Point prevalence survey of urinary catheterisation in care homes and where they were inserted, 2012

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Abstract

The extent to which the use of catheter care bundles and other interventions has led to a reduction in urinary catheterisation rates is unknown. We aimed to determine current urinary catheterisation rates in care homes with residents over 65 years old, and determine the extent to which residents are discharged from the hospital setting with urinary catheters. A point prevalence questionnaire survey was used in care homes that looked after residents over 65 years in six UK health boards or primary care trusts, to determine urinary catheterisation rates, and where these catheters were inserted. Questionnaires for 445 of 461 care homes (96.5%) were completed, 425 of 445 care homes cared for residents over 65 years; 888 (6.9%) of 12,827 residents had a urethral (82.5%) or supra-pubic (17.5%) urinary catheter. Over half of all catheters (both urethral and suprapubic, 57.4%, 509 of 888 catheters), and 3.1% of all residents had a catheter inserted while the residents were hospital inpatients, and then discharged back to the care home still catheterised. There was a significant variation in urinary catheterisation rates in the care homes surveyed, and rates remain similar to previous English surveys in 2003 and 2009. More still needs to be done to understand the variation in urinary catheterisation rates in care homes and reduce these rates, including the numbers of residents that are discharged from hospital with a urinary catheter.

Introduction

Recent surveys in UK care homes found that about 8% of residents in registered homes had long-term urinary catheters (McNulty et al, 2006; Lomas et al, 2009). This mean UK figure conceals a wide range

of prevalence of urinary catheterisation from zero to almost 50% (Lomas et al, 2009), indicating that there is an opportunity to reduce catheterisation rates. Urinary catheterisation is associated with significant morbidity; residents with urinary catheters in care homes have up to an eightfold greater risk of harbouring resistant bacteria such as extended-spectrum β -lactamase-producing Gram-negative bacteria (Tinelli et al, 2012) and these patients are significantly more likely to be taking antimicrobials (Cotter et al, 2012), develop health-care associated infections (Eriksen et al, 2007) and bacteraemia (Chazan et al, 2009).

Care home staff have indicated that many of their residents are discharged from hospital after an inpatient stay with a catheter (McNulty et al, 2008) and indeed our 2008 survey confirmed that 57% of urinary catheters in Gloucestershire care homes were inserted in hospitals (Lomas et al, 2009). Over the last five years there have been a series of care bundles introduced for community and hospital care (Wilson, 2011, pp. 16–25), with the aim of reducing urinary catheterisation rates and catheter associated urinary tract infections (CAUTI).

Study aims

To determine:

1. The current urinary catheterisation rates in care homes with residents over 65 years.
2. How many care home residents with urinary catheters are discharged from the hospital with urinary catheters *in situ*.

Methods

Study population: The Infection Prevention Society invited their members to participate in a survey of care home urinary catheterisation. Infection control nurses serving 18 primary care trusts (PCTs) or health boards (from herein referred to as areas) initially expressed interest, but

Table 1. Number and percentage of residents over 65 years with urinary catheters in care homes surveyed in six areas across the UK

Primary care trust or health board	Care homes in area		Residents with urinary catheters					
			Urethral or suprapubic		Urethral		Suprapubic	
	Number	Residents	Total	%	Total	%	Total	%
Cornwall	56	1880	98	5.2	72	73.5	26	26.5
Derbyshire	130	3803	300	7.9	261	87.0	39	13.0
Gloucestershire	124	3682	295	8.0	240	81.4	55	18.6
North Lincolnshire and Goole	37	1117	62	5.6	51	82.3	11	17.7
Pembrokeshire in Wales	36	856	56	6.5	45	80.4	11	19.6
South Eastern Northern Ireland	42	1489	77	5.2	64	83.1	13	16.9
Totals	425	12,827	888	6.9	733	82.5	155	16.5

12 areas did not participate because of time commitments. The point prevalence survey was undertaken in six areas across the UK; Cornwall, Derbyshire, Gloucestershire, and North Lincolnshire and Goole in England, Pembrokeshire in Wales, and South Eastern Northern Ireland. Detailed lists of the care homes in each area, and the type of provision, were obtained for each area from care home websites. As residents under 65 years are not typical of the majority of care home residents, we excluded care homes catering only for residents less than 65 years.

Survey: We used a previously validated questionnaire (Lomas et al, 2009). The questionnaire asked care homes about the total number of residents, the number with a urethral or suprapubic urinary catheter and where they were inserted, on the day the questionnaire was completed (Lomas et al, 2009). The questionnaire is available online.

Survey distribution: Between May 2012 and 2013 care homes with residents 65 years or older in the six areas were sent an invitation letter from their local infection control nurse (ICN) addressed to the care home manager. Homes which did not respond in about three weeks were reminded by telephone. The care home staff were given the opportunity to complete the short questionnaire over the telephone; if they preferred this option, it was completed by a nurse.

Data entry and analysis: The data was double entered, and care home data was anonymised before analysis. Negative binomial regression models with numerator, denominator and area as explanatory variable, together with Wald testing, were used to determine the statistical significance of the differences in the percentage of care home residents with urinary catheters between different areas. When ascertaining whether the number of residents in each area was a confounder, this was an added explanatory variable in the model. In the analysis comparing catheterisation rates between areas, the numerator was either the number of suprapubic or urethral catheters, and the denominator was the total number of residents or urinary catheters, respectively, in that area. When considering the healthcare setting where the urinary catheter was inserted, the numerator was the number of urethral or suprapubic catheters inserted in that healthcare setting with the denominator as the total number of urethral or suprapubic catheters, respectively, in that area. The Wald tests were conducted by taking the parameter estimates and standard errors obtained from the appropriate model and forming a composite test statistic which had a chi-squared distribution on five degrees of freedom because there were six areas. Data analysis was undertaken by the statistician using © STATA version 12.1 (StataCorp, 2011).

Results

Questionnaires were sent to 461 care homes, and 445 (96.5%) were completed. We only included 425 care homes in the analysis as 20 care homes only had residents under 65 years. The 425 homes had 12,827 residents

over 65 years and 761 under 65 years; data from the under 65 year olds is not presented. Overall 888 (6.9%) of the 12,827 residents over 65 years had a urinary catheter; 733 (82.5%) were urethral and 155 (17.5%) suprapubic. In each area the percentage of residents with a urinary catheter ranged from 5.2% in South Eastern Northern Ireland to 8% in Gloucestershire, significant at the 5% level ($p=0.04$) (Table 1) as derived from the model with numerator the number of urinary catheters and denominator the total number of residents. Thirty one per cent (132/425) of care homes had no urethral catheters and 74% (312/425) had no suprapubic catheters; the percentage of residents with a urinary catheter in individual care homes ranged from 0 to 100%. Care homes registered with nursing care had significantly more residents with catheters (7.7%, 751/9,717) than care homes without nursing (4.4%, 137/3110; $p<0.001$) as ascertained from a chi-squared test on one degree of freedom.

Over half of all catheters (both urethral and suprapubic, 57.4%, 509 of 888), and 3.1% of all residents had a catheter inserted in the hospital setting while the residents were patients in hospitals; these residents were then discharged back to the care home with the catheter in situ (Table 2). Sixty-eight of the 888 urinary catheters were inserted in another care home and 24.2% (215/888) were inserted in the resident's own care home. Only 4% (59/888) were inserted in another health care setting (in some cases this was inserted by a health care professional in the patient's own home). The percentage of catheters inserted while the resident was a hospital inpatient was similar for urethral catheters and suprapubic catheters (Table 2). A significantly greater percentage of urethral catheters were inserted in the residents own care home than suprapubic catheters (26.3% of urethral compared to 14.2% of suprapubic, $p=0.001$); in contrast, more suprapubic catheters were inserted in another home ($p=0.007$, Table 2) using a chi-squared test on one degree of freedom in both cases.

The number of catheters inserted in the hospital setting varied by area; only 35% of care home residents in Cornwall had a urethral catheter inserted in the hospital setting compared to 86% in the South Eastern Health Board in Northern Ireland ($p=0.007$) (Table 3) as derived from the model with the numerator as the number of urethral or suprapubic catheters inserted at that healthcare setting and the denominator the number of urethral or suprapubic catheters inserted wherein each healthcare setting was analysed separately. The other four areas had similar percentages inserted while the resident was a hospital inpatient (range 52.9 to 64.4%). Care homes in Cornwall were significantly more likely than other areas to report that catheters had been inserted in another care home (19%, $p=0.009$; Table 3).

Discussion

Main findings: We found in this point prevalence survey that the current urinary catheterisation rates in care homes with residents

Table 2. Healthcare setting where urinary catheters inserted in care home residents over 65 years in the six areas (425 homes, 12827 residents)

	Urethral and suprapubic		Urethral		Suprapubic		p value urethral vs suprapubic
	Number (% of all residents)	% of urethral and suprapubic	Number	% of urethral	Number	% of suprapubic	
Number of care home residents with urinary catheters in the six areas on the day questionnaire completed	888 (6.9)	–	733	–	155	–	–
Number inserted while resident was a hospital in-patient and discharged into your care home with catheter. (Resident was not catheterised before hospital admission)	509 (4.0)	57.4	422	57.6	87	56.1	0.7
Number inserted while resident was living at another care home and transferred to your care home	68 (0.5)	7.7	48	6.5	20	12.9	0.007
Number inserted while resident was living at your care home (Whether inserted as a hospital day patient, in GP surgery or home)	215 (1.7)	24.2	193	26.3	22	14.2	0.001
Number of residents catheterised at a healthcare setting not already mentioned (Please specify place)	37 (0.3)	4.2	25	3.4	12	7.7	0.01
Number where place of catheterisation is not known	59 (0.5)	6.6	45	6.1	14	9.0	0.17

over 65 years was 7%, but there was a very wide variation in rates between homes from 0 to 100%. Fifty five per cent of care home residents with urinary catheters were discharged from the hospital with urinary catheters in situ: this is similar to previous care home surveys in the UK in 2002 and 2008 (McNulty et al, 2003; Lomas et al, 2009). However there was a significant difference between areas, varying between 35% and 86%, suggesting there is an opportunity to reduce this. We considered whether this could have been due to the variation in numbers of residents in the care homes, but when we allowed for this in the negative binomial regression model, the differences were still significant.

Strengths and limitations: The survey co-ordinators in each area were recruited through the Infection Protection Society network and therefore this facilitated involvement of a large number of care homes across the UK. Because the survey was so simple, the response rate was almost 100%, however it did rely on reported catheterisation of residents by care home staff, rather than direct observation by a single individual, so the results are open to some recall bias. We did not investigate the hospital urinary catheterisation rates in each area which serve these care homes, so in our analysis we cannot allow for this confounder by including it in the regression models so that the association between percentage catheterised and area is adjusted for hospital rates. Furthermore, we did not ask the clinical indication for the urinary catheter or hospital inpatient stay, therefore we cannot determine whether the catheter was definitely needed; a prospective, more complex survey would be needed to determine this.

Where this work fits in: A recent point prevalence survey found that urinary catheterisation rates in English hospitals have fallen from 31.6% of inpatients in 2006 to 18.8% in 2011 (Health Protection Agency, 2012); the authors suggested that this may be due to high impact interventions (Wilson, 2011) introduced over this time period. Our study indicates that falls in hospital catheterisation rates have not been mirrored by a concomitant fall in urinary catheterisation rates in care homes or in the numbers discharged to care homes with catheters from hospitals, as catheterisation rates are similar to our previous survey in 2008 (Lomas et al, 2009). Reducing catheterisation rates in care homes should help to reduce morbidity and costs. The cost of catheterisation in 366 patients in 78 care homes over one year in Sweden was calculated at 1157 Swedish Krona (140 Euros) per month per resident (Jonsson and Hedelin, 2012). A US study showed that 23% of 39,282 postoperative patients discharged to nursing homes had urinary catheters; those patients discharged with catheters had a greater risk of rehospitalisation and death (Wald et al, 2008). The wide variation in urinary catheterisation has previously been explored by us (McNulty et al, 2006, 2008) and is not due to differences in rates of residents' incontinence or nursing needs). Homes with lower prevalence of catheterisation or no catheters took a more proactive approach to removing inherited catheters, toileting, managing continence, and mobility; these homes often had a different culture of care aimed at maintaining residents' dignity and independence. Staff in low catheterisation homes would often encourage the resident to return to regular toileting and/or the use of continence aids. In contrast, staff in homes with higher prevalence of catheterisation reported that they usually left an inherited catheter in situ, unless it became blocked or the resident pulled it out and they always complied with the wishes of residents who wanted to keep a catheter. (McNulty et al, 2008). As there is still a wide range of catheterisation rates between homes, maybe these differences in care home culture and continence care need to be re-explored, and furthermore we need to disseminate the current good practice in care homes with low catheterisation rates or no catheters at all (which constitute 31%).

We suggest that to reduce the percentage of residents catheterised in care homes we may need to have a four pronged approach aimed at both hospitals and individual care homes with higher catheterisation

Table 3. Healthcare setting where urinary catheters of care home residents over 65 years were inserted in six areas across the UK

Number and % of residents in each area and healthcare setting where urethral or suprapubic catheter inserted														
Health care setting where catheters were inserted	Catheter type (number of residents with catheter)	Cornwall		Derbyshire		Gloucs		North Lincolnshire & Goole (n=62)		Pembrokeshire (n=56)		South Eastern NI (n=77)		p value
		(n=98)		(n=300)		(n=295)								
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	
Hospital in patient	Urethral (n=422)	25	(34.7)	145	(55.6)	141	(58.8)	27	(52.9)	29	(64.4)	55	(85.9)	0.007
	Suprapubic (n=87)	11	(42.3)	21	(53.8)	26	(47.3)	10	(90.9)	6	(54.5)	13	(100.0)	0.15
Another care home	Urethral (n=48)	14	(19.4)	9	(3.4)	24	(10.0)	1	(2.0)	0	(0.0)	0	(0.0)	0.009
	Suprapubic (n=20)	6	(23.1)	7	(17.9)	6	(10.9)	0	(0.0)	1	(9.1)	0	(0.0)	0.8
Your care home	Urethral (n=193)	22	(30.6)	72	(27.6)	55	(22.9)	23	(45.1)	13	(28.9)	8	(12.5)	0.12
	Suprapubic (n=22)	5	(19.2)	5	(12.8)	10	(18.2)	0	(0.0)	2	(18.2)	0	(0.0)	0.992
Other site or unknown	Urethral or suprapubic (n=96)	15	(15.3)	41	(13.7)	33	(11.2)	1	(1.6)	5	(8.9)	1	(1.3)	—

rates – reducing the numbers of patients discharged from hospital with catheters (Seymour, 2007); improving discharge summaries to include the details of the indication for urinary catheterisation and when its need should be reviewed; reviewing residents' need for a catheter once discharged; and reducing catheter insertion in the care home setting. We have found no high quality trials that have measured the effectiveness of interventions in the care home setting to reduce urinary catheterisation. There have been many studies in the acute care setting (Murphy et al, 2013); implementing similar interventions across hospitals could reduce the number of patients discharged to care homes with catheters, and could also be used in the care home setting. Seven of eight studies in a systematic review used multifaceted interventions to reduce urinary catheterisation rates in hospitals including: education of clinicians, bladder scanners, implementation of guidelines, checklist reminders, feedback on rates and champions (Murphy et al, 2013). These multifaceted interventions work as they address the different factors that influence a carer's behaviour (Ajzen, 1991). They include a carer's personal attitude to residents' care and urinary catheters; attitude of a home or hospital to patients' care and urinary catheters; and perceived or real barriers to keeping catheterisation rates low. A clinician's, hospital's and home's attitude to urinary catheterisation is influenced by whether they think it is important to make the effort to keep catheterisation rates low, whether they personally can make a difference to rates and if they are rewarded in some way for attaining and/or maintaining low rates (this does not need to be financially driven) or conversely reprimanded for high rates. Barriers may include staff or resident lack of understanding or confidence and time, leading to forgetfulness, staffing and financial pressures. All these factors influencing behaviour need to be addressed if catheterisation rates in our care homes are to be kept to a minimum. But although it may seem a mammoth task, we can learn how successful interventions and homes with low rates have addressed these cognitive factors influencing behaviour.

Prewritten stop orders have a direct effect on urinary catheterisation rates in the hospital setting (Loeb et al, 2008) by removing the "forgetfulness of clinicians" barrier, and may have an effect on urinary catheterisation on discharge and in care homes, especially if the stop order is included in the discharge documents. In a Canadian study in a tertiary referral hospital, stop orders reduced numbers of inappropriate catheters (Loeb et al, 2008). Good compliance with stop orders can be attained; in 2010 56% of US hospitals involved in a "Nurses Improving the Care of Health systems Elders Programme" were using urinary catheter stop orders (Fink et al, 2012).

In the UK and USA, patient assessment tools, HOUDINI (Adams et al, 2012) and CHAMMP (Bucci, 2007) have been used to inform clinicians and enable them to determine a patient's need for a urinary catheter. If the patient doesn't have any of the criteria the clinician may then feel confident to remove the catheter. These tools could be used to break down the barrier of lack of confidence in care homes and if care homes lack staff trained to review the need for urinary catheterisation, district nurses or continence nurses could initially be involved in assessment and also help educate the carers.

The 2012 NHS thermometer asks hospitals to provide monthly data on urinary catheterisation rates in hospitals (Department of Health, 2012). This should encourage hospitals to consider how they can reduce their urinary catheterisation rates (influencing social norms), but there has been no published data on catheterisation rates since its introduction to determine its effectiveness. We consider that the thermometer could include the number of patients discharged into the community with a catheter. This measure may be more helpful than the rates of catheter associated urinary tract infections (CAUTI), which are more difficult to define. Audit and feedback of data on urinary catheterisation rates and numbers discharged with urinary catheters may assist organisational learning and promote best practice in both the hospital and care home setting.

One important way that hospitals and care homes could reduce the numbers of urinary catheter rates is through increased use of intermittent catheterisation, encouraged in the 2012 National Institute for Health and Clinical Excellence guidance (National Institute for Health and Clinical Excellence, 2012). Success rate in training men and women over 65 years in a UK setting was 86% and 68% respectively (Parsons et al, 2012); this should be trialled in the care home setting.

Seventeen per cent of the residents urinary catheters were suprapubic, which is slightly lower than the single centre study in Gloucester in 2008 in which 27% of all catheters were suprapubic (Lomas et al, 2009). A study of men with prostatic enlargement reported a significantly lower rate of infection in those with suprapubic rather than urethral catheters, despite the former being used for two weeks longer (Horgan et al, 1992). Thus encouraging the use of suprapubic catheters may also contribute to reducing the infection associated morbidity linked with urethral catheterisation (National Institute for Health and Clinical Excellence, 2012).

Implications

A multitude of different approaches have been applied to reduce urinary catheter prevalence – it is difficult to know which ones have

attained sustained results, but this study shows that more needs to be done as the percentage of care home residents with urinary catheters is similar to previous studies in 2003 and 2008, there is still significant variation in numbers of residents catheterised, and many residents are still being discharged from hospital with a catheter in situ. A more proactive approach is therefore needed to reduce these numbers, exploring multifaceted cognitive-based interventions constructed on approaches identified by exploring practice and behaviours in care homes and hospitals with low and high catheterisation rates. This should include not just care homes, and we suggest that hospitals should be auditing their numbers discharged with catheters and developing discharge care plans, with catheter removal dates.

Declaration of conflicting interest

The author(s) declare that there is no conflict of interest.

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References

- Adams D, Bucior H, Day G, Rimmer J. (2012) HOUDINI: make that urinary catheter disappear – nurse-led protocol. *Journal of Infection Prevention* **13**(2): 44–6.
- Ajzen I. (1991) The theory of planned behaviour. *Organizational Behavior and Human Decision Processes* **50**: 171–87.
- Bucci AT. (2007) Be a continence champion: use the CHAMMP tool to individualize the plan of care. *Geriatric Nursing* **28**(2): 120–4.
- Chazan B, Raz R, Teitler N, Nitzan O, Edelstein H, Colodner R. (2009) Epidemiology and susceptibility to antimicrobials in community, hospital and long-term care facility bacteremia in northern Israel: a 6 year surveillance. *Israeli Medical Association Journal* **11**(10): 592–7.
- Cotter M, Donlon S, Roche F, Byrne H, Fitzpatrick F. (2012) Healthcare-associated infection in Irish long-term care facilities: results from the First National Prevalence Study. *Journal of Hospital Infection* **80**(3): 212–16.
- Department of Health. (2012) Delivering the NHS safety thermometer CQUIN 2012/13. A preliminary guide to measuring 'harm free' care. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/152324/dh_134329.pdf.pdf (accessed 21 August 2013).
- Eriksen HM, Koch AM, Elstrøm P, Nilsen RM, Harthug S, Avastland P. (2007) Healthcare-associated infection among residents of long-term care facilities: a cohort and nested case-control study. *Journal of Hospital Infection* **65**(4): 334–40.
- Fink R, Gilmartin H, Richard A, Capezuti E, Boltz M, Wald H. (2012) Indwelling urinary catheter management and catheter-associated urinary tract infection prevention practices in Nurses Improving Care for Health system Elders hospitals. *American Journal of Infection Control* **40**(8): 715–20.
- Health Protection Agency. (2012) English national point prevalence survey on healthcare associated infections and antimicrobial use, 2011: preliminary data. Health Protection Agency: London. Available at: <http://www.hpa.org.uk/Publications/InfectiousDiseases/AntimicrobialAndHealthcareAssociatedInfections/1205HCAIEnglishPPSforhcaandamu2011prelim/> (accessed 20 August 2013).
- Horgan AF, Prasad B, Waldron DJ, O'Sullivan DC. (1992) Acute urinary retention. Comparison of suprapubic and urethral catheterisation. *British Journal of Urology* **70**(2): 149–51.
- Jonsson K, Hedelin H. (2012) Costs associated with long-term catheter care in nursing home patients. *Scandinavian Journal of Urology and Nephrology* **47**(2): 113–17.
- Loeb M, Hunt D, O'Halloran K, Carusone SC, Dafoe N, Walter SD. (2008) Stop orders to reduce inappropriate urinary catheterization in hospitalized patients: a randomized controlled trial. *Journal of General Internal Medicine* **23**(6): 816–20.
- Lomas GM, Howell-Jones R, McNulty CAM (2009) Identifying key factors that affect care home catheterisation rates: changing practice through audit. *Journal of Infection Prevention* **10**(2): 66–9.
- McNulty CAM, Bowen J, Foy C, Gunn K, Freeman E, Tompkins D, Brady A, Ejidokun T, Donald I, Smith GE. (2006) Is there an opportunity to reduce urinary catheter-related infections? Exploring variation in catheterisation rates in care homes. *British Journal of Infection Control* **7**(1): 22–8.
- McNulty C, Bowen J, Howell-Jones R, Walker M, Freeman E. (2008) Exploring reasons for variation in urinary catheterisation prevalence in care homes: a qualitative study. *Age Ageing* **37**(6): 706–10.
- McNulty C, Freeman E, Smith G, Gunn K, Foy C, Tompkins D, Brady A, Cartwright K. (2003) Prevalence of urinary catheterisation in UK nursing homes. *Journal of Hospital Infection* **55**(2): 119–23.
- Murphy C, Fader M, Prieto J. (2013) Interventions to minimise the initial use of indwelling urinary catheters in acute care: a systematic review. *International Journal of Nursing Studies*. Epub ahead of print 16 January 2013. DOI: 10.1016/j.ijnurstu.2012.12.007
- National Institute for Health and Clinical Excellence. (2012) Partial Update of NICE Clinical Guideline 2: infection: prevention and control of healthcare-associated infections in primary and community care. Available at: www.nice.org.uk/guidance/CG2 (accessed 20 August 2013).
- Parsons BA, Narshi A, Drake MJ. (2012) Success rates for learning intermittent self-catheterisation according to age and gender. *International Urology and Nephrology* **44**(4): 1127–31.
- Seymour C. (2007) Development: transferring patients with a urinary catheter. *Nursing Times* **103**(42): 52–4.
- Statacorp ©. (2011) Stata Statistical Software: Release 12. College Station, TX: StataCorp LP.
- Tinelli M, Cataldo MA, Mantengoli E, Cadeddu C, Cunietti E, Luzzaro F, Rossolini GM, Tacconelli E. (2012) Epidemiology and genetic characteristics of extended-spectrum β -lactamase-producing Gram-negative bacteria causing urinary tract infections in long-term care facilities. *Journal of Antimicrobial Chemotherapy* **67**(12): 2982–7.
- Wald HL, Epstein AM, Radcliff TA, Kramer AM. (2008) Extended use of urinary catheters in older surgical patients: a patient safety problem? *Infection Control and Hospital Epidemiology* **29**(2): 116–24.
- Wilson M. (2011) Addressing the problems of long-term urethral catheterization: part 1. *British Journal of Nursing* **21**(1): 16–25.

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