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Will more restrictive indications decrease rates of urinary catheterisation? An historical comparative study

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ABSTRACT

Objectives: To determine if more restrictive indications for urinary catheterisation reinforced by daily chart review will lower catheterisation rates.

Design: An historical comparative observational study.

Setting: An internal medicine department in a regional hospital in Israel.

Participants: The authors compared 882 patients hospitalised after a change in policy to an historical cohort of 690 hospitalised patients. Exclusions included patients less than age 30 and those with bladder outlet obstruction.

Intervention: Emergency and internal medicine department physicians received instruction on a more restricted urinary catheterisation policy. During daily chart rounds, admissions were discussed with an emphasis on the appropriateness of all new urinary catheter insertions.

Main outcome measures: The primary outcome measure was catheterisation rate by admission diagnosis. Secondary outcome measures were the need for post-admission in hospital catheterisations and the rate of indwelling catheters 14 or more days after discharge.

Results: There was a reduction in catheterisation rate in patients with congestive heart failure from 30/106 (29.3%) to 3/107 (2.8%) ($p<0.001$), in patients with an admission diagnosis of fever unable to provide a urine sample for culture from 35/132 (26.5%) to 12/153 (7.8%) ($p<0.001$) and in patients admitted for palliative care from 51.7% (15/29) to 12.0% (3/25) ($p=0.002$). The overall rate of catheterisation decreased from 17.5% (121/690) to 6.6% (58/882) ($p<0.001$). There was only one indicated catheterisation after admission due to the change in policy, and the proportion of patients discharged with catheters decreased.

Conclusion: The use of more restrictive indications for urinary catheterisation along with daily chart rounds can reduce the rate of urinary catheterisation in an internal medicine department without adverse consequences.

ARTICLE SUMMARY

Article focus

- We studied the effect on catheterisation rates of more restrictive indications for catheterisation, reinforced by daily chart review.

Key messages

- More restrictive indications for urinary catheterisation along with daily chart reviews can reduce the rates of urinary catheterisation without adverse consequences.

Strengths and limitations of this study

- We used the admission diagnosis as a common denominator and controlled for patient age.
- Patients were followed up during hospitalisation and for 2 weeks after discharge if the catheter was left in place.
- The study involved only one internal medicine department.
- All nursing and medical staff participated in chart review of newly hospitalised patients, a policy that might not be practical in other settings.
- There were only historical controls for comparison.

INTRODUCTION

Urinary catheterisation has risks, and its use should be limited. Instrumentation of the urinary tract is responsible for up to 80% of nosocomial urinary tract infections[1] and 30% of all nosocomial infections reported by acute care hospitals.[2] Other risks are the potential for urethral injuries, and the possibility that the catheter will be left in permanently. In certain clinical situations, catheterisation can improve patient care, but the broad definition of appropriate use leads to variable interpretations.[3–9]

Despite the broad definitions of the appropriate use, studies report reductions in urinary catheterisation rate and days of catheterisation after various interventions. A systematic review and meta-analysis found that reminder systems reduced the mean duration of catheterisation by 37%.[10] A protocol developed to make clinicians aware of the appropriate use of catheters in geriatric hospitalised patients reduced the incidence of indwelling urinary catheters from

33% to 15.3%.[11] In a study of intensive care unit patients, nurse education and the possibility to weigh diapers to assess 24-h urinary output decreased the proportion of patients with the introduction of a urinary catheter from 33.3% to 18.8%.[12] In an emergency department, the establishment of guidelines decreased the urinary catheter insertion rate from 16.4% to 13%.[13] On the other hand, a recent study reported both increases and decreases in the catheterisation rates using a variety of interventions that included various combinations of protocol revisions, education and information, explicit attention during daily rounds, fixed stop orders and bladder scans.[14]

In a previous study, we found that there were patients with urinary catheters that had been inserted appropriately according to broad indications[3] but with no observable clinical benefit. They included those with congestive heart failure (CHF), with stroke, needing palliative care or incontinent patients with an admission diagnosis of fever unable to provide a urinary culture sample. In this study, we report the effect on catheterisation rates of more restrictive indications reinforced by chart reviews of newly admitted patients.

METHODS

This is an historical comparative observational study conducted over two 3-month periods, 1 March to 31 May 2007, and after a change in policy from 22 November 2009 to 22 February 2010.

Study setting and population

The patients presented to a regional 400-bed hospital and were hospitalised in an internal medicine department with 42 general medicine beds, including 6 beds providing monitoring and treatment for those needing respiratory support. The cohorts consisted of consecutive hospitalised patients over a 3-month period. We excluded patients with bladder outlet obstruction, usually hospitalised in the Urology Department and also patients aged <30 years because of small numbers. The historical control group consisted of 690 patients,[3] and the intervention group of 882, prospectively followed up consecutive patients admitted after instituting a change in policy: the inception date was chosen for convenience.

Study protocol

During the first study period, the charts of all patients catheterised within 24 h of admission were reviewed in detail by two of the authors (ZS and PF) using previously reported indications for catheterisation[3–9]: (1) need to measure urinary output for diagnostic or clinical purposes, (2) alteration of blood pressure or volume requiring urine volume measurement, (3) palliative care for terminal patients, (4) incontinence posing a risk to the patient and (5) obstruction of the urinary tract distal to the bladder. We added the following restrictions;

1. Monitoring urinary output for clinical purposes is acceptable only if multiple daily measurements are needed and the patient is unable to urinate on command.
2. Catheterisation for palliative care is accepted only when informed consent has been given by the patient or family.
3. Catheterization in patients with urinary retention is only justified if there is a documented decrease in renal function, ureteric dilatation, recurrent urinary tract infections/sepsis and/or patient discomfort.

A few months after completion of the first study period, we presented the findings of the study to the emergency and internal medicine department physicians and added the additional restrictions. Physicians were instructed to remove a catheter inserted in the emergency department immediately after hospitalisation if not indicated; this was classified as a short duration indwelling catheter. Intermittent straight catheterisation was not used. The entire staff (physicians and nurses) discussed all admissions and reasons for new urinary catheter insertions during the interim period and until the end of the second study period. The patient's health provider or family member was contacted at least 14 days after discharge if the catheter was not removed during hospitalisation.

Measurements

We extracted from the hospital database reasons for catheterisation, age, gender and diagnosis on admission (International Classification of Disease 9). Two authors (ZS and PF) classified catheterisations as appropriate or inappropriate according to the revised indications by chart review. We recorded the residual volume for all catheterisations (mandatory fields in the emergency department chart) and the number of days with an indwelling urinary catheter. We defined prolonged post-hospital catheterisation as the use of an indwelling urinary catheter 14 days or more after discharge. No routine urine cultures were done. The definition of a nosocomial infection for this study was a urine culture with 100 000 organisms/ml or more in a symptomatic patient.[12]

Data analysis

We compared the frequency of urinary catheterisation during the two periods according to age groups and reasons for hospitalisation. The χ^2 test was used to test for statistical significance. For small numbers, Fisher's exact test was substituted. A p value of <0.05 was considered statistically significant.

ETHICAL APPROVAL

The project was approved by the local ethics committee on 3 March 2011, number 0021-11-LND. The approval did not include the change in policy that was considered by the department to be good clinical practice but only for retrospective patient chart review and publication. For the same reason, no patient consent was needed.

RESULTS

We excluded 1 patient from the historical controls and 11 in the period after the change in policy because of bladder outlet obstruction. There was no significant difference in the proportion of patients in the various age groups (p=0.670) (table 1). The residual volumes in those catheterised were also not significantly different between the two groups (p=0.564). The overall rate of catheterisation decreased from 17.5% (121/690) to 6.6% (58/882) (p<0.001) (table 1) and was observed in all age groups. For patients catheterised, the median number of days of catheterisation remained unchanged, but the total number of days with catheterisation decreased from 582 in 690 patients to 390 days in 882 after the policy change (0.84−0.44 per hospitalised patient); only 130 of those days were in patients with an indication considered appropriate. Most of the inappropriate days (234 of 260 (90.0%)) were in patients not receiving paralytic medications with coma and/or needing respiratory support.

The three patient groups who had a significant reduction in catheterisation rates were patients with an admission diagnosis of fever unable to provide a urinary sample for culture, patients with CHF and patients hospitalised for palliative care (table 2). There was a significant reduction in the number of unacceptable catheterisations from 13.0% (90/690) to 4.3% (38/882) (p<0.001). Complete adherence to the new policy would have decreased the catheterisation rate to 2.6% (23/882).

In the historical cohort, there were no short duration catheterisations. This increased during the intervention period to 44 procedures; 32 were in patients with an admission diagnosis of fever unable to provide a urine specimen for culture (appropriate in 31; one patient could have given a sample without catheterisation). In 12 patients, the procedure was not justified (four patients with a stroke, two with CHF and another six without indications on any list).

Follow-up

There was only one patient after the policy change with a catheter-associated urinary tract infection during hospitalisation (an 88-year-old woman with chronic obstructive lung disease and dementia requiring respiratory support). No catheters were inserted during the follow-up in those with CHF or in patients with an admission diagnosis of fever unable to provide a urine sample for culture. There was one patient who after a short duration procedure had symptomatic urinary retention probably due to the procedure (residual volume of 100 ml that within 24 h of the procedure was 900 ml). There were 10 catheterisations during the in-hospital follow-up period; in only one patient was the catheterisation acceptable; a patient with widespread cancer was catheterised on the second day of admission. There were four patients catheterised because of a suspected enlarged bladder palpated during daily rounds; they had large residuals (700, 750, 1200 and 700 ml). These patients, however, were not symptomatic and did not have laboratory evidence of a decrease in renal function. The catheter was successfully removed a few days later.

The rate of patients without an indication for continued catheterisation who were discharged with the catheter in situ decreased from 1.9% to 0.5% (table 3, p=0.006). There was a trend for a decrease in total discharge catheterisation rates (2.9% to 1.6%) (p=0.111). Before the change in policy, four patients without indications had prolonged post-discharge catheterisation (14 days or more) and one was re-hospitalised with urosepsis.[3] After the change in policy, no patients without indications had prolonged use of a urinary catheter.

DISCUSSION

The major finding of this study was that the rate of catheterisation can be dramatically reduced in patients with certain admitting diagnosis, including patients with CHF, those admitted for palliative care and incontinent patients with an admission diagnosis of fever unable to provide a urine sample for culture. The total rate of catheterisation decreased from 17.5% (121/690) to 6.6% (58/882). Complete adherence to the more

Table 1 Age and proportion catheterised in the historical controls compared with patients hospitalised after introduction of a more restrictive policy (study group)

	Controls		Study group		
Age (years)	Number	Catheterised, N (%)	Number	Catheterised, N (%)	p Value
30–59	122	7 (5.7)	196	1 (0.5)	0.006†
60–69	79	5 (6.3)	120	4 (3.3)	0.256†
70–79	200	34 (17.0)	185	11 (5.9)	<0.001
80–89	231	55 (23.8)	292	33 (11.3)	<0.001
90 or more	58	20 (34.5)	89	9 (10.1)	<0.001
Total	690	121 (17.5)*	882	58 (6.6)*	<0.001
Median days		3		3	
Total days‡		582		390	

*Increased incidence with age (p<0.001) before and after the intervention.
†Fisher's exact test.
‡Total includes residual for those with in and out procedures (N=44).

Table 2 Admission diagnosis and proportion of patients catheterised in the historical controls and after the introduction of a more restrictive policy (study group)

	Controls			Study group			
Admission diagnosis	Total, N	Catheter, N (%)	Unacceptable, N	Total, N	Catheter, N (%)	Unacceptable, N	p Value
Fever	132	35 (26.5)	35	153	12 (7.8)	12	<0.001
Stroke	34	11 (32.4)	11	40	8 (20.0)	8	0.225
Congestive heart failure	106	30 (29.3)	30	107	3 (2.8)	3	<0.001
Sepsis/hypotension	9	8 (88.9)	0	14	13 (92.9)	0	0.641*
COPD	44	4 (11.4)	4	91	5 (5.5)	5	0.222
Acute renal failure	1	0 (0)	0	6	1 (50.0)	0	0.571*
Palliative care	29	15 (51.7)	0	25	3 (12.0)	0	0.002
Cellulitis/ulcer	8	7 (87.5)	0	17	4 (23.5)	0	0.475*
Macroscopic hematuria	5	1 (20.0)	0	7	2 (28.6)	0	0.634*
No listed criteria	10		10		8	8	
Total	690	121 (17.5)	90 (12.0)	882	58 (6.6)	36 (4.1)	<0.001

All P values relate to the comparison between the proportion of catheterisations per indication, except for the total where the p value is for both the proportion of catheterisations and the proportion of unjustified catheterisations.
*Fisher's exact test.
COPD, chronic obstructive pulmonary disease.

restrictive policy would have resulted in a 2.6% rate of catheterisation, much lower than reported previously in internal medicine departments where post-intervention rates have been reported to be as low as 6.5%[15] and 11%[14] but are generally much higher.[4–7 14 16] Our policy did not lead to the need for post-admission urinary catheterisations, except in one patient hospitalised for palliative care. Fewer patients were discharged with an indwelling urinary catheter, significantly so in those who had no medical indication for continued catheterisation.

As in our baseline study,[3] previous interventional studies used less restrictive definitions of an appropriate urinary catheterisation. Catheterisation in patients hospitalised for palliative care did not include any statement about patient preference.[9 11 13–15 17] For patients requiring urine volume measurements, there were some but not universal clarifying statements that catheterisation is acceptable only in patients who require continuous accurate urine volume measurements[11] or who are unable to collect urine.[15 17] One study included as acceptable patients requiring aggressive treatment with diuretic medications or fluids.[11] Urinary retention was generally an acceptable indication without any qualifiers.[9 15 17] Finally in one interventional study, acceptable indications included unresponsiveness, severe hypoxia, the need for administration of ≥6 l oxygen/min or intubation.[13] Our study suggests that more restrictive indications would have lowered the rates of catheterisation in those studies.

Generalisation of our outcomes is limited by use of a single unit in a single institution, and further studies in other settings are warranted. We did not have a concurrent control group but had instead an historical control group. No data were available during the interim period, and there are no data available to determine if the intervention will continue to be effective. The use of randomised controlled trials for comprehensive interventions, however, is not practical in single departments, and the use of other departments as controls is problematic because of intrinsic differences. We did, however,

Table 3 Discharged with an indwelling urinary catheter in historical controls compared with patients hospitalised after the change in policy (study group)

	Controls, N=690	Study group, N=882	p Value
Coma/respirator	3	5	
Decubitus ulcer/cellulitis	4	2	
Macroscopic haematuria—clots	0	1	
Palliative-widespread cancer	0	2	
Renal failure—neurogenic bladder	0	1	
Difficulty removing in hospital without an indication for continued catheterisation	13 (1.9%)*	4 (0.5%)†	0.006‡
Total	20 (2.9%)	15 (1.7%)	0.110

*Four not removed on follow-up with one case of re-hospitalisation for urosepsis.
†All removed within few days outside hospital.
‡Fisher's exact test.

use the admission diagnosis as a common denominator and also compared various age groups. Lack of significant differences in these parameters makes it unlikely that the timing lead to a differential bias. Also the dramatic changes make it unlikely that selection bias led to the observed effect. Finally, a potential weakness was that the classification of the catheterisation as acceptable or not was not made independently by the two authors. The clarity of the more restrictive indications, however, leaves little room for misinterpretation.

We conclude that urinary catheterisation rates can be reduced in hospitalised internal medicine patients without adverse consequences, particularly in patients with an admission diagnosis of CHF, incontinent patients with an admission diagnosis of fever unable to provide a urine culture sample, patients with stroke and those admitted for palliative care.

Further studies are warranted in other settings to determine if our findings can be extrapolated to other internal medicine departments with different mixes of diseases and disease severities. The best way to implement a change in policy needs to be clarified, although various strategies appear to be effective in decreasing catheterisation rates.[10–14] Situations where hourly urinary outputs change therapeutic decisions and improve patient outcomes need to be defined. For example, in patients with CHF, consensus opinion broadly states that 'the types and level of monitoring required for any individual patient vary widely depending on the severity of the cardiac decompensation and the response to initial therapy',[18] but it is unclear when if ever hourly urinary output measurements will improve patient outcomes. In patients with stroke, catheterisation is associated with an increased risk of urinary tract infections and a poorer prognosis. Bladder dysfunction is common in such patients, and the best strategy to limit urinary tract infections is still unclear.[19] In patients admitted for palliative care, it has been reported that the vast majority of staff and family members preferred diapers to urinary catheterisation[20] but extrapolation of these findings to other settings might not be valid.

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