Restriction of Long-term Indwelling Urethral Catheterisation in the Elderly

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Summary—Eighty-nine (16%) of 543 patients admitted to a chronic care centre in 1983 had an indwelling urethral catheter. Of the 89, 51 patients (57%) received the catheter in a general hospital, 4 (5%) at home and 34 (38%) in the centre. More than half of the catheters that were inserted in the hospital could be removed within 4 weeks of admission to the centre, implying that a more restricted use of indwelling catheters in hospitals is possible. Only 18% of the indwelling catheters remained *in situ* for the designated period of 1 month. The other catheters were changed before that time, mainly because of obstructed drainage or leakage of urine around the catheter.

The incidence of bacteriuria among catheterised patients was 90%. The bacteria were multiresistant in 37% of these cases, compared with 25% of non-catheterised patients. Multiresistant microflora were present significantly more often in the urine of patients admitted from hospitals (irrespective of whether they had a catheter) and the catheterised residents of the centre than in that of the other patients ($P < 0.001$). When all patients of the centre were considered, it was found that 30.6% were treated with antimicrobial agents in the course of the year; 10.9% were treated more than once a year. This latter group of patients received 58% of all prescribed antimicrobial drugs; 37% of them had an indwelling catheter. The majority of catheterised patients (65%) did not need antimicrobial treatment.

No significant influence of catheterisation on mortality could be demonstrated.

Elderly patients in acute care hospitals and chronic care centres often have a urethral catheter (Jepsen *et al.*, 1982; Warren, 1983). Temporary catheterisation is often performed in acute care hospitals, while long-term indwelling urethral catheterisation is more common in chronic care centres (Garibaldi *et al.*, 1981; Warren, 1983).

Indwelling catheters are an important source of traumatic, technical and infectious complications (Gillespie *et al.*, 1960; Garibaldi *et al.*, 1974; Cools, 1985). The frequency of infections has diminished following the introduction of closed drainage systems (Kunin and McCormack, 1966; Reid *et al.*, 1982), intermittent catheterisation and self-catheterisation (Lapides *et al.*, 1974) and post-catheterisation irrigation of the bladder with povidone-iodine (Van den Broek *et al.*, 1985). The skill of

medical and nursing personnel is of great importance in the prevention of traumatic and technical complications (Garibaldi *et al.*, 1974; Reid *et al.*, 1982). Restriction of long-term indwelling urethral catheterisation, however, is the most important way to prevent these complications. In the present study the implications of long-term indwelling urethral catheterisation were studied in a chronic care centre.

Patients and Methods

A prospective 1-year prevalence study was carried out in a chronic care centre for nursing and rehabilitation. The total patient population of 1983 was divided into residents, *i.e.* patients already in the centre at the beginning of the study, hospital patients, *i.e.* patients admitted during the year from

general hospitals, and domiciliary patients, *i.e.* those admitted during the year from their own home or homes for the elderly.

Registration of infections

Since the diagnostic modalities in the chronic care centre are limited, infections could not be defined by objective standards. Therefore more subjective criteria such as symptoms and signs, when possible in combination with laboratory findings, were used. We limited ourselves to registration of those bacterial infections that required antibiotic treatment. The four attending physicians agreed to treat suspicious urinary tract infections with antibiotics only, if at least three of the following signs and symptoms were present: frequency, strangury, abdominal pain, fever, dullness, (increasing) incontinence of urine, offensive smelling and gritty urine. Urine specimens were analysed upon admission to the centre and in the event of suspicious clinical symptoms and signs of urinary tract infection. Urine cultures were done once every 3 months. The symptoms, signs and laboratory findings were registered by the physicians. Leucocyturia was defined as more than 10 leucocytes/field (magnification $\times 400$) in the urinary sediment. Bacteriuria was defined as the presence of more than 10^5 bacteria of one species/ml voided urine or one or two species/ml catheter-drained urine, as determined with the dipslide technique. A specimen was considered contaminated if more than 10^5 bacteria of two or more species/ml voided urine or three or more species/ml catheter-drained urine were cultured. Further assessment of the bacteria was performed in the microbiological laboratory (S.S.D.Z. Delft) with routine methods. Antibiotic resistance was determined by the standard disk agar diffusion method for amoxicillin, cefaloridin, gentamicin, tetracycline, nalidixic acid, nitrofurantoin, sulfamethizole and trimethoprim. The urine samples of residents remaining for at least 6 months in the centre were screened for asymptomatic bacteriuria once every 3 months.

Indication, technique and maintenance of catheterisation

Male residents received a catheter because of acute urinary retention. If this persisted, they received an indwelling catheter. In a minority of male and female cases an indwelling catheter was given to provide reasonable independence in a wheelchair or because the patient was totally bedridden and in a terminal stage. Only skilled physicians and licensed nurses performed catheterisation;

routinely, latex balloon catheters (18 F, Norta Hamburg) were inserted with the help of disposable sterile sets containing sterile gloves, cotton wool, a syringe with 10 ml physiological saline and a bag of glycerine. According to the protocol, the catheter was to be replaced once every 1 to 2 months. Urine bags with a valve and short tube (10 cm) were used. During the night and for bedridden patients urine bags with a valve and long tube (90 cm) were used so that the urine bags need not be placed in the bed. If obstruction of the catheter was suspected, disposable "Urotainer" irrigating bags were used, containing 50 ml physiological saline (Roussel Medical Supplies, Netherlands).

An indwelling catheter was removed at the time of catheter replacement if there was no firm evidence of chronic urinary retention. In the following 10 h the patient tried to urinate every 2 h and voided urine was measured. If there was no spontaneous voiding, the patient was catheterised twice intermittently before an indwelling catheter was inserted again. In addition, the frequency and reasons for replacement of the catheter in patients catheterised for more than 3 months were investigated by reviewing the nursing charts.

Antimicrobial treatment

The attending physicians agreed to treat only symptomatic urinary tract infections and to use antimicrobial agents from a restricted list, *i.e.* sulfamethizole, co-trimoxazole, amoxicillin, nitrofurantoin, tetracycline and nalidixic acid. Their reasons for treatment were documented (see above). Three groups of patients were distinguished: those who did not require antimicrobial therapy for 1 year (NT = no therapy), those treated with antimicrobials once a year (IT = incidental therapy) and those treated more than once a year (RT = recurrent therapy).

Physicians in hospitals and general practitioners were asked whether they had prescribed antimicrobial agents during hospitalisation or the 3 months at home preceding admission to the centre.

Results

Population characteristics

In the chronic care centre 320 beds are available. In 1983 the bed occupancy rate was 98.5% and 543 patients were admitted: 296 residents, 157 hospital patients and 90 domiciliary patients. Their median age was 82 years (range 33-98); 75% were female. The median duration of residence was 15 months. Of the total population, 42% were ambulatory,

Table 1 Duration of Indwelling Urethral Catheterisation in the Various Patient Groups

| | Origin | | | |
	Resident	Hospital	Domiciliary	Total
Number of patients	296	157	90	543
Catheterised patients	34 (100%)	51 (100%)	4 (100%)	89 (100%)
<4 weeks	5 (15%)	27 (53%)	1 (25%)	33 (37%)
>4 weeks	29 (85%)	24 (47%)	3 (75%)	56 (63%)

49% were confined to a wheelchair, 5% were temporarily bedridden and 4% were long-term bedridden. Altogether 45% were always incontinent of urine and 38% had faecal incontinence. Nearly 80% needed help to visit the toilet.

Mental disturbances (Alzheimer's disease, multi-infarction syndrome, Korsakoff's syndrome) occurred in 35% of the patients, neurological defects (stroke, multiple sclerosis, Parkinson's disease, Huntingtons' disease) in 30% and both post-traumatic states (fractures of the hip) and internal diseases (heart failure, diabetes mellitus, dehydration, urinary incontinence, pneumonia, cancer) in 20%. Fifteen per cent of the patients were admitted because of severe social problems (social deprivation, severe marital problems, sudden widowhood).

Indwelling urethral catheterisation

The incidence of patients with indwelling urethral catheters was 11% of residents, 32% of hospital patients and 4% of domiciliary patients; for all patients the prevalence was 16%; the point prevalence was 9.6%. The duration of urethral catheterisation for these three groups of patients is given in Table 1, which shows that in 53% of hospital patients the catheters could be removed within 4 weeks of admission to the centre.
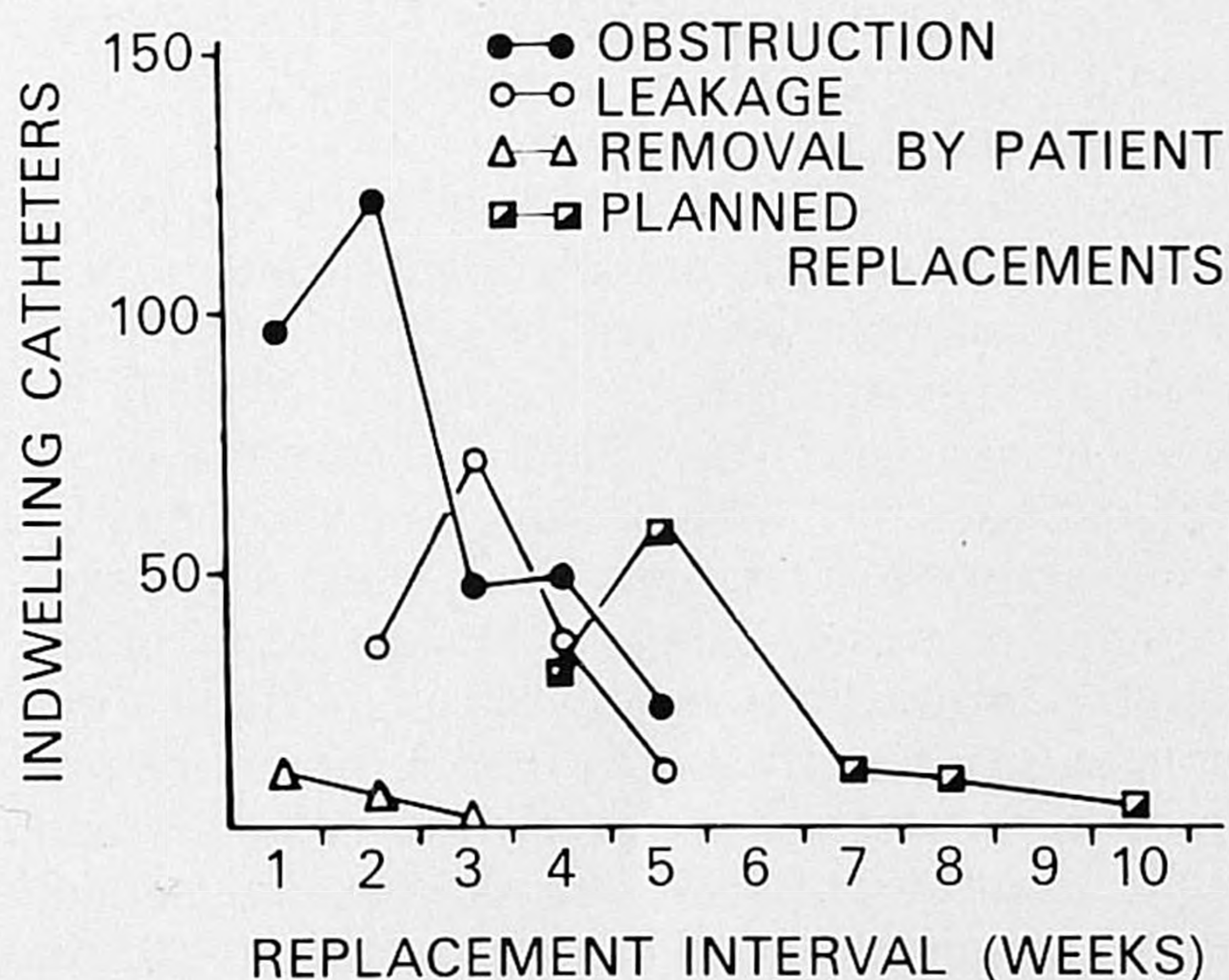
The indications for indwelling urethral catheterisation could not be ascertained reliably for either the hospital or the domiciliary patient groups. Residents received a catheter because of acute urinary retention in 85% of male patients and to provide reasonable independence in a wheelchair in 8% of the male and female patients; the remaining females (7%) were catheterised because they were totally bedridden, had decubital ulcers and were in the terminal stage.

During the year of investigation 110 patients died; 21 (19%) had an indwelling catheter during the previous year. Of the 433 survivors, 68 (16%) had had a catheter during the previous year. The incidence of bacteriuria did not differ in either group.

In a retrospective study of 69 long-term catheterised patients, it appeared that only 18% of the catheters were replaced according to the once-a-month protocol. In all other cases earlier replacement was necessary because of obstruction (54%), persistent leakage of urine around the catheter (25%) and removal of the catheter by the patient (3%). Fig. 1 shows the number of replacements and the reasons for replacement. It appeared that most indwelling catheters had to be replaced in the second or third week because of obstruction. Some siliconised catheters were replaced after 7 weeks or more, because the patient had suffered no complications over a long period of time.

Bacteriology

Of the 1001 urine samples requested for the screening programme, 41% were not obtained on time for a variety of reasons (such as continuous incontinence and excessive activity at the centre) and 28% were considered to be contaminated; of the remaining 310 (31%), 27% showed bacteriuria and 4% sterile urine. The 464 requests for a urine specimen due to a medical indication (symptomatic

Fig. 1 Indications for replacement and period of catheterisation for 623 indwelling urethral catheters in 69 patients with an indwelling catheter for more than 3 months.

bacteriuria and admission) were somewhat more successful: 16% of the specimens could not be collected on time and 24% turned out to be contaminated; 51% exhibited bacteriuria and 9% sterile urine. Of the 175 catheter samples of urine analysed, 90% showed bacteriuria, 3% were sterile and 7% were contaminated.

The bacteriological results (Fig. 2) showed a significantly different distribution of bacteria in patients with and those without an indwelling urethral catheter ($P<0.0005$). No significant differences existed between the resident, hospital and domiciliary patients. *Escherichia coli* was found in 70%, *Klebsiella* species in 10%, *Proteus* species in 13%, *Pseudomonas* species in 3% and other Gram-negative rods in 4% of the specimens.

Resistance to antimicrobial drugs

Because of the low number of micro-organisms in the domiciliary group, this group was not taken into account in this analysis. Bacterial resistance to the two most commonly prescribed antimicrobial agents (amoxicillin and sulfamethizole) is shown in Table 2. *Escherichia coli* that were resistant to amoxicillin and sulfamethizole occurred significantly more often in the urine samples of hospital patients than in those of the residents ($P<0.01$). No significant difference in the pattern of resistance for *Escherichia coli* could be demonstrated in either group between those with and those without an indwelling urethral catheter ($P<0.05$). Other Gram-negative rods that were resistant to amoxicillin and sulfamethizole occurred significantly more often in the urine of catheterised patients than in those without a catheter ($P<0.01$). No difference in the resistance patterns for other Gram-negative rods could be demonstrated between hospital patients and residents.

If multiple resistance is defined as resistance against at least three antimicrobial agents, multiresistant bacteria occurred in significantly more hospital patients than residents ($P<0.001$). Multiple resistance was established for 28% of all isolated bacteria, 40% of which occurred in the urine samples of a relatively small group of patients with long-term indwelling urethral catheters. In the resident group these multiresistant bacteria were isolated significantly more often in the samples of those with an indwelling urethral catheter than those without ($P<0.001$); in the hospital patient group no significant difference existed ($P=0.16$). Multiple resistance was shown for 48% of *Escherichia coli*, 43% of other Gram-negative rods and 9% of the enterococci.
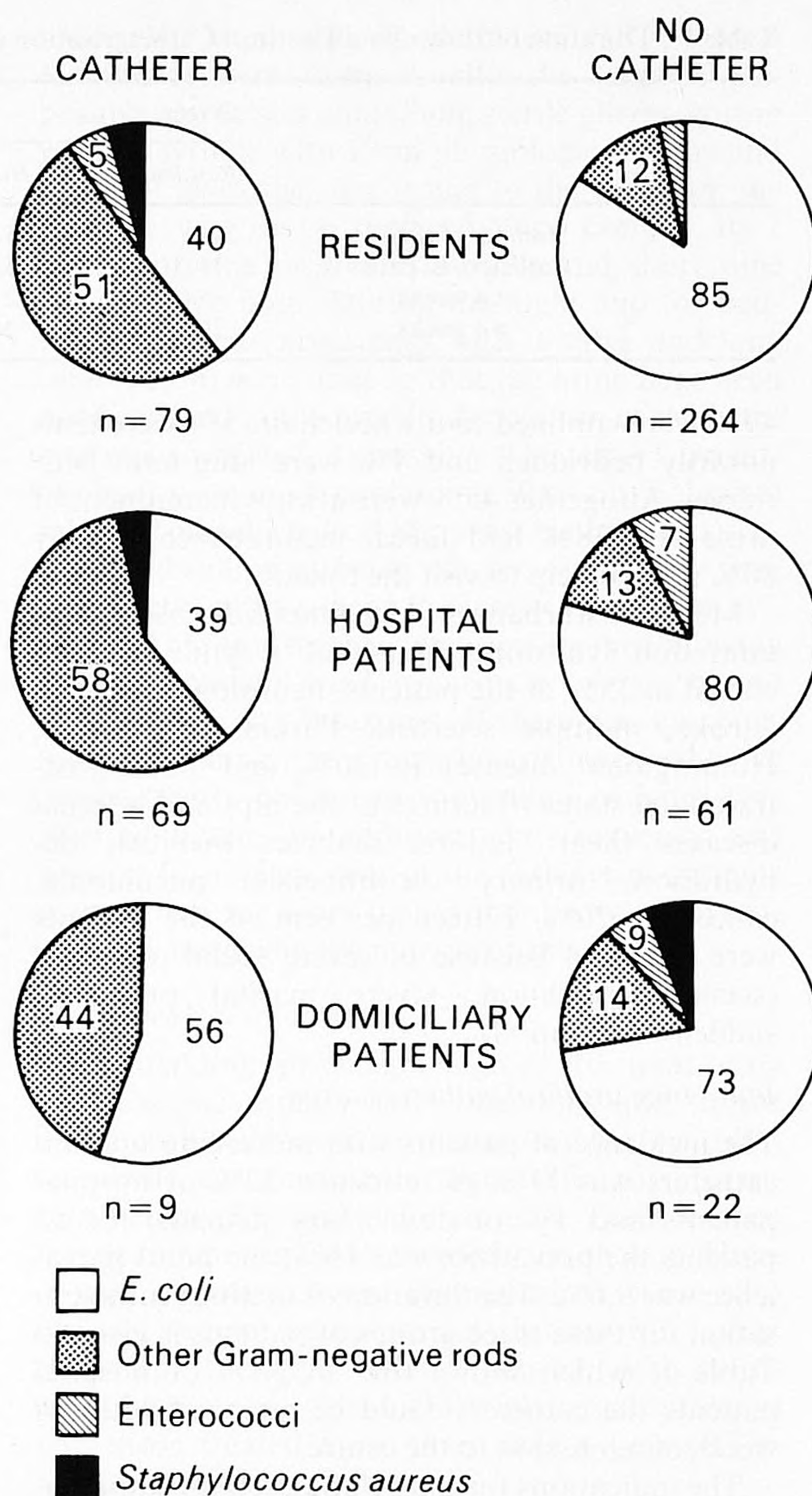

Fig. 2 Determination of bacteria in urine samples from patients with and without indwelling urethral catheters. n = number of isolates.

Antibiotic-treated infections

During the year of investigation 243 courses of treatment with antimicrobial agents were given to 170 patients: 143 for symptomatic urinary tract infections, 80 for lower respiratory infections, 20 for other infections (cholecystitis, colitis, wound infection, erysipelas, infected bursitis, furunculosis, osteomyelitis, epididymitis, vaginitis and three for unlocalised infections). Symptoms and signs of the symptomatic urinary tract infections were bacteriuria (74%; the remaining 26% of the urine samples

Table 2 Antimicrobial Resistance of *Escherichia coli* and other Gram-negative Rods Isolated in Urine Specimens from Patients with and without Indwelling Urethral Catheters in a Chronic Care Centre

	Residents		Hospital patients	
	Catheter	No catheter	Catheter	No catheter
Escherichia coli	32	225	27	48
Resistant to	%	%	%	%
amoxicillin	38	37	63	35
sulfamethizole	41	24	44	42
Other Gram-negative rods	40	32	40	8
Resistant to	%	%	%	%
amoxicillin	80	47	85	50
sulfamethizole	45	34	43	25

were contaminated), (increasing) incontinence of urine (66%), leucocyturia (59%), offensive smelling and gritty urine (58%), frequency (54%), dullness (36%), abdominal pain (35%), fever (32%) and strangury (30%). Of the total population, 113 patients (20.8%) were treated with antimicrobial agents once a year (IT group), 57 (10.5%) more than once a year (RT group) and thus 373 (68.7%) received no antimicrobial agents at all (NT group).

The antibiotic treatment of patients with and without an indwelling urethral catheter is shown in Table 3. Patients with a catheter belonged to the RT group significantly more often than those without a catheter ($P < 0.0005$). More than one-third of the RT group had a catheter. The bacteria isolated from the urine of these patients were not *Escherichia coli* but other Gram-negative rods in all cases. Nevertheless, most patients with an indwelling catheter were not treated with antimicrobial agents during the year of investigation.

Antimicrobial therapy before admission

Before admission to our chronic care centre, 89 hospital patients (66%) had received antimicrobial agents in the hospital; for patients with an indwell-

Table 3 Antimicrobial Treatment of Patients in a Chronic Care Centre

	No therapy	Incidental therapy*	Recurrent therapy**	Total
Catheterised patients	58	10	21	89
Non-catheterised patients	315	103	36	454

* One treatment a year.
** More than one treatment a year.

ing urethral catheter this percentage amounted to 85%. During the last 3 months of 1982, 16% of the 296 residents were treated with antimicrobial agents; 29% of the domiciliary group of 28 patients received antibiotics in the 3 months prior to admission. The latter percentage was obtained via a questionnaire sent to general practitioners; since only 31% responded, the validity of this percentage is questionable.

Discussion

A number of conclusions can be drawn from the present study. First, most of our patients received their indwelling catheter in the hospital. It appeared that more than half of the catheters could be removed without problems during the first month of admission to the centre. It is our impression that indwelling urethral catheterisation is performed too soon in hospitals; our findings are in agreement with those of Nordqvist et al. (1984). The elderly often remain in bed in the hospital; they cannot get out of bed and cannot find the toilet by themselves. If voiding in the sitting or standing position spontaneously or with carbachol is not possible, intermittent catheterisation and irrigation with povidone-iodine seems to be effective (Van den Broek et al., 1985).

Secondly, patients admitted from hospital to chronic care centres often harbour multiresistant bacteria in their urine whether they have a catheter or not. From our data it is clear that patients who cannot live without a catheter carry multiresistant microflora. Since our resident population without a catheter had a more benign microflora, it is possible that hospital patients whose catheter is removed gradually lose the multiresistant flora.

However, the relative roles of improvement in clinical condition, mobility and decreased need for antimicrobial treatment cannot be fully assessed. The sensitivity of the microflora of the residents closely resembles that of the open population in the Netherlands (Degener *et al.*, 1985) and is far more favourable than that reported for nursing homes in the United States (Garibaldi *et al.*, 1981). Probably our use of a limited number of antimicrobial agents is crucial here.

A third conclusion concerns antimicrobial treatment. Even with a restricted antimicrobial policy, it appears that a small number of patients require multiple courses of antimicrobial agents (RT group), mainly for presumed urinary tract infections. Patients with indwelling catheters make up one-third of this group. However, the indwelling catheter is not the single predisposing factor, since most catheterised patients do not require antimicrobial treatment for symptomatic infection. So far we have not been able to determine the factors that predispose to infections in the RT group.

Another important conclusion is that mortality is not increased in bacteriuric catheterised patients. This contrasts with the results of Platt *et al.* (1982), who demonstrated a poor prognosis for bacteriuric patients with indwelling urethral catheters.

When catheter care is considered, it is remarkable that—according to our data—replacement of catheters once every 1 or 2 months is not feasible because of various catheter-related problems. These findings are in keeping with those of Brocklehurst and Brocklehurst (1978) and Kennedy and Brocklehurst (1982). Thus, in general, a more frequent catheter change is recommended for most patients. With this more frequent change of catheters, removal is less traumatic for the urethra. The optimal frequency of catheter change should be investigated in a prospective study. It should be remembered that removal and introduction of a catheter both require great skill. Therefore we selected a limited number of licensed nurses and physicians to perform these procedures.

Our study has a number of limitations which exemplify the problems encountered in chronic care centres. We were unable to obtain urine specimens from all patients and we are aware that this may have produced some bias in the results. The relatively small number of specimens is patient-related on the one hand (*i.e.* unable, immobile, incontinent) while reflecting on the other the fact that the centre is orientated towards practical nursing and rehabilitation rather than research.

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