (13.3)	38 (28.8)	
USG or IVP or VCUG	Annually	230 (46.7)	201 (55.8)	29 (22.0)	< 0.001
	2 times in 5 years	111 (22.6)	93 (25.8)	18 (13.6)	
	1 time in 5 years	23 (4.7)	19 (5.3)	4 (3.0)	
	Never received	128 (26.0)	47 (13.0)	81 (61.4)	
UDS or cystometry	Annually	168 (34.1)	167 (46.4)	1 (0.8)	< 0.001
	2 times in 5 years	82 (16.7)	80 (22.2)	2 (1.5)	
	1 time in 5 years	22 (4.5)	18 (5.0)	4 (3.0)	
	Never received	220 (44.7)	95 (26.4)	125 (94.7)	

Number (%); *$p < 0.05$

IVP, Intravenous pyelography; MOPH, Ministry of Public Health; VCUG, voiding cystourethrography; UDS, urodynamic study; USG, ultrasonography

Table 6. Incidence of upper urinary tract complications (n = 760)

Upper urinary tract complications	
Vesicoureteral reflux grade 1-3	47 (6.2)
Vesicoureteral reflux with hydronephrosis	192 (25.3)
Chronic kidney disease	28 (3.7)
Chronic kidney disease with renal replacement therapy	9 (1.2)
Other upper urinary tract complications	5 (0.7)
Total	281 (36.9)
No Upper urinary tract complications reported	479 (63.1)

Number (%)

hospital. The significant disparity in the long-term surveillance investigations between the university and the MOPH hospitals is shown in Table 5.

Of the 760 patients that received at least one USG or IVP or VCUG, 3.2% had urinary tract calculi and 36.9% had upper urinary tract complications of different degrees as shown in Table 6.

Discussion

The first urological assessment for NLUTD determined that about half the patients had either a UDS or cystometry which was performed late, about 1-2 years post-onset of injury/post-diagnosis of the primary disease and only one-fourth of the patients had a complete urological assessment. The incidence of complete assessment and UDS was higher in the university hospitals than in the MOPH hospitals, with less than 10% of UDS or cystometry tests performed in MOPH hospitals. This difference could be due to limited resource availability, e.g., only one of the three MOPH hospitals had a urodynamic machine.

The management of NLUTD in Thailand differs from that in high-income countries. For example, the United Kingdom offers an initial urological assessment to all SCI patients at 3-6 months post onset.[5] In addition, SCI units in the UK mandate the evaluation of kidney-ureter-bladder imaging together with urodynamics as part of the initial assessment, with more than 80% of all units using video-urodynamics in the assessment process.[12] In comparison, only half of the patients in our study received UDS/cystometry as a part of the first assessment, even though one-channel simple cystometry is an alternative and safe technique of assessing detrusor functions[18] and has been one of the procedural skills taught in the rehabilitation medicine residency training program in Thailand.[19] The low percentage of UDS/cystometry found in this study suggests that all rehabilitation medicine training institutes should increase emphasis on simple cystometry and provide more opportunity to practice during the training program so that every physiatrist could master this competency. Additionally, assessment of bladder diaries and PVR helps physiatrists/urologists to evaluate the effectiveness and appropriateness of bladder-emptying techniques. However, they were performed in less than one-third of patients during the first assessment.

Two-third of the patients in our study used urinary catheters to empty the bladder, more used indwelling catheters, and about one-third used reflex voiding. These findings are not congruent with the recommendations of the existing guidelines.[2,5,7] Reflex voiding should be used only when UDS shows that the bladder situation is safe and an adequate follow-up is guaranteed. Indwelling catheters are not recommended for long-term use because of the risk of urinary complications.[2,6,7,20] According to the available evidence, bladder emptying techniques used by a patient can be changed over time. El-Masri followed SCI patients for 8-12 years and discovered that 84% learned to used CIC, 67% were using CIC at the time of SCI rehabilitation unit discharge, but only 18% still used CIC at 8-12 years.[21] In Taiwan, long-term follow-up in NLUTD patients similarly showed a decreasing number of patients using CIC over time.[22] Our study findings were similar, with about half the patients who were trained still continuing to perform CIC/CISC at their latest visit. According to a previous study in Thailand, the main reason that chronic SCI

patients choose indwelling catheters is convenience; however, the quality of life of those performing CISC/CIC and those with indwelling catheters are not different.[17]

One-fourth of the patients in this study reported urinary incontinence which is far lower than another study which reported 52.3% urinary incontinence in SCI patients.[23] This difference could, at least in part, be due to the inadequate medical recording as well as to the retrospective nature of the present study. Improper management of incontinence may prompt patients using CIC/CISC to shift back to using indwelling catheters. According to an economic evaluation study in Thailand, the cost of using external collecting devices is a significant burden for people with physical impairment.[24] That added burden could influence patients' choice of bladder management. However, some of the patients using indwelling catheters in our study also had urinary incontinence which might be due to lack of or inadequate anti-muscarinic medications and/or improper care of long-term indwelling catheter usage which can cause bladder neck and urethral erosion.[20]

All NLUTD guidelines recommend controlling detrusor pressure for patients with detrusor activity in order to prevent upper tract damage as well as recommending an annual urological follow-up.[2,5-7,25] To effectively control detrusor pressure, anti-muscarinic mediations are needed,[20] but more than half the patients in our study had never received such medications. For those who did receive it, the medication was received late, about 2 years after the onset of the injury/diagnosis, and only one-third were still taking the medications at the time of their latest visit. Lack or delay in providing anti-muscarinic medication prescriptions and inadequate regular urological follow-up might be two main reasons why one-third of patients in our study had developed upper urinary tract complications.

The upper urinary tract complications rate in our study was 36.9%, higher than rates reported in other countries.[21,26] The proportion of patients with VUR and hydronephrosis in the current study was 31.5%, higher than the 20% in Thongchim's study in Thailand.[13] This difference is probably due to the latter study having been conducted in a single university hospital which has SCI specialists who conducted regular urological follow-ups, whereas some of the patients' records in our study were obtained from MOPH hospitals where NLUTD services are limited. Another recent study conducted in a MOPH tertiary hospital in Thailand found a comparable percentage of hydronephrosis in patients with NLUTD, and reported a high percentage of patients using indwelling catheterization (66.5%) and reflex voiding (16.5%). That study also reported that the bladder emptying method is a strong predictor of hydronephrosis and/or VUR.[27] It is crucial to note that the number of complications in our study could be higher than reported in the medical record as one-third of the patients never had USG, IVP, or VCUG. Five percent of patients in this study had experienced chronic kidney disease (CKD) which could also be an underestimate as the number of CKD patients in the general Thai population is as high as 17.5% and given that NLUTD patients are a high-risk group for CKD.[28] There is also a prediction based on estimated glomerular filtration rate (eGFR) that up to one-third of SCI patients experience some level of CKD but with no diagnosis in their medical record.[29]

Most guidelines suggest at least an annual surveillance check-up for NLUTD patients.[2,5-7] This study explored the period during the first five years of follow-up. About one-third of those who had at least 5 years of follow-up had received UDS/cystometry. In contrast, at the 8-year follow-up in the United Kingdom, up to 64% of patients still received a regular annual check-up.[21] One vital difference between the medical system in Thailand and that in the UK is that rehabilitation service in the UK is under the management of SCI units where there are 12 units in the country offering holistically long-term SCI care.[12] In contrast, rehabilitation services in Thailand are integrated in an acute hospital setting with very limited resources, resulting in limitations in access to care.[30-32] Our study demonstrates that there are significant differences in the provision of urological assessment and follow-up investigations and in bladder emptying techniques and anti-muscarinic prescriptions between university hospitals and MOPH hospitals. These differences reflect the uneven and insufficient NLUTD management for patients with SCI in Thailand, e.g., presently, specialized SCI rehabilitation facilities, which by far provide better functional outcomes, are located only in university hospitals.[33] The policy makers of the MOPH as well as the National Health Security Office (NHSO) should consider developing at least one SCI-specialized rehabilitation facility in each NHSO region to ensure adequate SCI management in the acute, post-acute and long-term phases of treatment.

There are certain limitations in this study due to the nature of the retrospective method used. First, the data were retrieved from only 5 hospitals, which might not be representative of the situation of all Thai patients with SCI. Second, it was a retrospective review of only available medical records, and some data were missing or hard to interpret. Additionally, many investigations, for example, urine analysis, urine culture, and serum creatinine, could have been performed as part of an assessment of other co-morbidities. Even though the investigations included in the study were counted as part of NLUTD evaluation, it was difficult to interpret the intention of the physician at that time, i.e., whether an investigation was performed specifically for NLUTD care or not. In addition, there was a limitation in determining the actual number of patients receiving a complete initial NLUTD assessment. Due to the lack of a standardized NLUTD protocol in all hospitals, each of the six categories of initial assessment was performed over a wide time interval. If this study had included only cases where a strict protocol had been followed and all assessments were done within the prescribed time frame,

the percentage of patients who received a proper initial assessment would be far lower than the 23.8% reported in this study. Finally, the upper urinary tract complication rates might have been higher if all patients had undergone the appropriate investigations, e.g., USG/IVP/VCUG. To overcome these limitations, a prospective study should be conducted in a larger number of hospitals which would better represent the actual situation.

Conclusions

There is a wide variety in the initial assessment and long-term care provided for patients with SCI and NLUTD in Thailand. The majority of patients receive the first urological assessment more than a year post-onset which could result in inappropriate and/or insufficient management as well as an increase in the number of upper urinary tract complications. The retrospective data in this study was insufficient to develop a strong recommendation; however, the available evidence suggests that there might be problems due to the insufficient availability of services and the limitations in the knowledge of healthcare providers related to NLUTD management, especially in the MOPH hospitals. Development of standardized guidelines for NLUTD management which take into account the context of Thai healthcare system would be highly beneficial for both healthcare providers and for NLUTD patients.

Disclosure

This study was funded by the National Health Security Office (NHSO), Thailand.

The authors declare that there is no conflict of interest.

Acknowledgements

The authors gratefully acknowledge Dr. Patpiya Sirasaporn, Dr. Jittima Saengsuwan, Dr. Tanyaluck Kwansanit, Dr. Apiradee Singjam, Dr. Chayanin Vejabhuti and Dr. Wit Visetsin for coordinating the medical record reviews at each hospital, and Dr. Sarinee Kaewsawang, Head of Research and Academic Support Department of Sirindhorn National Medical Rehabilitation Institute, for advice on statistical analysis.

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