

DIFFICULTY IN REMOVING SUPRAPUBIC URINARY CATHETERS IN HOME BASED PATIENTS: A COMPARATIVE DESCRIPTIVE STUDY

Wendy Jannings, RN, SCM, CertSpinal Injuries, GradCertAdultEd, CertIVWorkplaceT&A, is a Clinical Nurse Consultant - Spinal Injuries, with the Northern Sydney Home Nursing Service, Sydney, Australia

Mary Kelly, RN, BN(Hons), is a Clinical Nurse Consultant - Continence, with the Northern Sydney Home Nursing Service, Sydney, Australia

Accepted for publication June 2001

ACKNOWLEDGEMENTS:

The authors would like to thank the community nurses of Northern and Central Sydney who completed the questionnaires. We also thank Murray Fisher, University of Sydney, for his assistance with the statistical analysis.

Key words: suprapubic catheter, balloon cuffing, hysteresis, community nursing

ABSTRACT

The aim of the study was to monitor difficulties being experienced by community nurses when removing suprapubic catheters in 94 patients living in two area health services in Sydney. The study identified one catheter brand (Simpla) that was associated with more pain and bleeding for patients, and increased difficulties in removal for the nurses. It was found that muscle relaxant medications taken by patients contributed significantly in ease of catheter removal. In over 50% of all-silicone catheters surveyed, there was evidence of hysteresis leading to balloon cuffing on deflation. This phenomenon could be associated with increased trauma to the suprapubic cystostomy tract on catheter removal. A review of the risks and benefits associated with all-silicone catheters used for suprapubic insertion is recommended.

INTRODUCTION

In two specific area health services of Sydney, the combined incidence of long term catheterisation for bladder drainage management is estimated to be between 1-6% of all patients managed at home by either private, government or non-government community nursing agencies. These findings are similar to the 1-4% incidence noted by Capwell and Morris in 1993. Currently within the two area health services, 63% of all persons with a long term urinary catheter insitu (n=155) and who are managed at home by community nurses, have a suprapubic catheter (SPC).

An SPC may be the preferred choice for long term management of non emptying bladders or as the last option for managing urinary incontinence. A doctor initially inserts the SPC directly into the bladder via the anterior abdominal wall, sited approximately 2cm above the pubic bone. All-silicone or silicone latex combinations are the materials of choice in Foley catheters used for long term catheterisation (>28 days), particularly since studies in the 1980's linked certain types of all-latex rubber catheters with cytotoxicity (Ruutu et al 1985) and urethral stricture formation (Burkitt et al 1986, p.668). All-silicone catheters have the advantage of having a wider lumen and have been found to be least toxic compared with other materials (Talja et al 1985).

Community nurses are responsible for assisting patients to manage indwelling urinary catheters at home. This involves catheter changes and providing ongoing monitoring, education and support to patients and carers. An increasing number of community nurses over the past 18 months had experienced difficulties removing SPCs. The effort needed by the nurses to remove some catheters had led to trauma of tracts with bleeding and patient

discomfort. Difficulties had also been experienced with insertion of the new catheter as the suprapubic cystostomy tract obliterated as the detrusor fibres contracted following the traumatic removal episode.

Anecdotally, these difficulties had been linked to the Foley's balloon deflation problems. The silicone membrane that forms the balloon, when deflated, folds into a cuff or ridge which then creates resistance and stops the catheter from being removed easily through the tract. The cuff formation is due to the balloon's silicone material being elongated or stretched for a period of time beyond normal size (whilst inflated to retain the catheter in place) - which then does not return to original shape on deflation. This phenomenon with stretched materials is called hysteresis.

On some occasions, as a direct result from the difficulties experienced at home during the catheter change, patients had required admission to hospital emergency departments for completion of the procedure. This had caused much anxiety both to patients and attending community nurses, and placed unnecessary strain on hospital resources. Some community nurses had identified a particular brand of catheter as problematic, whilst others had experienced similar problems with other brands of all-silicone catheters.

It was then determined to monitor, by means of a survey, the incidence of difficulty in removing SPCs being managed at home by community nurses from government agencies within two specific area health services of Sydney.

The aims of the two stage survey were to:

- identify problems encountered with the insertion and removal of SPCs,
- note the incidence of balloon cuffing, and,
- assess factors including conditions and equipment used that may affect ease of SPC insertion and removal.

LITERATURE REVIEW

Medical problems generally associated with the use of long term catheterisation have been well documented such as bacteriuria, urinary tract infections, and histological changes (Cravens and Zweig 2000; Tambyah et al 1999; Delnay et al 1999). Although the use of SPCs for long term drainage of the bladder is controversial (Schaafsma et al 1999; Hackler 1982), Sheriff et al (1998) found that patients had a high level of satisfaction in this particular form of bladder management.

The SPC offers several advantages over traditional urethral catheters in that it is sited in a more comfortable position, particularly for persons with limited mobility, it is more appropriate in sexually active persons, it is associated with lower infection rates (Winder 1994, p.25;

Warren 1992, p.814), and it removes the risk of urethral trauma. Also, larger gauge catheters, which are generally avoided in urethral catheterisation, can be used via this insertion method.

Stokes et al (1995) suggest that chronic irritation by the catheter may be associated with the development of pre malignant states in the suprapubic cystostomy tract. Within the past 10 years carcinomas arising in the tract have been reported (Schaafsma et al 1999; Berge et al 1999; Blake et al 1996; Stroumbakis et al 1993).

There are a number of nursing articles on care and maintenance of both urethral catheters and SPCs (Godfrey and Evans 2000; Sienty and Dawson 1999; Ostaszkievicz 1997). Although Foley balloon deflation problems are discussed in the literature (Robinson 2000; Semjonow et al 1995, p.241; Falkiner 1993; Belfield 1988), there was nothing found reporting on the difficulty with SPC removal despite the increasing anecdotal evidence from community nurses of balloon cuffing on deflation and resultant problems.

SURVEY POPULATION AND METHOD

The study was of a comparative descriptive design. The non-probability convenience sample included all persons who had an SPC in situ being managed at home by government employed community nurses and who lived within two specific area health services of Sydney in which the two investigators worked. There were no exclusion criteria. The sample group was to be monitored by means of two staged questionnaires that were to be completed by the attending community nurses at two consecutive SPC changes between the months of January and April 2000. Stage One questionnaire comprised of nine questions that related to the insertion of an SPC and Stage Two questionnaire comprised of 13 questions that related to the removal of the same SPC weeks later.

Stage One questionnaire

As well as patient demographic data, the date and initials of the community nurse who was undertaking the SPC insertion were requested. The community nurse was to list the patient's current medications, date of initial SPC insertion, condition of the stoma, any apparent bleeding, the catheter brand, lumen type, balloon size, and, type and amount of fluid instilled into the retaining balloon. The degree of difficulty to insert the catheter was to be rated by the nurse on a ten point Likert scale, 1 = no difficulty, 10 = very difficult. The degree of pain experienced during the procedure was to be rated by the patient also by means of a 10 point Likert scale, 1 = no pain, 10 = very painful.

Stage Two questionnaire

This questionnaire was to be completed by the attending nurse at the patient's next catheter change. Data collected included the date and the initials of the nurse undertaking the removal procedure. Other data collected was frequency of catheter change, use of anaesthetic jelly, amount of fluid removed from the deflated balloon, and, any associated bleeding on catheter removal. If the patient had a spinal cord injury any symptoms of dysreflexia were to be described. The community nurse was requested to inspect the removed catheter and to note the state of the deflated balloon, that is whether a cuff had been formed or not. Likert scales (as previously described) were to measure degree of difficulty in removing the SPC and degree of associated patient pain.

THE PILOT STUDY

Five community nurses undertook a pilot trial of the survey instruments. A minor change to the Stage Two questionnaire was made to improve clarification prior to implementation across the regions. It was initially planned to have the removed catheters returned along with the completed questionnaires for the investigators to inspect, but this could not be readily organised due to distance, storage, transportation and concerns regarding infection control.

Permission was sought and granted from the relevant directors of nursing in the two area health services, to undertake the two-stage survey. The directors informed their community nursing staff of the pending survey. The questionnaires with an explanatory cover sheet were then delivered to the 11 community centres, and distributed to community nurses known to have patients with an SPC insitu. When the attending community nurses had completed the two stages for each patient the questionnaires were stapled together and sent back to the investigators via the postal system. A 12-week period was given for return of questionnaires.

ANALYSIS

The data were collated, coded and analysed using Statistical Package for the Social Sciences (SPSS-X). Chi Square Test of independence was used to determine the difference between brands of catheter, medications,

balloon cuffing, pain and bleeding. The Mann-Whitney U-test was used to determine the community nurse's degree of difficulty and the patient's degree of pain during both the insertion and removal of the named catheters.

RESULTS

A total of 54 community nurses returned the Stage One and Stage Two questionnaires for each of 98 patients with an SPC insitu (100% return rate). Four paired questionnaires could not be used in the analysis because they were incomplete. The sample therefore comprised of 94 patients, 59% male and 41% female, whose ages ranged from 17 to 90 years of age, with the mean age of 63.5 years. The standard deviation of the mean age was 20 years.

The majority (71%) of patients had their SPC initially inserted more than 12 months prior to the survey date. A majority (89%) had their catheters changed routinely between the 4-6 weekly intervals. Eleven percent had their catheter changed based on functional status. Table 1 demonstrates number of patients, time intervals between changes and reason for change.

Twenty nine percent of the sample were on anticholinergic medication. None of these patients experienced urine leakage from either urethra or stoma site. Anticoagulants were taken regularly by 17% of the sample. Thirty five percent of the sample took muscle relaxant medication regularly, and another 5% took a muscle relaxant only just prior to each catheter change. Other medication types recorded were urinary antiseptics, vitamins, minerals and laxatives. Five patients had a routine intra-muscular injection of an antibiotic 10 minutes prior to the SPC change procedure.

Non parametric statistics were undertaken to identify if medications taken by patients were associated with evidence of pain, bleeding or difficulty in catheter removal. There was a difference in the degree of difficulty in catheter removal, where patients on muscle relaxation medication had a less difficult removal episode ($U=680.0$; $P=0.0055$). No significance was identified between patients who were, and those who were not taking anticoagulant or anticholinergic medication, with pain experienced, evidence of bleeding, or difficulty in catheter removal.

Table 1: Time interval between catheter change, number of patients and reasons for catheter change

Time interval	1 week	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks
Number of patients	1	2	8	53	15	15
Reason for change	Non functioning catheter			Functioning catheter changed on routine		

Out of the 27 patients diagnosed as having had a traumatic spinal cord injury, 20 had the potential for experiencing autonomic dysreflexia. Eleven of these patients actually experienced the condition during the catheter change procedure, however none required medication as treatment. The dysreflexic episode was probably due to the result of pain stimuli either on catheter removal or insertion, but this is conjecture, and therefore these patients could not be included in the patients' self rating degrees of pain Likert scale.

The attending nurses stated that in 30% of cases, the catheter was difficult to insert, and degrees of pain were experienced by 42% of the patients during the insertion procedure. In 49% of cases, the catheter was difficult to remove and degrees of pain were experienced by 48% of the patients during the removal procedure. There was evidence of bleeding from the site following the removal of 35% of the catheters. Twenty seven percent of the sample group had apparent overgranulation occurring of the stoma. Bleeding either on insertion or removal of the catheters was not significant in these patients.

Five different brands of Foley catheter were used during the survey. These included: Simpla, Bard, Dover, Cliny and Bardia. The catheter material of the first four brands is all-silicone, and Bardia is manufactured from natural rubber latex, silicone elastomer coated. The Bardia sample two cases were not included in analysis when brands were compared because of the different material make up.

The nurses in 53% of cases visually identified apparent cuffing of the collapsed deflated balloon. There was no significant statistical difference between the rate of cuffing between brands, however the Simpla brand was significantly more difficult to remove compared with the other brands ($\chi^2=16.2486$, d.f.=3, $P=0.0010$). There was no significant difference identified between brands of catheter and bleeding or pain on catheter removal ($\chi^2=5.94548$, d.f.=3, $P=0.11429$). Despite no significance, Table 2 demonstrates a trend towards increased bleeding and pain with the Simpla brand when compared to the other brands.

There was no difference between solution types, either saline or water, instilled into a balloon and balloon cuffing on deflation. Eighty two percent of the nurses tested the balloon by solution inflation prior to insertion, and on 81% of occasions, the balloon size was small, 5-10mls. Catheter sizes ranged from 12Fg to 24Fg with the most utilised size being 16Fg (43%). No particular size was associated with difficult removal when compared with other sizes. Ten percent of the nurses used an anesthetic jelly in the SPC tract prior to the catheter's insertion for the patient's comfort.

DISCUSSION

Repeated trauma to the SPC tract, apart from the immediate pain and bleeding associated with difficult removal of the catheter, may be harmful. The potential for complications arising from such repeated trauma raised questions about the incidence of traumatic SPC removals. The presence of a cuffed deflated balloon was evident in over half of the all-silicone catheters surveyed. The question is whether all-silicone catheters should continue to be used, given the need for regular catheter changes and the potential problem of tissue damage on catheter removal. Although all the catheters used in the survey were identical in material it was identified that the Simpla brand of catheter was associated with more bleeding, more pain and more difficulty in removal (Table 2). These findings support the clinical practice difficulties associated with Simpla catheters that had been reported by the community nurses.

In the majority of catheters surveyed, the balloon size was small, as is generally recommended for optimal drainage and decreased chance of bladder irritability with spasm (Getliffe 1994), and the balloons were test inflated prior to insertion to confirm a spherical shape. A wide size range of catheters were used - each size selected on the basis of the individual's need to adequately drain urine. The size of the catheter did not impact on the degree of removal difficulty.

Table 2: Comparison of catheter brands against difficulty in removal, a cuff present, evidence of bleeding and pain on removal

Brand of catheter	Cases	Difficulty in removal Mean rank	Cuff present on removed catheter	Bleeding on removal	Pain on removal Mean rank
Dover	34	49.13	20 (58.8%)	10 (29.4%)	48.51
Cliny	30	33.52	14 (46.7%)	13 (43.3%)	36.62
Simpla	14	64.86	9 (64.35)	9 (64.35)	63.14
Bard	14	49.57	6 (42.9%)	4 (28.6%)	46.14
Bardia	2				
Total	94				

Frequency of catheter changes is of concern because of the potential repeated trauma that occurs during the procedure. This survey found that the majority of patients had their catheters changed routinely between four and six weeks (Table 1). Catheter change frequencies is a controversial issue for clinicians. Despite the understanding that bacteriuria is almost inevitable in persons with long term indwelling catheters (Zimakoff et al 1996, p.215; Warren 1996, p.212), there remain inconsistencies in practice related to care of indwelling catheters. Millard's guidelines (1987) have driven the practice of changing a catheter on a monthly basis in New South Wales, on the understanding that the practice lowers the incidence of complications such as blockage and symptomatic UTIs, while others (White and Ragland 1995) argue that individuals whose catheters were changed more frequently were more likely to develop infection. Getliffe (1993) and Belfield (1988) state that catheter changes should be based on function, degree of catheter encrustation and frequency of blockage, and that catheters which are functioning effectively could be left insitu for up to three months.

Within the sample group surveyed were persons with the diagnosis of traumatic spinal cord injury, 11 of whom experienced autonomic dysreflexia during the catheter change. Only on five of these occasions a deflated balloon cuff was present causing difficult catheter removal. It is known that the catheter change procedure alone can act as a stimulus for autonomic dysreflexia, however a traumatic change, by pulling a cuffed deflated balloon through the tract, increases the risk. Any stimulus that brings on dysreflexia should be avoided as autonomic dysreflexia is a medical emergency.

Muscle relaxants used in this sample group were Valium and Baclofan/Lioresal. Although the use of muscle relaxant medication was found to be associated with increased ease of catheter removal, widespread advocacy for their use prior to SPC removal is not recommended in view of the significant associated side effects.

As a non-probability convenience sample was used for this survey, caution should be taken in generalising the findings. Further research is required to overcome the limitations of the study. A large randomised control study with significant numbers of participants is required to achieve statistical power, therefore preventing a Type 2 error. For example, no significant difference was found between medications and pain or bleeding, overgranulation and bleeding, or between catheter brands, solution types instilled into balloons and rates of balloon cuffing. The reason for this was the small sample size (n=94) whereby there may have been an effect if the sample was larger. Another limitation of the study was that interrater variability could not be controlled for in the 54 community nurses.

CONCLUSION

In the mid 1980s urethral catheters were the common mode of bladder drainage, while today, SPCs are gaining in popularity as the drainage mechanism of choice. Our study within two specific area health services found that 63% of all indwelling catheters (n=155) were SPCs. Given the rate of cuffing associated with all-silicone catheters and possible complications the question is whether all-silicone catheters are necessary for SPC tracts. Latex and silicone combinations exist and their cuffing rate is anecdotally believed to be less than that of all-silicone, however this is an area that has not been researched. Given the issue of latex allergy and the recent New South Wales Department of Health (NSW Health Dept) position on eliminating latex from usage in public health care facilities by 2003, there may be no present alternative than to use all-silicone catheters. Product companies were aware of this survey and have received the results.

This study has identified one catheter brand (Simpla) being associated with more pain, bleeding and increased difficulty in removal. Cuffing of the deflated balloon as a result of hysteresis was evident in 50% in the four brands of all-silicone catheters surveyed. Cuffing may be associated with increased trauma to the tract and bladder at catheter change. In view of the anecdotal evidence, and in light of these findings, a review of the risks and benefits associated with all-silicone catheters used for SPC insertions is recommended. Further research is also needed to address the ongoing questions as to whether frequent regular catheter changes make a difference to rates of catheter acquired UTIs or other complications.

REFERENCES

- Belfield, P.W. 1988. Urinary catheters' balloon volume. *British Medical Journal*. 296:836-837.
- Berge, B., Heicappell, R., Steine, U. and Miller, K. 1999. Urothelial carcinoma in a suprapubic cystostomy tract 27 years after tube removal. *Journal of Urology*. 162:797-798.
- Blake, P.A., Kim, C.O., Lopez, A.E. and Krongrad, A. 1996. Verrucous carcinoma of a suprapubic cystostomy track. *Journal of Urology*. 156:174.
- Burkitt, D.S., Barwell, N.J. and Wilson, A.G.M. 1986. Urethral catheter strictures. *Lancet*. 1:688.
- Cravens, D.D. and Zweig, S. 2000. Urinary catheter management. *American Family Physician*. 61(2):369-376.
- Capwell, A.E. and Morris, M. 1993. Audit of catheter management provided by district nurses and continence advisors. *British Journal of Urology*. 71:259-264.
- Delnay, K.M., Stonehill, W.H., Goldman, H., Jukkola, A.F. and Dmochowski, R.R. 1999. Bladder histological changes associated with chronic indwelling urinary catheters. *Journal of Urology*. 161:1106-1108.
- Falkiner, F.R. 1993. The insertion and management of indwelling urethral catheters. *Journal of Hospital Infection*. 25(2):79-90.
- Getliffe, K. 1993. Informed choices for long term benefits. The management of catheters in continence care. *Professional Nurse*. 9(2):122-126.
- Getliffe, K. 1994. The characteristics and management of patients with recurrent blockage of long term urinary catheters. *Journal of Advanced Nursing*. 20(1):140-149.
- Godfrey, H. and Evans, A. 2000. Catheterisation and urinary tract infections. *British Journal of Nursing*. 9(11):682-686.

- Hackler, R.H. 1982. Long term suprapubic cystostomy drainage in spinal cord injury patients. *British Journal of Urology*. 54:120-121
- Millard, R.J. 1987. *Guidelines for satisfactory chronic indwelling catheter care*. Eastern Area Community Health. Sydney: Australia.
- New South Wales (NSW) Health Department. 2000. *Policy framework and guidelines for the prevention and management of on latex allergies*. Circular 2000/99. New South Wales. December 2000.
- Ostaszkievicz, J. 1997. Catheterisation and nursing management. *Australian Nursing Journal*. 14(8):22-27.
- Robinson, J. 2000. Removing catheters. *Journal of Community Contacts* (online) 14(12). Website: <http://www.jcn.co.uk/3-12-07.htm>
- Ruutu, M., Alfthan, O., Talja, M. and Anderson, L.C. 1985. Cytotoxicity of latex urinary catheters. *British Journal of Urology*. 57:82-87.
- Schaafsma, H., Delaere, K.P.J. and Theunissen, P.H.M.H. 1999. Squamous cell carcinoma of suprapubic cystostomy tract without bladder involvement. *Spinal Cord*. 37:373-374.
- Semjonow, A., Roth, S. and Hertle, L. 1995. Reducing trauma removing long term balloon catheters. *British Journal of Urology*. 75:241.
- Sheriff, M., Foley, S., McFarlane, R., Nauth-Misir, R., Craggs, M. and Shah, P. 1998. Long term suprapubic catheterisation: clinical outcomes and satisfaction survey. *Spinal Cord*. 36:171-176.
- Sienty, M. and Dawson, N. 1999. Preventing urosepsis from indwelling urinary catheters. *American Journal of Nursing*. 99(1):24C-24H.
- Stokes, S., Wheeler, J.S. and Reyes, C.V. 1995. Squamous cell carcinoma arising from a suprapubic cystostomy tract with extension into the bladder. *Journal of Urology*. 154:1332-1333.
- Stroumbakis, N., Choudhury, M.S. and Hernandez-Graulau, J.M. 1993. Squamous cell carcinoma arising from a suprapubic cystostomy site without bladder involvement. *Journal of Urology*. 41:568-570.
- Talja, A., Andersson, L.C., Ruutu, M. and Alfthan, O. 1985. Toxicity testing of urinary catheters. *British Journal of Urology*. 57:579-584.
- Tambyah, P.A., Halvorson, M.S. and Maki, D. 1999. A prospective study of pathogenesis of catheter associated urinary tract infections. *Mayo clinic proceedings*. 74:131-136
- Warren, J. 1992. Catheter associated bacteriuria. *Clinics in Geriatric Medicine*. 8(4):805-819.
- Warren, J. 1996. Urethral catheters, condom catheters and nosocomial urinary tract infections. *Infection Control and Epidemiology*. 17(4):212-214.
- Winder, A. 1994. Supra-pubic catheterisation. *Community Outlook*. 4(12):25-27.
- White, M.C. and Ragland, K. 1995. Urinary catheter related infections among home care patients. *Journal of Wound, Ostomy and Continence Nursing*. 22 (6): 286-289.
- Zimakoff, J., Stickler, D., Pontoppidan, B. and Larsen, S. 1996. Bladder management and urinary tract infections in Danish hospitals, nursing homes and home care: a national prevalence study. *Infection Control and Epidemiology*. 17 (4):215-221