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RESEARCH ARTICLE

COMPARISON OF ECONOMIC BURDEN AND INCOME BETWEEN CLEAN INTERMITTENT CATHETERIZATION AND INDWELLING CATHETERIZATION FOR NEUROGENIC BLADDER

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ABSTRACT

Background*:* Patients with neurogenic bladder (NB) always need regularly to drain bladder artificially, mostly by clean intermittent catheterizations (CIC) or indwelling catheterizations. This study attempted to compare the cost of bladder drainage and salary between patients with NB willing to conduct CIC and that of preferring to indwelling catheterization. ***Methods****:* The age, cost of bladder drainage, salary, and income were compared between two groups according to selection of CIC or indwelling catheterization. ***Results:*** There was no significant difference of age in two groups. Although significant higher cost of bladder drainage in patients with CIC was found than that of indwelling catheterization, significantly higher salary was earn by patients with CIC compared to the other group. Therefore, lower income was discerned in patients preferring to indwelling catheterizations when compared to that of CIC. ***Conclusion:*** Patients eligible for CIC should be encouraged to perform CIC because of lower salary and income resulting from indwelling catheterization compared to CIC.

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INTRODUCTION

Neurogenic bladder (NB) is derived from diverse conditions affecting central and peripheral nervous system, such as injuries to the spinal cord (SCI), diabetes mellitus (DM), parkinson's disease, and radical surgery for carcinoma of pelvic organs (Prieto *et al*. 2021). Bladder dysfunction always are associated with NB from disorders of storage phase, including frequency, urgency, and incontinence, to dysfunctions of voiding phase, including intermittent voiding, incomplete empty, difficult in micturition, and chronic urinary retention (CUR). Those patients with NB may suffering from CUR due to detrusor under activity (DU) and need clean intermittent catheterization (CIC) to facilitate the regular drainage of bladder urine, usually 4-6 times a day (Bermingham *et al*. 2013). However, a significantly negative impact on quality of life and the associated economic costs may be overwhelming for those patients needing CIC because of frequent infection of lower urinary tract, pain during underwent CIC, and consumption in usage of catheters for CIC (Rognoni and Tarricone 2017). Although one of major advantages ofCIC is a significant reduction in the incidence of lower urinary tract infections (LUTI) and preservation of renal function, parts of patients eligible for CIC prefers to receive indwelling catheterization rather than a CIC due to a significant economic burden in purchase of catheter using CIC (Bermingham *et al*. 2013). This study attempted to compare the cost of bladder drainage, salary, and income between patients with NB willing to conduct CIC and that of refusing to CIC and referring to indwelling catheterization.

METHODS

Participants: This study was performed from Aug 2023 to Oct 2023at the second affiliated hospital of Guilin Medical University. The ethics committee of the second affiliated hospital of Guilin Medical University approved this study and informed consents were obtain from each patient. All methods in this study were performed in according with relevant guidelines and regulations. A total of 18 patients with NB eligible for CIC were enrolled in the study, in whom 7 patients were diagnosed with DU due to radical surgery for carcinoma of pelvic organs, including 5 patients with cervical cancer and 2 patients with rectal cancer, and 5 patients could not voiding spontaneously and had a large post-voiding residual urine (PVR) due to cauda equina syndrome, and 3 patients needed CIC due to flaccid bladder resulting from DM, and 2 patients with benign hyperplasia obstruction (BPO) were infected by covid-19 and the decompensation of bladder detrusor occurred, and 1 patients have a difficulty of micturition with large PVR attributed to meningitis. DU were proved by sonographic video urodynamic studies (SVUDS) in all patients.

Design: 18 patients were divided into two groups, including CIC group and indwelling catheterization group, according to their willing. Cost of bladder drainage, including the fee of purchasing catheters using in CIC or indwelling catheterization and hospital visits for replace urethral catheter in patients selecting indwelling catheterization, often 2 times a month, and salary of each patient were

recoded from Aug 2023 to Oct 2023. The monthly average value of cost of bladder drainage, salary and income (salary minus cost of bladder drainage) were generated. The differences in age, salary, cost of bladder drainage, and income between two groups were assessed.

Effectiveness assessment: All statistical analyses were carried using SPSS version 27.0 software. The measurement data were expressed in the form of "x±s". Significance was assessed from t-test. Comparison of age, salary, cost, and income between two groups. $p < 0.05$ set as statistically significant.

RESULTS

9 patients selected CIC, and 9 patients preferred to indwelling catheterization. Although 53.6 years ± 9.5 of patients selecting indwelling catheterization was seemingly older that of CIC (47.0 years ± 7.0), no significant difference in age between two groups was found (*P*=0.114). The cost of bladder drainage in patients of CIC group was significantly higher than that of indwelling catheterization (1405RMB±619.7.vs116RMB±52.0), whereas the salary in CIC group also was significantly higher when compared to the other group (5200RMB±531.5.vs 3144RMB±441.9) (all *P*<0.001). Hence, the monthly income of patients refusing CIC (3027RMB±440.6) was significantly lower than that of CIC (3794RMB±766.7) (*P*=0.019)

Table 1. Comparison of age, salary, cost of bladder drainage, and income between two groups

	CIC	Indwelling catheterization	T-value	*P*
Age (years)	47.0 ± 7.0	53.6 ± 9.5	1.674	0.114
Salary (RMB)	5200±531.5	3144±441.9	8.921	<0.001
Cost of bladder drainage(RMB)	1405±619.7	116±52.0	6.218	<0.001
Income (RMB)	3794±766.7	3027±440.6	2.601	0.019

DISCUSSION

CIC is regarded as a choice of methods for management of dysfunctional bladder due to NB. A substantial economic burden, LUTI, urethral trauma, and consequently increasing hospitalizations is likely to result in preferring to indwelling catheterization in parts of patients eligible for CIC rather than CIC. Although various types of catheters, including single use catheter, reuse catheter, uncoated catheter, and hydrophilic catheter, are available for CIC, there is no robust evidence as to which catheter is best choice (Santos-Pérez de la Blanca *et al*. 2023). Rognoni *et al* conducted a study over budget impact analysis of CIC and found hydrophilic catheter may be a cost-effective choice when compared to uncoated ones when considered over a lifetime (Rognoni and Tarricone 2017). Reusable catheters have gradually become a potential method of reduction in cost and waste because of rising cost and environmental pollution resulting from substantially increasing usage of disposable single use catheters (van Doorn *et al*. 2022). In this study, half of patients eligible for CIC preferred to select indwelling catheterization due to failure in affording to purchase the single use catheters, fear of pain and urethral bleeding. Although no significant difference of age found between two groups, older patients had a tendency of selecting indwelling catheterization rather than CIC. It was reasonable that older patients may be associated with decreasing ability of earn high salary and the propensity of selecting a palliative method.

Although the advantage of comfortable in using hydrophilic catheter, one patient in CIC groups has to use the uncoated catheters due to significant higher price of hydrophilic catheters (10-20RMB/catheter) when compared to uncoated one（1-0.5RMB/catheter). However, the patient have not complained of LUTI and urethral trauma over more than 6 months since CIC. It was suggested that good maneuver of CIC may take a important role in preventing from LUTI and urethral pain and bleeding.

Although significant higher cost of purchasing single use catheter for CIC was found when compared to periodical replacement of indwelling catheterization, usually two times a month, patients with CIC could earn higher income when compared to that of indwelling catheterization. Given possible life-long dysfunction of bladder in patients with NB, parts of patients with normal limb mobility were needed to be employed for salary to sustain their living expense. However, employers always did not willing to recruit those patients with a indwelling catheters, whereas these patients with CIC have more opportunities to be employed because they could work more conveniently during the interval between two times of CIC when compared to that of indwelling catheterization. Hence, it was not surprised that significant higher salary could be obtained by patients with CIC when compared to that of indwelling catheterization. Through this study, we recommended that patients eligible for CIC should be strongly encouraged to conduct CIC rather than indwelling catheterization, disregard of various types of catheters with different characteristics and materials.

Conflicts of Interest: All authors have no conflicts of interest to declare.

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