



Indwelling urethral versus suprapubic catheters in nursing home residents: determining the safest option for long-term use[☆]

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ARTICLE INFO

Article history:

Received 28 June 2018

Accepted 19 July 2018

Available online 26 July 2018

Keywords:

Indwelling urethral catheter

Suprapubic catheter

Nursing homes

Catheter-associated urinary tract infection

Multidrug-resistant organisms



SUMMARY

Background: The incidence of infectious complications has not been previously compared for two types of common urinary catheters used in the long-term care setting: indwelling urethral catheters and suprapubic catheters.

Aim: To compare catheter-associated urinary tract infection (CAUTI) rates and multidrug-resistant organism (MDRO) colonization between nursing home residents with indwelling urethral and suprapubic catheters.

Methods: Participants included 418 nursing home residents with an indwelling device enrolled in a previously published prospective targeted infection prevention study conducted between 2010 and 2013. Resident age, gender, function, comorbidities, and information on infections, antibiotic use, and recent hospitalizations were obtained at study enrolment, day 14, and every 30 days thereafter for up to one year. Microbiological samples were obtained from several anatomic sites at each visit. Cox proportional hazard models were adjusted for facility-level clustering and other covariates.

Findings: In all, 208 study participants had an indwelling urinary catheter, contributing 21,700 device-days; 173 (83%) with a urethral catheter, 35 (17%) with a suprapubic catheter. After covariate adjustment, the suprapubic group had a lower incidence of CAUTI (6.6 vs 8.8 per 1000 device-days; $P = 0.05$), were half as likely to be hospitalized (hazard ratio (HR) = 0.46; $P < 0.01$) and were 23% less likely to have had antibiotics in the past 30 days (HR = 0.77; $P = 0.02$). Among residents catheterized ≥ 90 days, the mean number of MDROs isolated in the suprapubic group was significantly higher than in the urethral group

[☆] This manuscript was presented as an oral presentation at the American Geriatrics Society (AGS) conference in Long Beach, California, USA, May 19th to 21st, 2016.

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(0.57 vs 0.44; $P = 0.01$). Ciprofloxacin-resistant Gram-negative bacilli were frequent in both groups.

Conclusion: Residents with a suprapubic catheter may have fewer CAUTIs, less hospitalization and less antibiotic use, but are more likely colonized with MDROs.

Published by Elsevier Ltd on behalf of The Healthcare Infection Society.

Introduction

Nearly 5–8% of 1.6 million individuals in US nursing homes have an indwelling urinary catheter [1–3]. The indications for urinary catheter use are wide-ranging, from patients with pressure ulcers or wounds and low functional status to traumatic pelvic injury or neurogenic bladder disease [3,4]. Nursing home residents are often catheterized for weeks to months or longer. Whereas urinary catheterization may simplify the daily care of these patients, catheterization significantly increases urinary tract infections (UTIs) and overall morbidity and mortality [3–5]. Microbial colonization of urine occurs within five to seven days of urinary catheter placement and is frequently associated with the development of a bacterial biofilm, presumably the source of catheter-associated urinary tract infection (CAUTI) [6]. Furthermore, previous research from our group has shown that indwelling urinary catheter doubles the prevalence and new acquisition of multidrug-resistant organisms (MDROs) [7–10].

Urethral catheters and suprapubic catheters are two types of indwelling urinary catheterization used in hospitals and other long-term settings including nursing homes, long-term acute care hospitals, and inpatient hospice care [4]. Some studies have found a decreased risk of CAUTI with the use of a suprapubic catheter relative to a urethral catheter, but most of these focus on acute, postoperative patients with durations of catheterization substantially shorter than long-term settings [11–13]. For example, the 2006 review from McPhail *et al.* focused on six studies of patients undergoing abdominal surgery, with duration of catheterization ranging from four to eight days [13]. Further, the patient populations in these studies are, on average, younger and more functional compared with patients receiving care at nursing homes. Thus, the findings from these studies are not generalizable to patients receiving long-term care.

The goals of our study were to compare the incidence of clinically defined and antibiotic-treated CAUTIs, rates of hospitalization, and antibiotic usage between nursing home residents with indwelling urethral catheters and suprapubic catheters. Additionally, we examined rates and patterns of MDRO colonization between the two groups.

Methods

Study population and design

This pilot study was nested within a larger, cluster-randomized targeted infection prevention (TIP) study [14]. The goal of the parent study was to design, implement, and evaluate the efficacy of a multi-component TIP programme in reducing MDRO prevalence and infections in high-risk nursing home residents. Components of this programme included: active surveillance for infections and MDROs; barrier

precautions; hand hygiene; and infection prevention education. The project was approved by the University of Michigan Institutional Review Board and was conducted in 12 (six control, six intervention) community-based nursing homes in Michigan over the course of three years. Study inclusion criteria were: (a) any short- or long-stay resident with an indwelling urinary catheter (urethral or suprapubic) and/or a feeding tube (nasogastric or percutaneous endoscopic gastrostomy tube) for >72 h (residents with long-standing devices as well as new devices were included since all residents with devices were at risk for new MDRO acquisition or infection); and (b) provision of informed consent. Residents receiving end-of-life care were excluded.

Upon enrolment, study visits occurred at baseline, day 14, and monthly thereafter for a maximum of one year (or until death, discharge, or device discontinuation). Residents who were admitted to acute care hospitals and returned to the nursing home remained in the study. Clinical and demographic data were obtained from the source documents at the participating facility and chart review conducted by trained research staff. A total of 418 residents (control sites, $N = 215$; intervention sites, $N = 203$) were enrolled in the TIP study. For the current study, we focused on residents with an indwelling urinary catheter in place for more than one follow-up visit ($N = 208$).

Data collection

Demographic data including age, race, and sex were recorded for each participant at study enrolment. The Charlson Comorbidity Index was calculated for each resident and the Lawton and Brody Physical Self-Maintenance Scale was used to assess patients' functional status at each study visit [15]. Clinical data such as device type, new infections, hospitalizations for any reason within the last 30 days (yes/no) and antibiotic usage within the last 30 days (yes/no, antibiotic, dosage, duration) were collected at enrolment and each subsequent study visit. CAUTIs were defined clinically, requiring a clinician's note documenting a UTI in a catheterized patient and the use of systemic antibiotics for ≥ 3 days to treat the infection.

Active surveillance cultures for MDROs were performed by obtaining microbiological samples from resident nares, oropharynx, enteral feeding tube and suprapubic device insertion sites, groin, peri-rectal area, and wounds at each follow-up visit, regardless of prior colonization status. Standard microbiologic methods were used to identify meticillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), ceftazidime-resistant Gram-negative bacilli (CTZ-R GNB), and ciprofloxacin-resistant Gram-negative bacilli (CIP-R GNB) as previously described [9].

Statistical analyses

The incidence per 1000 device-days of three outcomes (CAUTI, antibiotic usage, and hospitalization) was compared

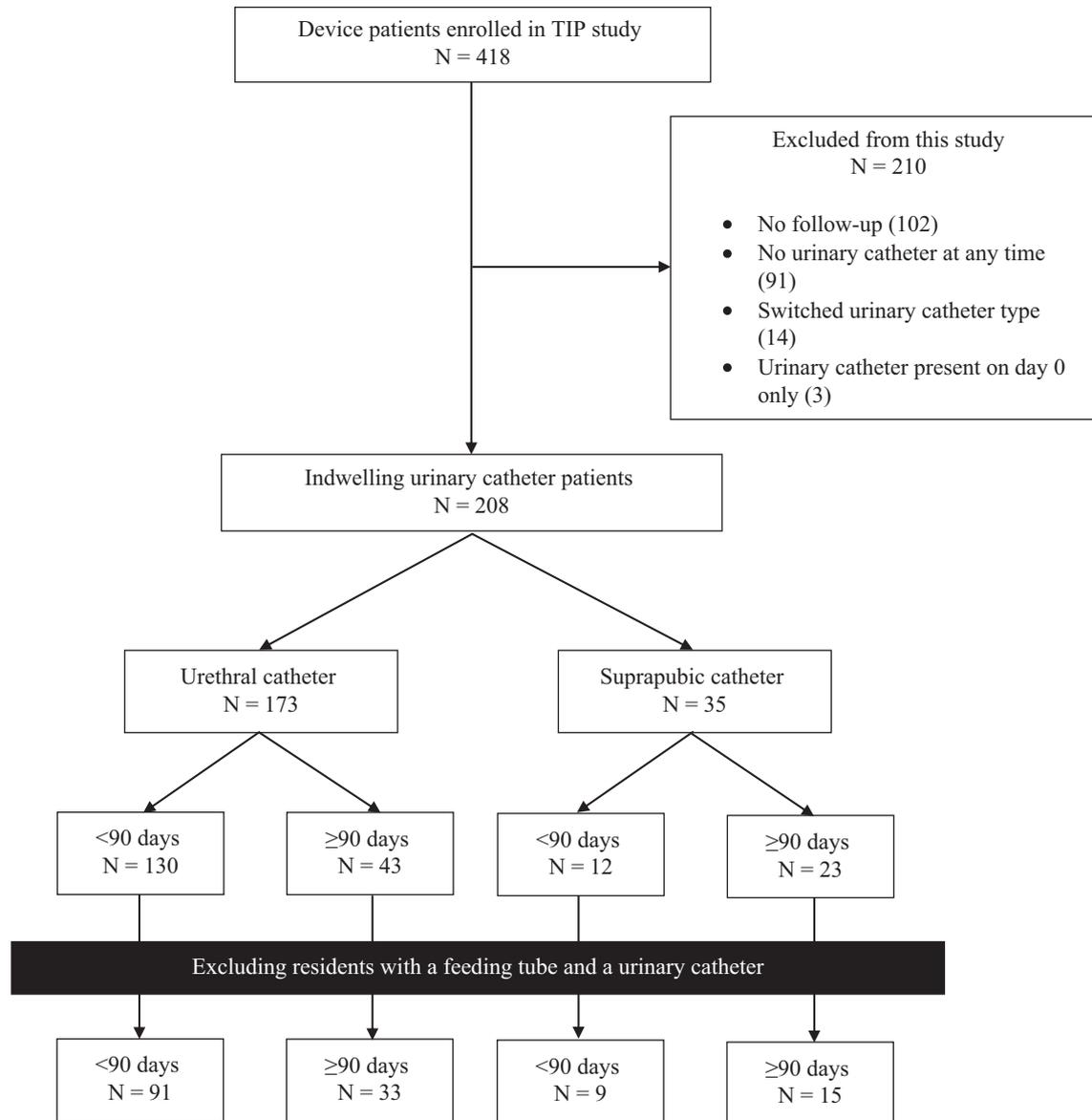


Figure 1. The Targeted Infection Prevention (TIP) study included 418 residents from 12 different nursing home facilities who had an indwelling device in place (urinary catheter, feeding tube, or both). Of these, 102 had only an initial study visit without subsequent follow-up. We excluded these patients from analysis. Of the remaining 316 residents, 91 had no catheter during the study period (i.e. had a feeding tube only) and 14 switched from one catheter type to another one. Three residents with a catheter were identified at the first visit only. These 108 residents were also excluded from the analysis, resulting in 208 nursing home residents with an indwelling urinary catheter in place during follow-up. Of the 208 residents with an indwelling urinary catheter, 173 had a urethral catheter and 35 had a suprapubic catheter. Those who had the device in place for <90 days or ≥90 days were separated out. For the analysis focusing on colonization with multidrug-resistant organisms, residents who had a feeding tube were excluded, isolating those residents who had a urinary catheter only (seen here below the black line).

between residents with a urethral and a suprapubic catheter. A Cox proportional hazard model was used to determine the effect of catheter type on the three outcomes with and without adjusting for other covariates. The proportional hazard assumption was tested using Kaplan–Meier survival curves between the two groups. Since the outcomes are often recurrent events, we employed a counting process approach by considering the risk interval [16]. Covariate-adjusted hazard ratios were adjusted for site intervention

status, age, sex, race, comorbidity score, functional status, and the standard error for facility cluster. The analysis was stratified by duration of catheter use (<90 vs ≥90 days). To compare catheter-type differences in MDRO colonization, the unpaired *t*-test was used; to compare the prevalence of MRSA, VRE, CTZ-R GNB, and CIP-R GNB-positive samples, SAS 9.3 was used to run a generalized linear mixed model adjusting for facility-level clustering and intervention effect.

Table IBaseline characteristics of nursing home residents with indwelling urethral and suprapubic catheters (*n* = 208)

Characteristic	Urethral catheter (<i>N</i> = 173)	Suprapubic catheter (<i>N</i> = 35)	Total (<i>N</i> = 208)	<i>P</i> -value
Age (years), mean (SD)	74.7 (12.0)	71.0 (14.2)	74.1 (12.4)	0.11
Male	85 (49.1)	25 (71.4)	110 (52.9)	0.02
White	155 (89.6)	30 (85.7)	185 (88.9)	0.55
Baseline weight, mean (SD)	186.9 (78.1)	175.7 (41.1)	185.0 (73.2)	0.23
Comorbidity score, mean (SD)	2.9 (1.8)	3.0 (2.1)	2.9 (1.8)	0.85
PSMS ^a , mean (SD)	22.0 (3.9)	22.7 (3.5)	22.1 (3.9)	0.36
Urinary catheter device-days				<0.001
≥90	43 (24.9)	23 (65.7)	66 (31.7)	
<90	130 (75.1)	12 (34.3)	142 (68.3)	
Feeding tube device-days				0.25
0 days	124 (71.7)	24 (68.6)	148 (71.2)	
1–30 days	11 (6.4)	2 (5.7)	13 (6.25)	
21–90 days	17 (9.8)	1 (2.8)	18 (8.7)	
>90 days	21 (12.1)	8 (22.9)	29 (13.9)	
Intervention site	90 (52.0)	16 (45.7)	106 (51.0)	0.50

SD, standard deviation; PSMS, physical self-maintenance score.

Data are no. (column %) of residents, unless otherwise indicated. *P* values were obtained using Student's *t*-test for continuous variables and χ^2 -test for categorical variables.^a The Lawton and Brody scale assigns patients a score from 6 to 30, with 30 representing the highest level of physical dependence.

Results

Study population

In all, 208 nursing home residents had an indwelling urinary catheter in place during follow-up, contributing 21,700 device-days (Figure 1). Of these, 173 (83.2%) residents had an indwelling urethral catheter and 35 (16.8%) residents had a suprapubic catheter. Resident characteristics are shown in Table I.

Rates of infection, hospitalization, and antibiotic usage

Table II shows incidence rates for CAUTI, recent hospitalizations, and recent antibiotic use in the total population and at the intervention versus control sites. The unadjusted hazard

ratio (HR) for CAUTI in suprapubic residents when compared to urethral catheter residents was 0.82 (95% confidence interval (CI): 0.61–1.11; *P* = 0.21). When adjusting for site intervention status, age, sex, race, comorbidity score, and functional status, the HR decreased to 0.73 (95% CI: 0.53–1.00; *P* = 0.05). The intervention did not change any of the observed differences between suprapubic and urethral catheters.

In an unadjusted model, patients with suprapubic catheters were 52% less likely to have been hospitalized in the past 30 days (HR: 0.48; 95% CI: 0.29–0.78; *P* < 0.01). After covariate-adjustment, suprapubic residents were still only half as likely to have been hospitalized in the previous 30 days than those with a urethral catheter (HR: 0.46; 95% CI: 0.32–0.67; *P* < 0.01).

The unadjusted HR for antibiotic use in suprapubic residents was 0.85 (95% CI: 0.71–1.02; *P* = 0.08). After covariate adjustment, suprapubic residents were ~23% less likely to

Table II

Clinical outcomes (i.e. infection, hospitalization and antibiotic rates)

	Rate, per 1000 device-days		Unadjusted HR		Covariate-adjusted HR ^a	
	Urethral catheter	Suprapubic catheter	HR (95% CI)	<i>P</i> -value	HR (95% CI)	<i>P</i> -value
Total population	(<i>N</i> = 173)	(<i>N</i> = 35)				
New CAUTI	8.8	6.6	0.82 (0.61–1.11)	0.21	0.73 (0.53–1.00)	0.05
Hospitalized in past 30 days	6.2	2.4	0.48 (0.29–0.78)	<0.01	0.46 (0.32–0.67)	<0.01
Antibiotic use in the past 30 days	20.2	15.7	0.85 (0.71–1.02)	0.08	0.77 (0.62–0.96)	0.02
Control sites	(<i>N</i> = 83)	(<i>N</i> = 19)				
New CAUTI	10.8	6.5	0.73 (0.47–1.15)	0.17	0.64 (0.44–0.94)	0.02
Hospitalized in past 30 days	6.9	3.0	0.51 (0.26–1.00)	0.05	0.43 (0.25–0.75)	<0.01
Antibiotic use in the past 30 days	21.5	15.6	0.81 (0.56–1.18)	0.28	0.73 (0.47–1.12)	0.15
Intervention sites	(<i>N</i> = 90)	(<i>N</i> = 16)				
New CAUTI	7.1	6.7	0.93 (0.60–1.43)	0.73	0.98 (0.71–1.34)	0.88
Hospitalized in past 30 days	5.6	1.7	0.39 (0.23–0.68)	<0.01	0.51 (0.26–1.02)	0.06
Antibiotic use in the past 30 days	19.2	15.8	0.89 (0.77–1.04)	0.15	0.81 (0.64–1.02)	0.07

HR, hazard ratio; CI, confidence interval; CAUTI, catheter-associated urinary tract infection.

^a Adjusted for site intervention status, age, sex, race, comorbidity score, functional status, and the standard error for facility cluster.

have been prescribed antibiotics in the previous 30 days (HR: 0.77; 95% CI: 0.62–0.96; $P = 0.02$).

Patients with catheterization extending beyond 90 days

Because a major distinction between indwelling urinary catheterization in nursing home facilities and the acute care setting is duration of catheterization, we also analyzed infection outcomes in a subgroup of nursing home residents who were catheterized for ≥ 90 days. Sixty-six residents were catheterized for this length of time; 43 (24.9%) in the urethral catheter group and 23 (65.7%) in the suprapubic catheter group (Figure 1).

After covariate adjustment, there was no statistically significant difference in CAUTI occurrence between residents with a suprapubic catheter in place for ≥ 90 days compared to those with a urethral catheter in place for ≥ 90 days (HR: 0.83; 95% CI: 0.61–1.16; $P = 0.29$). There was no statistically significant difference in antibiotic usage in the past 30 days in suprapubic residents compared to urethral catheter residents (HR: 0.92; 95% CI: 0.78–1.08; $P = 0.29$). On the other hand, there remained a statistically significant reduction in hospitalizations among residents who had a suprapubic catheter compared to those with a urethral catheter for ≥ 90 days (HR: 0.53; 95% CI: 0.35–0.79; $P < 0.01$).

MDRO colonization

MDRO colonization was assessed at different anatomic sites in residents with a urethral and suprapubic catheter, again stratifying by length of catheterization. For this analysis, those residents who had both a feeding tube and a urinary catheter were excluded, resulting in 124 residents with a urethral catheter only and 24 residents with a suprapubic catheter only (Figure 1). Among those catheterized for ≥ 90 days, residents with a suprapubic catheter had a significantly higher mean number of MDROs (0.57 vs 0.44, $P = 0.01$) than residents with a urethral catheter. Residents with suprapubic catheters were more frequently colonized at the groin and wounds (Table III). Table IV shows the specific organisms found in each group. CIP-R GNB were the most frequent organisms colonizing both

urethral and suprapubic catheter residents (Table IV), specifically *Proteus mirabilis* and *Escherichia coli* (Table V).

Discussion

We compared rates of CAUTI, hospitalization, and antibiotic use among nursing home residents with either indwelling urethral or suprapubic catheter. MDRO colonization was also examined at various anatomic sites of residents with either type of catheter. Use of a suprapubic catheter among nursing home residents was protective against CAUTI in residents catheterized < 90 days, but this result did not reach statistical significance in those catheterized ≥ 90 days. Residents with a suprapubic catheter were half as likely to be hospitalized, and 23% were less likely to receive antibiotics in the past 30 days, when compared to residents with a urethral catheter. Whereas suprapubic catheterization appeared to be advantageous in terms of clinical outcomes, nursing home residents with a suprapubic catheter were more likely to be colonized with MDROs.

Previous studies comparing urethral and suprapubic catheterization have revealed advantages and disadvantages to both [11,17–19]. In a systematic review and meta-analysis by Healy *et al.*, suprapubic catheterization was associated with a significant reduction in postoperative UTIs (20% compared with 31%; pooled odds ratio (OR): 0.31; 95% CI: 0.185–0.512; $P < 0.01$) compared to urethral catheterization in gynaecologic populations [11]. However, suprapubic catheter patients had an increased risk of non-infectious complications including urine leakage, catheter blockage, haematuria and urinary retention (29% compared with 11%; pooled OR: 4.14; 95% CI: 1.33–12.9; $P = 0.01$). Another review by Hunter *et al.* identified studies comparing suprapubic catheterization to any other method of bladder emptying such as intermittent and indwelling urethral catheterization in adults [19]. Whereas the incidence of upper and lower urinary tract complications between urethral and suprapubic catheters was similar, suprapubic catheterization was associated with a lower incidence of urethral complications.

In our study, nursing home residents with suprapubic catheterization were less likely to be hospitalized, to receive antibiotics and to experience a CAUTI. This protective effect of suprapubic catheterization on hospitalization and antibiotic

Table III

Mean number of multidrug-resistant organisms isolated from each anatomic site

Anatomic site	Mean no. of MDROs (95% CI)					
	<90 days			≥ 90 days		
	Urethral catheter ($N = 91$)	Suprapubic catheter ($N = 9$)	P -value ^a	Urethral catheter ($N = 33$)	Suprapubic catheter ($N = 15$)	P -value ^a
Nares	0.17 (0.11, 0.22)	0.22 (0.04, 0.40)	0.55	0.11 (0.07, 0.14)	0.15 (0.10, 0.20)	0.16
Oropharynx	0.21 (0.14, 0.29)	0	<0.001	0.07 (0.03, 0.11)	0.03 (–0.00, 0.07)	0.19
Groin	0.46 (0.34, 0.58)	0.50 (0.05, 0.95)	0.85	0.69 (0.58, 0.80)	0.94 (0.76, 1.12)	0.02
Peri-rectal	0.93 (0.70, 1.17)	1.17 (–0.23, 2.56)	0.66	1.06 (0.90, 1.21)	1.22 (0.94, 1.50)	0.32
Wound	0.91 (0.28, 1.54)	2.33 (–1.46, 6.13)	0.06	1.14 (0.64, 1.65)	3.54 (2.07, 5.01)	<0.01
Total	0.39 (0.33, 0.44)	0.40 (0.19, 0.60)	0.91	0.44 (0.39, 0.49)	0.57 (0.48, 0.66)	0.01

MDRO, multidrug-resistant organism; CI, confidence interval.

Data are from 148 residents who had a urinary catheter only (no feeding tube). The total number of swabs collected from each site included: 698 nares swabs; 647 oropharynx swabs; 719 groin swabs; 369 peri-rectal swabs; and 48 wound swabs. The 48 wound swabs were collected from 27 nursing home residents (22 urethral catheter; five suprapubic catheter).

^a P values were obtained from unpaired t -test, unadjusted for clustering.

Table IV

Microbial survey results for individual multidrug-resistant organisms in nursing home residents with a urethral catheter versus suprapubic catheter

Organism	No. of MDRO-positive samples/no. samples collected (%)					
	<90 days			≥90 days		
	Urethral catheter (n = 91)	Suprapubic catheter (n = 9)	P-value ^a	Urethral catheter (n = 33)	Suprapubic catheter (n = 15)	P-value ^a
MRSA	82/791 (10.4)	10/78 (12.8)	0.53	72/977 (7.4)	49/577 (8.5)	0.46
VRE	65/791 (8.2)	1/78 (1.3)	0.12	32/977 (3.3)	25/577 (4.3)	0.33
CTZ-R GNB	45/791 (5.7)	4/78 (5.1)	0.85	43/977 (4.4)	42/577 (7.3)	0.05
CIP-R GNB	96/791 (12.1)	12/78 (15.4)	0.45	227/977 (23.2)	155/577 (26.9)	0.16
Any MDRO	188/791 (23.8)	17/78 (21.8)	0.71	281/977 (28.8)	185/577 (32.1)	0.22

MDRO, multidrug-resistant organism; MRSA, methicillin-resistant *Staphylococcus aureus*; VRE, vancomycin-resistant enterococci; CTZ-R, ceftazidime-resistant; GNB, Gram-negative bacilli; CIP-R, ciprofloxacin-resistant.

Data are from 148 residents who had a urinary catheter only (no feeding tube).

^a P values were obtained using a generalized linear mixed model, adjusted for facility-level clustering.

Table V

Microbial survey results for ciprofloxacin-resistant Gram-negative bacilli in indwelling urethral catheters versus suprapubic catheters

Organism	No. (%) CIP-R GNB organisms/total no. (%) CIP-R isolates	
	Urethral catheter	Suprapubic catheter
	<i>Acinetobacter baumannii</i>	17/393 (4.3)
<i>Escherichia coli</i>	147/393 (37.4)	66/216 (30.6)
<i>Klebsiella pneumoniae</i>	22/393 (6.0)	12/216 (5.6)
<i>Morganella morganii</i>	14/393 (3.6)	9/216 (4.2)
<i>Proteus mirabilis</i>	146/393 (37.2)	70/216 (32.4)
<i>Providencia stuartii</i>	13/393 (3.3)	14/216 (6.5)
<i>Pseudomonas</i> spp.	20/393 (5.1)	26/216 (12.0)
<i>P. aeruginosa</i>	15/393 (3.8)	17/216 (7.9)
<i>P. fluorescens</i>	0/393 (0)	4/216 (1.9)
<i>P. luteola</i>	3/393 (1.0)	1/216 (0.5)
<i>P. oryzihabitans</i>	2/393 (0.5)	3/216 (1.4)
<i>Pseudomonas</i> sp.	0/393 (0)	1/216 (0.5)
Other/unknown ID	14/393 (3.6)	2/216 (1.0)

CIP-R GNB, ciprofloxacin-resistant Gram-negative bacilli.

usage remained even after adjusting for covariates, including measures of comorbidity and functional status. It is possible that nursing home residents with suprapubic catheters are a different patient population with lower severity of illness. However, the parameters collected in our study suggest that the two groups had no significant differences in baseline characteristics other than female sex (the urethral catheter had a higher proportion of female patients) and length of catheterization (higher in the suprapubic group); both of these variables were adjusted for in Cox regression models and the difference remained statistically significant. Importantly, there were no baseline differences in functional status or Charlson comorbidity scores and the results remained significant after adjusting for these indices. Our results call for future randomized prospective studies to evaluate differences in clinical outcomes based on catheter choices. Such studies can then inform choices made by practicing physicians and urologists.

It is possible that the protective effect of suprapubic catheters seen in this study signifies a truly decreased risk of occult

infection, urinary tract colonization, urosepsis, and other phenomena that may lead to clinical worsening or destabilization of a patient, requiring hospitalization and/or antibiotic usage. Maintenance care provision habits also differ between suprapubic and urethral catheters – suprapubic catheter sites are typically manipulated using sterile technique and only by nurses or advanced providers, whereas urethral catheters may be managed by nursing aides and with hand hygiene measures (handwashing, gloves), but not sterile technique [5]. Further, suprapubic catheters are visible in areas often examined (abdomen), whereas the perineal area may not be examined as frequently or with as much ease as the abdomen.

It is hypothesized that urethral catheters are associated with higher rates of CAUTI due to an increase in urethral trauma, catheter blockage, and manipulation of a device in close proximity to the perineal area and associated flora, of which many common species are known uropathogens [12,13]. Whereas nursing home residents with a urethral catheter in our study did have higher rates of CAUTIs, they were less likely to be colonized with MDROs at the groin and peri-rectal area compared to those with a suprapubic catheter, regardless of length of catheterization. Prospective culturing of multiple anatomic sites over a prolonged period of time is a unique strength of our study [7,8]. Previous studies involving MDRO colonization in device patients have not found significant differences between indwelling urethral and suprapubic catheter patients; however, these studies focused on microbiology reports of urine cultures rather than asymptomatic colonization [20,21]. Higher colonization with MDROs may play a role in transmission of MDROs from patient to environment, health-care workers and other patients. Future studies should design interventions to reduce MDROs in these high-risk patients.

We acknowledge some limitations in our study. First, although we had substantial follow-up period as measured by device-days, the number of participants with a suprapubic catheter was low. Future studies should involve more facilities and study participants followed for a longer duration. Although beyond the scope of this study, future studies should also evaluate non-infectious complications related to suprapubic catheters, such as encrustation and blockage, skin and soft tissue infections, tissue erosion, and accidental removals. Lastly, we acknowledge that there are many different definitions used to define CAUTI. Previous work from our group has

shown that there is a gap between clinically defined CAUTIs and those defined by standardized criteria, such that only 20% of all clinically treated infections meet standardized criteria. We chose to use clinically defined CAUTI because this measure represents actual antibiotic-treated infections and antibiotic use remains a significant risk factor for MDRO colonization [2,9]. Major strengths of this study are its prospective longitudinal design that involved catheterized residents from multiple free-standing nursing homes. Data were collected and multiple anatomic sites of nursing home residents were cultured by trained research staff for an extended period of time. There are few studies assessing the effects of catheter type on infectious complications in the long-term care setting.

In conclusion, we present findings from a prospective surveillance study focusing on nursing home residents with an indwelling urinary catheter. A larger percentage of these patients had a urethral catheter than a suprapubic catheter (83% vs 17%). Suprapubic catheterization was associated with reduced rates of CAUTI, hospitalization and antibiotic usage, but increased rates of MDRO colonization. Indwelling catheters and their management are a major source of urologic problems among nursing home residents. Our findings should lead to further investigations including randomized controlled trials to study safety of various urinary collection devices, increased communication between urologists and nursing home providers to improve urologic care and enhance comfort and quality of life of our ageing populations.

Acknowledgements

We thank the leadership and healthcare personnel at all participating nursing home facilities, and the members of the TIP Study Team, including: S. Bradley, MD; K. Cherian, MSc; J. Fisch, MSc; J.T. Fitzgerald, PhD; A. Galecki, MD; M. Kabeto, MS; C.A. Kauffman, MD; E. Koo, MS, MPH; S.L. Krein, PhD; B. Lansing, LPN; S.E. McNamara, MPH; L. Min, MD; A. Montoya, MD; T. Moore, BA; R. Olmsted, MPH; R.A. Rye, BS; S. Saint, MD; K. Symons, BA; and L. Wang, BS.

Conflict of interest statement

None declared.

Funding sources

This work was supported by Veterans Affairs Healthcare System Geriatric Research Education and Clinical Care Center (GRECC, L. Mody), National Institute on Aging Pepper Center (grant P30AG024824 to L. Mody), and National Institute on Aging (grants R01AG032298, R01AG041780 and K24AG050685 to L. Mody), and AHRQ K08 (K08 HS019767 to J. Meddings).

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