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Disfunção Vesical e Infecção do Trato Urinário: Impacto do Cateterismo Intermitente Limpo

DISSERTAÇÃO DE MESTRADO

Orientador: Prof. Dr. Carlos Arturo Levi D'Ancona

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Disfunção Vesical e Infecção do Trato Urinário: Impacto do Cateterismo Intermitente Limpo

Dissertação de Mestrado apresentada à Pós-Graduação da Faculdade de Ciências Médicas da Universidade Estadual de Campinas para obtenção do Título de Mestre na área de A.B. Pesquisa Experimental

Orientador: Prof. Dr. Carlos Arturo Levi D'Ancona

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Símbolos, Siglas e Abreviaturas

CI	Cateterismo Intermitente
CIL	Cateterismo Intermitente Limpo
CIC	Clean Intermittent Catheterization
ITU	Infecção do Trato Urinário
PVC	Cloreto de Polivinil (Polyvinyl Chloride)
SUS	Sistema Único de Saúde
UTI	Urinary Tract Infection

Resumo

Introdução: O cateterismo intermitente limpo (CIL) tem sido uma valiosa ferramenta no tratamento da disfunção neurogênica e não neurogênica do trato urinário inferior. **Objetivo**: Verificar a incidência de infecção do trato urinário (ITU) antes e após instituir o CIL, e identificar os agentes etiológicos. **Métodos**: Estudo de intervenção, não controlado, longitudinal e prospectivo, com pacientes de ambos os sexos e sem limite de idade. Foram realizadas quatro avaliações com seguimento por sete meses. O diagnóstico de ITU foi definido com presença de cultura de urina igual ou superior a 10^5 unidades formadoras de colônias por mililitro, acompanhada de um ou mais sinais ou sintomas de ITU. Foi usado cateter de cloreto de polivinil (PVC) com orientação de reuso do cateter por até sete dias após higienização e para os homens, também foi orientado lubrificação intra-uretral antes da cateterização. Recomendou-se CIL uma a cinco vezes ao dia conforme a disfunção vesical. A coleta de urina foi realizada pelo paciente ou pelo cuidador. **Resultados**: Cinquenta e sete pacientes foram incluídos, destes 30 completaram o estudo. A idade mediana foi de 30 anos, variando de cinco a 73 anos, sendo 22 (73,3%) homens. Foram coletadas 120 amostras de urina para análise laboratorial. Na primeira avaliação 14 (46,7%) pacientes apresentaram ITU

e após inicio do CIL, ocorreu diminuição progressiva para 2 (6,7%) na quarta avaliação. Os principais uropatógenos identificados foram: *Escherichia coli, Klebsiella Pneumoniae e Proteus Mirabilis* e dentre estes, o uropatógeno mais freqüente foi *Escherichia coli.* **Conclusões**: A incidência de ITU na amostra estudada foi de 46,7% e o CIL reduziu a ocorrência de ITU em 85,7%. O agente etiológico mais freqüente foi *Escherichia coli*. Os resultados do presente estudo sugerem que o cateterismo intermitente com a técnica limpa, reusando o cateter de PVC por sete dias é um método seguro.

Palavras-chave: Cateterismo urinário, Infecção do trato urinário, disfunção vesical.

Abstract

Background: Clean intermittent catheterization (CIC) has been a valuable tool for treating neurogenic and non-neurogenic lower urinary tract dysfunctions. **Objectives:** to verify the incidence of urinary tract infection (UTI) before and after instituting CIC, and identify the etiological agents. **Method:** this is an interventional, uncontrolled, longitudinal and prospective study performed with patients of both genders and with no age limits. Four interventions were performed during seven-month follow-up. The UTI diagnosis was defined by the presence of bacteria in a urinary culture equal or above to 10^5 colony forming units per milliliter, accompanied by one or more UTI signs or symptoms. Polyvinyl chloride catheters (PVC) were reused after cleaning for up to seven days and in men, was used intraurethral lydocaine 2% lubrication. CIC was recommended for one to five times a day according to the type of vesical dysfunction. Urine samples were collected by the patient or the caregiver. **Results:** Fifty-seven patients were enrolled, of these 30 completed the study.The median age was 30 years, ranging from five to 73 years, and 22 (73.3%) of patients were men. A total of 120 urine samples were collected for laboratory analysis. In the first evaluation, done prior to commencement of CIC, 14 (46.7%) of patients had clinically significant UTI; after initiating CIC there was a progressive reduction to a 2 (6.7%) infection rate by the

fourth evaluation. The main uropathogens found were: *Escherichia coli, Klebsiella Pneumoniae and Proteus Mirabilis* and among these, the most frequent was *Escherichia coli.* **Conclusions:** The incidence of UTI in the studied sample was 46.7% and CIC reduced the occurrence of UTI in 85.7%. The most frequent etiologic agent was *Escherichia coli*. The present study results suggest that intermittent catheterization with the clean technique, reusing the (PVC) catheter, is safe.

Key words: urinary catheterization, urinary tract infections, vesical dysfunction

1.Introdução

Os cateteres são utilizados desde a civilização antiga. Inicialmente, eram confeccionados por diversos materiais como cana, palha, folhas de palmeira, prata, ouro, borracha, metal e outros[1].

Um passo significante na historia da evolução dos cateteres deu-se com Avicena, em 1036, o qual foi o primeiro a insistir que a cateterização poderia ser realizada com cuidado e sem força, sinalizando uma era de cateteres mais flexíveis e anunciando também uma preocupação quanto à necessidade de lubrificacão[1].

O conceito de cateterização intermitente (CI) no tratamento de pacientes com lesão medular ao invés de cateterização de demora foi proposto primeiramente em 1946 por Guttmann[2].

Essa técnica foi introduzida durante e após a segunda guerra mundial para reabilitação vesical em Stoke Mandeville, um Centro de Lesados Medulares na Inglaterra[3]. Nesse serviço, o cateterismo intermitente, em pacientes com lesão medular, paraplégicos e tetraplégicos, com técnica rigorosamente asséptica, era realizado por médicos em pacientes homens e por enfermeiras em pacientes mulheres, acreditando assim, manter a urina estéril [3,4].

Em 1966, Guttmann e Frankel, publicaram resultados de onze anos de estudo, com 608 pacientes que foram admitidos no Centro de Lesado Medular, sendo 476 paraplégicos e tetraplégicos (409 homens e 67 mulheres) que foram tratados e tiveram seguimento[5]. Dos 476, (62%) tiveram urina estéril na alta hospitalar e o período de uso de cateterização intermitente com técnica estéril não excedeu a sete semanas[5].

Comarr[6], em 1972, publicou um estudo que envolveu 141 pacientes com lesão medular. Os pacientes foram treinados para realizar o autocateterismo intermitente usando técnica estéril, porém sem se paramentar cirurgicamente e sem escovação rigorosa das mãos. Quando a técnica era realizada por pessoal técnico esses também não se paramentavam cirurgicamente e tampouco escovavam rigorosamente as mãos. Como os resultados deste estudo foram bons, (141 pacientes iniciaram cateterização e 118 (83,6%) ficaram livres dos cateteres), Comarr interrompeu o uso da técnica estéril elaborada por Guttmann[2].

Lapides e colaboradores, em 1972, apresentaram uma alternativa para a autocateterização estéril quando introduziram o procedimento com a técnica limpa, com base na teoria de que os fatores de resistência do hospedeiro e o esvaziamento vesical são mais importantes para a prevenção da infecção urinária do que a tentativa de impedir a introdução das bactérias no trato urinário por meio de técnica rigorosamente asséptica[4]**.**

A hiperdistensão vesical e o aumento da pressão intravesical podem diminuir o suprimento sanguíneo da bexiga resultando em isquemia do tecido

vesical, estando então sujeito a invasão de microorganismos gram-negativos do próprio intestino por via hematógena ou linfática[4], sendo recomendado que o volume vesical não ultrapasse 400ml[3,4].

Desde o relato da primeira experiência com cateterismo intermitente limpo (CIL), esse método tem sido uma valiosa ferramenta no tratamento da disfunção neurogênica e não neurogênica do trato urinário inferior[7] e também na redução da morbidade e a mortalidade por deterioração do trato urinário superior secundário aos efeitos da alta pressão de armazenamento vesical e da infecção do trato urinário (ITU)[8].

O CIL é, portanto, um método recomendado para esvaziamento e reeducação vesical de pacientes, crianças, homens e mulheres de todas as idades, portadores de disfunção vesical, através da introdução de cateter que é retirado após o esvaziamento da urina pela técnica limpa para prevenir infecções do trato urinário, preservação do trato urinário superior e promover a continência urinária[4,9,10,11].

No entanto, o cateterismo intermitente (CI) não está livre de complicações como a infecção urinária[12].

A patogênese da ITU não é bem entendida, particularmente nos pacientes em cateterismo vesical intermitente. Há uma relação entre o hospedeiro, o agente etiológico e meio ambiente[13].

No trato urinário, cálculos, neoplasias, parasitos, corpos estranhos, podem traumatizar ou romper a integridade do tecido de maneira que a uretrite, cistite, ureterite ou pielonefrite podem ser resultantes da invasão direta de microorganismos da corrente sanguínea, pele ou mucosas. A maioria de ITUs começam como uma cistite, secundária à diminuição da resistência do hospedeiro por alteração da integridade do tecido, ou diminuição de suprimento sanguíneo na bexiga por hiperdistensão vesical e aumento da pressão intravesical[14].

Outros fatores que podem causar ITUs são: traumatismo durante relação sexual que favorece a introdução de bactéria na uretra e bexiga, urina residual e estase devido ao esvaziamento incompleto que propicia bom meio de cultura, infecções renais primárias que migram para a bexiga, anormalidades da junção ureterovesical levando ao refluxo vesicoureteral, obstrução infravesical que é a causa mais comum de ITU em homens e manipulação do trato urinário[14,] Existem ainda outros fatores como o desempenho incorreto do procedimento do CIL[15,16] e tratamento inadequado de bacteríuria assintomática[16].

A bactéria que usualmente mais invade o sistema urinário tem origem no intestino grosso do próprio paciente e pode ser encontrada na vagina, orofaringe, uretra, corrente sanguínea, linfáticos e na pele[14]. Particularmente na mulher, sendo a uretra pequena (3–4 cm) a bactéria pode vir do reto ou vagina e ascender pela uretra ou ser introduzida durante o CIL[14,17,18].

No entanto, a maioria dos casos de ITUs são causadas por anormalidades estruturais ou funcionais do trato urogenital que levam à diminuição da resistência

tecidual e à invasão bacteriana[4,19] . Um dos fatores relacionados na ITU são a alta pressão intravesical e o aumento da distensão da parede vesical. Esses fatores devem ser tratados com finalidade de prevenir recidivas de ITU[19].

O cateterismo intermitente diminui a incidência de infecções do trato urinário, porém por ser um procedimento invasivo, a complicação urológica mais frequente da cateterização intermitente é a infecção do trato urinário[11, 16,20].

Estudos anteriores com CIL mostraram incidência de ITU em 35% a 82% dos casos[19,21,22,23]. Existe associação de ITU com as irregularidades na frequencia da cateterização intermitente com hiperdistensão vesical em 35% dos casos[19].

Entretanto, não há diferenças significativas na taxa de infecção urinária, quando pacientes são auto cateterizados e quando são cateterizados por uma equipe de profissionais de saúde[24]. Antibióticos não diminuem a incidência de ITU nos pacientes em CIL[20, 7].

De acordo com estudo anterior, usar um novo cateter e um cateter limpo com reuso não diminui a ITU[22], assim como usar cateter novo para cada procedimento não diminui a freqüência de bacteriúria, como demonstrado em estudo comparativo entre uso de cateter estéril e cateter de reuso para o CI[21,25].

A ocorrência de bacteriuria assintomática em pacientes com CIL e cateterização estéril não apresentou diferenças significativas em vários estudos anteriores[26, 21, 22] e não deve ser tratada com antibióticos porque são vistas como risco de aumentar a resistência bacteriana[16,27,28].

A maioria de estudos anteriores relatou predominância de gran-negativos *Escherichia coli* na cultura de urina [29, 21, 30, 18, 28, 31] e cocos gran-positivo na cultura de urina de homens[7]. É desconhecido o mecanismo de como *Escherichia coli* causa infecção sintomática em pacientes com bexiga neurogênica[17].

No entanto, as queixas de ITU podem muitas vezes expressar angústia do paciente e os médicos não reconhecendo esse sofrimento, podem ser induzidos a uma intervenção agressiva desnecessária tais como a prescrição de antibióticos. A identificação e tratamento de distúrbios psicológicos e função social comprometida deve tornar-se rotina no acompanhamento clínico dos pacientes em CIL. Essa rotina poderia reduzir as queixas urinárias, o uso desnecessário de antibióticos e aumentar a tolerância e adesão ao CI[31]. De fato, vários autores relatam que há elevada taxa de abandono do tratamento com CIL e que o seguimento é difícil[22].

Desta maneira, considerando que o nosso serviço compreende atendimento à pacientes do Sistema Único de Saúde (SUS) com baixa escolaridade e baixa renda familiar, a reutilização de cateter de PVC com orientação de reuso por até sete dias tem sido usualmente padronizada.

Atualmente há poucos estudos sobre CIL com cateter de reuso e ITU, sendo que o enfoque da maioria dos estudos é avaliar a ocorrência de ITU no uso de cateteres revestidos e não revestidos. Em estudos que comparam cateter de reuso versus cateter estéril, a maioria deles recomenda a troca diária de cateter.

Nos países em desenvolvimento é escasso o número de estudos sobre CIL com reuso de cateter por sete dias e ITU, no entanto, são necessárias pesquisas para avaliar se o procedimento é viável e seguro, uma vez que poderia ser uma opção para a população com menor poder aquisitivo.

Assim, a proposta deste estudo foi verificar a viabilidade e a segurança da técnica de CIL, com reuso de cateter por sete dias, em população de baixa renda dependente do Sistema Único de Saúde de um país em desenvolvimento.

2. Objetivos

2.1 Objetivos

- - Verificar a incidência da infecção do trato urinário (ITU) antes e depois de instituir o cateterismo intermitente limpo (CIL).
- - Identificar os agentes etiológicos.

3. Publicação

3.1. Artigo

Bladder Dysfunction and Urinary Tract Infection: the Impact of Clean Intermittent Catheterization

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Abstract

Background: Clean intermittent catheterization (CIC) has been a valuable tool for treating neurogenic and non-neurogenic lower urinary tract dysfunctions. **Objectives:** to verify the incidence of urinary tract infection (UTI) before and after instituting CIC, and identify the etiological agents. **Method:** this is an interventional, uncontrolled, longitudinal and prospective study performed with patients of both genders and with no age limits. Four interviews were performed and a seven-month follow-up took place. The UTI diagnosis was defined by the presence of bacteria in a urinary culture equal to or above 10^5 colony forming units per milliliter, accompanied by one or more UTI signs or symptoms. In men, polyvinyl chloride reusable catheters (PVC) were used after intraurethral lubrication. CIC was recommended for one to five times a day according to the type of bladder dysfunction. Urine samples were collected by the patient or the caregiver. **Results:** Fifty-seven patients were enrolled, of these 30 completed the study. The median age was 30 years, ranging from five to 73 years, and 73.3% of patients were men. A total of 120 urine samples were collected for laboratory analysis. In the first evaluation, done prior to commencement of CIC, 46.7% of patients had clinically significant UTI; after initiating CIC there was a progressive reduction to a 6.7% infection rate by the fourth evaluation. The main uropathogens found were: *Escherichia Coli, Klebsiella Pneumoniae and Proteus Mirabilis* and among these, the most frequent was uropathogen *Escherichia coli.* **Discussion**: The incidence of UTI in the studied sample was 46.7% and CIC reduced the occurrence of UTI in 85.7%. The most frequent etiologic agent was *Escherichia coli* in accordance with several previous studies**.** The present study results suggest that intermittent catheterization with the clean technique, reusing the (PVC) catheter is safe.

Key words: urinary catheterization, urinary tract infections

Introduction

Since Lapides, Diokono, Silber & Lowe (1972) reported the first experience with clean intermittent catheterization (CIC), this method has been a valuable tool to treat both neurogenic and non-neurogenic dysfunction of the lower urinary tract **(**Bakke, Digranes, & Hoisaeter, 1997; Wydaele, 2002). After CIC became more popular, the treatment of bladder dysfunction was changed, and there was a reduction in the morbidity and mortality rates due to the deterioration of the secondary upper urinary tract caused by high pressures of bladder storage and urinary tract infection (UTI) (Pohl et al., 2002). It should also be considered that urine loss, which is common among this group of patients, is an important cause of psychological problems and social embarrassment (D'Ancona, Bosqueiro, Santos, Borges, & Rodrigues Netto, 2000).

Therefore, CIC is a method recommended for emptying the bladder and reeducating bladder dysfunction patients, children, men, and women of all ages, by introducing a catheter into the bladder that is removed after passing the urine, using the clean technique so as to avoid any infection of the urinary tract, preserving the upper urinary tract and promoting urinary continence (Lapides, Diokono, Silber & Lowe, 1972; D'Ancona, Pereira, Monteiro, Rizzioli, & Rodrigues Netto, 1993**).** When intermittent catheterization is initiated in patients with recurrent or chronic infection and urine retention, UTI incidence decreases and it is possible that patients will become totally free from infection (Wyndaele & Maes, 1990).

CIC can be self-performed by the patient, or may be done by the caregiver, using sterile or clean catheters, and can be done periodically during the day and sometimes at night, if required (Woorward & Rew, 2003).

The UTI pathogenesis is not well understood, particularly in intermittent bladder catheterization patients. There is a relationship between the host, the etiological agent, and the environment; it is the interaction between the host's defense or immune system and the etiological agent which determines if the bacteria will persist or not. UTI development depends on several factors involved in the bacteria-host relationship, including: bacterial virulence; host factors, such as bacteria flora; acid vaginal pH; urine pH; high urea concentration; organic acids; genetic factors; and anatomical-functional changes of the urinary tract. There are also other factors involved, such as the catheters themselves, insertion technique, and the length of permanence of the catheter **(**Moore, Day, & Alberts, 2002).

Intermittent self-catheterization has reduced the risk of urinary tract infection **(**Association for Continence Advice, 2003)**.** However, using a new catheter in every procedure does not reduce the frequency of bacteriuria, as shown in a study that compared the use of sterile catheters versus reusable catheters for intermittent catheterization (Schlanger, Clark, & Anderson, 2001), just as a new catheter and a clean reusable catheter do not reduce UTI **(** Prieto-Fingerhut, Banovac, Lynne,1997; Moore, Burt, & Voaklander, 2006). Bacteriuria with-out symptoms of infection is frequently present in patients that empty their bladder several times a day by intermittent catheterization (Bakke, 1993; Schlanger et al., 2000; Schlanger , Clark & Anderson, 2001; Vapnek , Maynard & Kim, 2003; Moore, Burt & Voaklander, 2006).

Although De Ridder et al (2005) have observed increased incidence of UTI in patients using a uncoated polyvinyl chloride (PVC) catheter versus hydrophilic –coated catheter, another study (Vapnek, Maynard, Kim, 2003) cannot claim that this alternative is superior

to PVC catheters in association ITU after one year of study, when the rates remained similar.

The study by Clarke, Samuel, & Boddy (2005) showed that patients with self catheterization have a lower incidence of UTI compared to those catheterized by caregivers. However, a recent systematic review (Moore, Fader & Gentliffe, 2008) concluded that the lack of studies does not confirm this finding.

Therefore, CIC is a procedure that can be performed with safety and effectiveness at a low cost.

Hence, considering that our service cares for patients who seek the Unified Health System (Brazilian public health system), and who have a low educational level and low family income, reusing the reusable PVC catheter for up to seven days has been the standard recommendation.

Currently there are few studies about reuse of catheter and UTI, because the focus of most studies evaluates the effect in the UTI of hydrophilic coated catheters and uncoated polyvinyl chloride (PVC) catheter. When evaluated multiple use clean catheter versus single use sterile catheter, the catheter exchange have been daily in most studies.

In developing countries, it is scarce studies about UTI in the CIL with reuse of the catheter for seven days. However, studies are needed to assess whether the procedure is feasible and safe, since it is an option for people with less purchasing power.

So, the purpose of the study was to assess the feasibility and safety of the technique of CIL in a low-income population, dependent on the Unified Health System of a developing country.

Taking the above information into consideration, the objectives of the study were: to verify the incidence of urinary tract infection (UTI) before and after instituting CIC and identify the etiological agents.

Methods

This is an interventional, uncontrolled, longitudinal and prospective study performed with patients of both genders and with no age limitation. It was performed at the neurogenic bladder outpatient clinic and was approved by the ethics committee at the institution (register number 302/2004)**.** Participants provided written consent.

A specific form was created for this study to evaluate urinary tract infection symptoms, such as fever, dysuria, suprapubic pain, spasticity of the lower limbs, worsened urinary symptoms and observation of urine regarding the presence of sediments and fetid odors. The form was applied in the first evaluation and in the follow-up consultations that occurred in the 1^{st}, 4^{th} and 7^{th} month.

Patients were instructed to look for the service if they had signs and symptoms of UTI or other clinical complications in the period between the appointments.

The same researcher was always responsible for training the patient and/or caregiver to perform CIC. The technique was evaluated as adequate if the patient stated he or she understood the hygiene and CIC process, and was capable of describing it and performing the technique correctly, and if, after catheterization, the patient stated they felt able to perform the procedure at home. The standardized catheter was the reusable polyvinyl chloride (PVC) catheter, as it has been recommended that it could be reused for up to seven days after hygiene with soap and boil for three minutes. For the male population, it was standardized that they should use 2% lidocaine, in the form of a hydrosoluble jelly, by intraurethral instillation.

The urinary tract infections were identified based on the notes left on the specific form, and through an active search of the results from microbiological cultures at the microbiology laboratory. The urine sample was collected by the patient using the CIC technique and was performed at the neurogenic bladder outpatient clinic, using a urethral catheter and a sterile flask. The UTI diagnosis was defined as the presence in the urine culture of equal to or above 10^5 colonies forming units per milliliter ($\geq 10^5$ufc/mL), followed by one or more urinary tract symptoms described before.

The treatment of patients with UTI was based on culture and sensitivity report and all these patients received antibiotics.

In order to describe the sample's profile according to the studied variables, frequency tables of the categorical variables were designed, containing absolute (n) and percentage (%) frequency values, as well as descriptive statistics of the continuous variables stating the mean, standard deviation, maximum and minimum values, and the median.

The chi-square or Fisher's exact test were used to verify the association between the variables. The Cochran test (Q) was used to compare categorical variables in the four evaluations (initial and follow-ups). The level of significance used was 5% ($p<0.05$).

Results

The results were divided into: sociodemographic and clinical characterization, urinary tract infection, and etiological agent.

The patients were followed for seven months. Twenty-seven of the 57 initial patients were excluded because: the patient had a right hemiplegia after a cerebrovascular accident (1), the patient searched for different treatment (1), the patient was transferred to a different center (2); there was a change in the physician's order (2); the patient died (3), the patient

had spontaneous voiding without urine residuals (4), and the patient abandoned the treatment (14, or 51.9%).

The patients' median age was 30 years, ranging between five and 73 years; 73.3% were men and 66.7% had not completed elementary school. Most (73.3%) had a family income of two to four minimum salaries; 50% received some kind of pension, and 23.3% were not employed.

Twenty-one (70%) patients had neurologic bladder dysfunction, and the most common etiology was myelomeningocele (7), followed by Spinal Cord Injury (4), myeloradicular disease (5), cerebrovascular accident (3), and diabetes (2). Nine patients (30%) had non-neurological disorders: postoperative for abdomino-perineal rectum amputation (4), idiopathic detrusor hypoactivity (1), enterocystoplasty (3) and one overactivity detrusor idiopathic dysfunction.

The urodynamic evaluation diagnosed detrusor overactivity in 14 (46.7%) patients as the main cause of bladder dysfunction. In addition, there were 10 (33.4%) patients with detrusor hypoactivity, three (10.0%) with detrusor areflexia, two (6.7%) with low bladder compliance, and one idiopathic detrusor overactivity (3.4%).

As for comorbidities, five patients had pressure ulcer, and one patient presented the following: lupus erythematosus, thyroid nodule, and heart disease. Twenty-two (73.3%) patients did not have any other disease.

Twenty-three patients (76.7%) entered the program without an indwelling bladder catheter. Among those who used an indwelling catheter (23.3%), three had been using the catheter for seven to ten weeks; three for four to six weeks, and one for less than four weeks. After evaluating the patient, in the first evaluation it was recommended that patients use CIC one to five times per day, according to the patient's type of bladder dysfunction and the real

possibility that the patient and/or caregiver had to perform it at home. The CIC was performed, on average, 3.5 times per day, with a standard deviation of ±0.9 (1st evaluation) to ±1.34 (2nd evaluation).

After teaching the technique of clean intermittent catheterization (CIC), 22 (73.3%) patients were able to perform self-catheterization; for the other patients a caregiver would perform the procedure. However, by the fourth evaluation, 24 (80%) patients performed their own self-catheterization. Considering who performed CIC (caregiver or patient), this variable was not associated with UTI frequency ($p>0.05$).

One hundred and twenty urine samples were collected for the laboratory analysis (four per patient). Note that urine culture alone was not considered as the only criteria for UTI; UTI was diagnosed only when a positive culture was associated with signs and/or symptoms.

After starting CIC, 11 (36.7%) patients developed UTI at some time during the seven-month follow-up period. However, it was observed that urinary tract infection rates dropped after introducing and maintaining CIC ($Q=16.06$; $p=0.001$). It represents a reduction in the UTI occurrence of 85.7% (Figure).

That there was a reduction in clinical signs and symptoms and of UTI over time (Table 1). The most common signs and symptoms were suprapubic pain and an altered urine appearance/odor (43.3% and 40%, respectively), which significantly appeared more frequently in the first evaluation, compared to the other evaluations ($Q=20.27$, $p<0.001$ and $Q=23.14$, $p<0.001$, in relation to suprapubic pain and the altered urine appearance/odor, respectively).

Table 2 shows that, of the 120 urine samples collected, there were 67 positive urine cultures ($\geq 10^5$ cfu/mL) and 62 samples with positive leukocytes (leukocyturia) ($\geq$ 10cfu/c). The Cochran test showed there was no significant difference between the frequency of

leukocyturia and positive urine culture in the four evaluations (p=0.334 and p=0.487, respectively).

As for the main isolated microorganisms, it was observed that there was a prevalence of gram-negative bacilli of enteric contamination, mainly *Escherichia Coli, Klebsiella Pneumoniae* and *Proteus Mirabillis* (Table 3). Other uropathogens were isolated but were less frequent: *Klebsiella Oxytoca*, *Serratia Marcescens, Pseudomonas aeruginosa, Enterococcus Faecium, Enterococcus Faecallis, Morganella Morgani, Citrobacter Freuundi, Enterobacter Aerogenes* and *Staphylococcus aureus.*

In the 2nd evaluation, which took place one month after the patient started using CIC, it was observed that the patient's approval of the procedure was associated with the decrease occurrence of urinary tract infection (p=0.029),

Discussion

The prevalence of UTI varies widely due to the differences in the criteria used to determine the presence of infection, the type of catheters used, IC techniques, frequency of urine analysis, and whether or not antibiotics are prescribed (Wyndaele, 2002). However, there is consensus that CIC reduces UTI frequency (Wyndaele & Maes, 1990), agreeing with the findings of this study, which showed that UTI rates are reduced, progressively, if CIC is maintained.

UTI incidence in patients considered at risk and using CIC is reduced in 65% of patients when they receive instructions from a nurse, because good training together with an adequate and non-traumatic technique are parameters for CIC success over long periods of time (Barber, Woodard, Rogers, & Able, 1999).

Studies using different types of catheters in CIL, showed incidence of UTI in 35% to 82% of cases (Lapides, Diokno, Lowe, Kalish 1974, Prieto-Fingerhut, Banovac, Lynne 1997,

Moore, Burt & Voaklander 2006, De Ridder , Everaert, Garcia Fernandes, Forner Valero, Borau Durán, 2005).

The 36.7% rate found in the seven-month follow-up period observed in this study is, therefore, within the expected range.

In this study, patients using the clean PVC catheter presented a UTI rate similar to that reported in the literature. The act of reusing the catheter did not increase UTI rates. This result is also in agreement with a literature review of 14 studies (Moore, Fader & Gentliffe, 2008). Similarly, another study that compared IC using sterile catheters with IC using clean PVC catheters did not show any significant differences in UTI rates (Moore, Burt, & Voaklander, 2006).

In the literature, some studies (De Ridder et al., 2005) have reported lower UTI rates when patients use the SpeediCath® hydrophilic-coated catheters when compared to the non pre-lubricated PVC catheter (64% UTI *versus* 82%, respectively, in one year). One possible explanation is that the mean friction force of removing the catheter exerted by the SpeediCath® is significantly smaller (Stensballe, Looms, Nielsen & Tvede, 2005). However, one study that compared the use of the LoFric® hydrophilic-coated catheter and the non pre-lubricated PVC catheter reported that there was a significant difference between the two groups in terms of UTI rates at the beginning of the study; however, those rates became equal after one year (Vapnek, Maynard & Kim, 2003).

Whether CIC was performed by the patient or the caregiver did not change the urinary tract infection rates in this study. However, another study, performed with 53 children, reported that only six (17%) of the 35 patients who self-catheterized presented UTI, while 17 (94%) of the 18 children who were catheterized by one of the parents or a caregiver developed UTI (Clarke, Samuel, & Boddy, 2005)**.** Nevertheless, the scarcity of studies does not permit

stating there is any association between UTI rates and who performed the catheterization (the patient or the caregiver) (Moore, Fader & Gentliffe, 2008).

The prevalence of enterobacteria in urine cultures has also been reported in previous studies. In the present study, the most frequent were of the species *Escherichia Coli,* followed by *Klebsiella Pneumoniae* and *Proteus Mirabillis.* In fact, several studies have reported that the most frequent uropathogen was *Escherichia coli* (Schlanger, Clark & Anderson, 2001; Fera et al., 2002; Vapnek, Maynard & Kim, 2003; Clarke, Samuel & Boddy, 2005).

Bacteriuria is common among patients with chronic neurogenic bladder dysfunction treated by intermittent catheterization for bladder emptying (Schlanger et al., 2000), but it should not be treated when the patient is asymptomatic, because it increases the risk of developing resistant microorganisms (Wyndaele, 2002; Clarke, Samuel & Boddy, 2005). When there is vesicoureteral reflux, the bacteria can damage the renal function and, in this case, treatment is recommended (Wyndaele & Maes, 1990).

With a level of significance of $\geq 10^5$ cfu/mL for urine analysis, the bacteriuria rates in the present study ranged between 50% and 60%, which is in agreement with the 40% to 76% rates reported in the literature (Bakke, 1993; Schlanger , Clark & Anderson, 2001; Vapnek , Maynard & Kim, 2003; Moore, Burt & Voaklander, 2006).

The fact that most patients had a low educational level did not prevent them from learning the procedure. However, obtaining the materials needed to perform CIC was one of the difficulties that patients had to deal with, since most had a low family income.

Since most patients were men, and despite the PVC catheter being reused for seven days, the procedure was more expensive due to the need to use intraurethral lubricant jelly. Even so, the cost was lower than using the disposable pre-lubricated catheter.

In addition, catheter reuse could contribute to reducing environmental impact, considering the number of catheters that are disposed of every day by IC users in the world.

The present study results suggest that intermittent catheterization with the clean technique, reusing the (PVC) catheter is safe.

Conclusions

The incidence of UTI in the studied sample was 46.7% and CIC reduced the occurrence of UTI in 85.7%. The most frequent etiologic agent was *Escherichia coli*.

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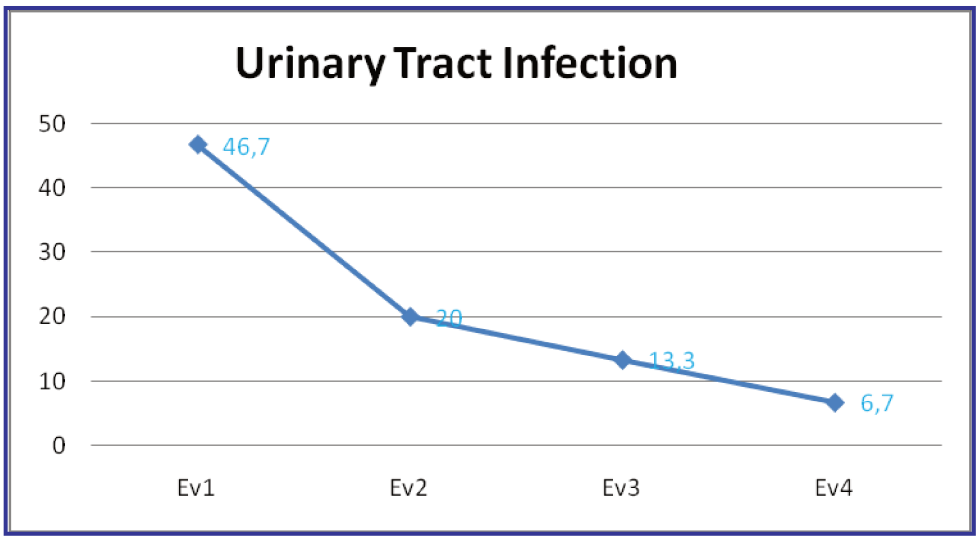

Ev = Evaluation
Figure – Initial urinary tract infection rates (1st evaluation) and subsequent evaluations after introducing CIC.

Table 1. Frequency of patients with signs and symptoms, positive urine culture and UTI (N=30)

Evaluations	Signs and symptoms*	*Positive urine culture*	UTI (n)	UTI (%)
1st Evaluation	32	18	14	46.7
2nd Evaluation	14	16	6	20.0
3rd Evaluation	10	15	4	13.3
4th Evaluation	3	18	2	6.7

Some patients presented more than one sign or symptom

Table 2. Frequency of leukocyturia and positive urine culture

Positive Urine Culture ($\geq 10^5$ cfu/mL)		Leukocyturia ($\geq 10^5$ cfu/c)	
n	%	n	%
1st 18	60.0	19	63.3
2nd 16	53.3	15	50.0
3rd 15	50.0	14	46.7
4th 18	60.0	14	46.7

Table 3. Frequency of etiological agent

Variable		Frequency (%)	
Etiological Agent			
1st Evaluation	*Escherichia coli*	11	57.89
	Klebsiella Pneumoniae	3	15.79
	Klebsiella Oxytoca	1	5.26
2nd Evaluation	*Escherichia coli*	11	61.11
	Klebsiella Pneumoniae	4	22.22
3rd Evaluation	*Escherichia coli*	5	33.33
	Klebsiella Pneumoniae	4	26.67
	Klebsiella Oxytoca	1	6.67
4th Evaluation	*Escherichia coli*	6	31.58
	Klebsiella Pneumoniae	2	10.53
	Klebsiella Oxytoca	1	5.26
	Proteus Mirabilis	3	15.79

4. Conclusões

4.1. A incidência de infecção do trato urinário na amostra estudada foi de 46,7% e o cateterismo intermitente limpo diminuiu a ocorrência em 85,7%.

4.2. O agente etiológico mais frequente foi ***Escherichia coli.***

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6. Anexos

6.1. Anexo 1 : Parecer do Comitê de Ética em Pesquisa

FACULDADE DE CIÊNCIAS MÉDICAS
COMITÊ DE ÉTICA EM PESQUISA

www.fcm.unicamp.br/pesquisa/etica/index.html

CEP, 27/11/07.
(**PARECER PROJETO:** Nº 302/2004)

PARECER

I-IDENTIFICAÇÃO:

PROJETO: **"INFECÇÃO URINÁRIA E QUALIDADE DE VIDA EM PACIENTES COM BEXIGA NEUROGÊNICA EM PROGRAMA DE CATETERIZAÇÃO INTERMITENTE LIMPO".**

PESQUISADOR RESPONSÁVEL: Célia Maria Bosqueiro

II - PARECER DO CEP

O Comitê de Ética em Pesquisa da Faculdade de Ciências Médicas da UNICAMP aprovou o Relatório Parcial, apresentado em outubro de 2.007, do protocolo de pesquisa supracitado.

O conteúdo e as conclusões aqui apresentados são de responsabilidade exclusiva do CEP/FCM/UNICAMP e não representam a opinião da Universidade Estadual de Campinas nem a comprometem.

Homologado na XI Reunião Ordinária do CEP/FCM, em 27 de novembro de 2.007.

Profa. Dra. Carmen Silvia Bertuzzo
PRESIDENTE do COMITÊ DE ÉTICA EM PESQUISA
FCM / UNICAMP

Comitê de Ética em Pesquisa - UNICAMP
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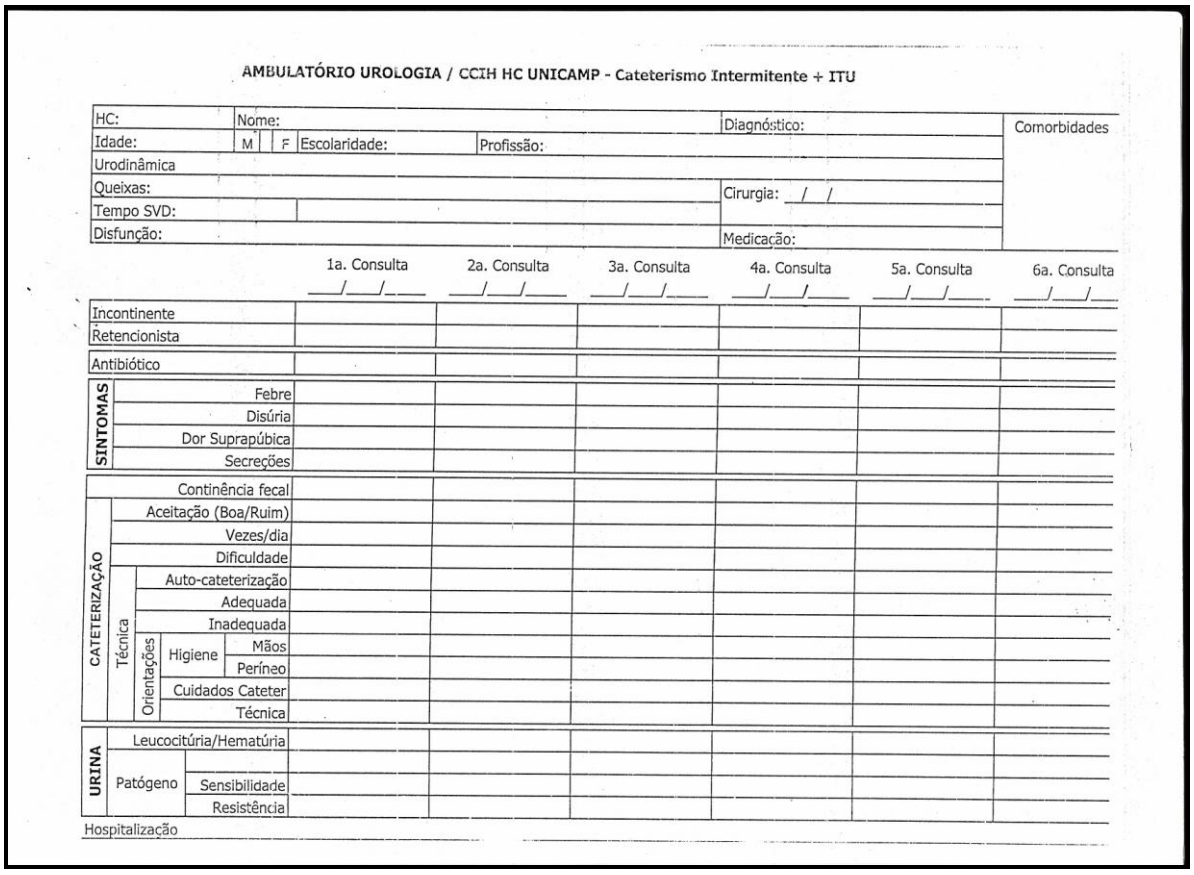
6.2. Anexo 2: Ficha do Paciente e Relatório de Pesquisa



AMBULATÓRIO UROLOGIA / CCIH HC UNICAMP - Cateterismo Intermitente + ITU

HC:	Nome:			Diagnóstico:		Comorbidades
Idade:	M F	Escolaridade:	Profissão:			
Urodinâmica						
Queixas:				Cirurgia: / /		
Tempo SVD:						
Disfunção:				Medicação:		

	1a. Consulta ___/___/___	2a. Consulta ___/___/___	3a. Consulta ___/___/___	4a. Consulta ___/___/___	5a. Consulta ___/___/___	6a. Consulta ___/___/___
Incontinente						
Retencionista						
Antibiótico						
SINTOMAS – Febre						
SINTOMAS – Disúria						
SINTOMAS – Dor Suprapúbica						
SINTOMAS – Secreções						
Continência fecal						
CATETERIZAÇÃO – Aceitação (Boa/Ruim)						
CATETERIZAÇÃO – Vezes/dia						
CATETERIZAÇÃO – Dificuldade						
CATETERIZAÇÃO – Técnica – Auto-cateterização						
CATETERIZAÇÃO – Técnica – Adequada						
CATETERIZAÇÃO – Técnica – Inadequada						
CATETERIZAÇÃO – Orientações – Higiene – Mãos						
CATETERIZAÇÃO – Orientações – Higiene – Períneo						
CATETERIZAÇÃO – Orientações – Cuidados Cateter						
CATETERIZAÇÃO – Orientações – Técnica						
URINA – Leucocitúria/Hematúria						
URINA – Patógeno						
URINA – Sensibilidade						
URINA – Resistência						

Hospitalização

6.3. Anexo 3: Envio do Artigo

---------- Forwarded message ----------
From: **celia bosqueiro** <celiabosqueiro@gmail.com>
Date: 2009/8/11
Subject: Fwd: NRES Submission Confirmation for Bladder Dysfunction and Urinary Tract Infection: the Impact of Clean Intermittent Catheterization
To: "Prof. Carlos D'Ancona" <cdancona@uol.com.br>, Maria Helena Baena <mhbaenaml@yahoo.com.br>, Renata <fagnani@hc.unicamp.br>, Jane Santos <janeksantos@hotmail.com>

---------- Forwarded message ----------
From: **Nursing Research** <handfing@email.unc.edu>
Date: 2009/8/11
Subject: NRES Submission Confirmation for Bladder Dysfunction and Urinary Tract Infection: the Impact of Clean Intermittent Catheterization
To: celiabosqueiro@gmail.com

Aug 11, 2009

Dear Miss Bosqueiro,

Your submission entitled "Bladder Dysfunction and Urinary Tract Infection: the Impact of Clean Intermittent Catheterization" has been received by the journal editorial office.

You will be able to check on the progress of your paper by logging on to Editorial Manager as an author.

http://nres.edmgr.com/

Your manuscript will be given a reference number once an Editor has been assigned.

Thank you for submitting your work to this journal.

Kind Regards,

Sherry Handfinger
Editorial Assistant
Nursing Research

http://webmail.chaves.com.br/webmail/21866/imp/message.php?actionID=print_mess... 20/10/2009