CLINICAL RESEARCH STUDY

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Measurement of Post-void Residual Bladder Volumes in Hospitalized Older Adults

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ABSTRACT

BACKGROUND: It is commonly recommended to catheterize or closely follow up patients with post-void residual volumes of 150 mL or more, but the frequency of such findings in geriatric hospitalized patients and the need for intervention are unclear.

METHODS: Post-void residual volumes were measured by ultrasound examination within 14 hours of admission in 464 patients aged 70 years or more who were hospitalized in a regional hospital general internal medicine department. Outcome variables included the need for an indwelling catheter and complications of urinary retention during the hospitalization.

RESULTS: Post-void residual volumes of ≥150 mL were common (23.9%; 111/464) and had the following distribution: 150 to 299 mL, 13.1% (61/464); 300 to 499 mL, 6.4% (30/464); and 500 mL or more, 6% (28/464). The rate of indwelling catheters was 3.2% (15/464). Results of post-void residual volumes did not predict the need for indwelling catheters in those without other criteria, although those with indications for indwelling catheters had a significantly higher frequency of post-void residual volumes ≥500 mL ($P < .001$) compared with those without such indications.

CONCLUSIONS: We conclude that urinary retention in hospitalized geriatric patients is common, but measurements of post-void residual volumes did not have definite clinical utility. However, the study had limited power to determine the benefits or potential harms of urinary catheterization for elevated post-void residual volumes.

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KEYWORDS: Catheterization; Geriatric patients; Post-voiding residuals

Urinary catheterization has risks, and its use should be limited. Up to 97% of nosocomial urinary tract infections are associated with instrumentation of the urinary tract[1,2] accounting for up to 40% of nosocomial infections annually in US hospitals.[3,4] Other risks are the potential for urethral injuries, the possibility that the catheter will be left in permanently, and the unnecessary use of resources.[5] In certain clinical situations, catheterization can improve patient care, but broad definitions of appropriate use leads to indwelling catheterization without demonstrated clinical utility.

One common reason for catheterization in geriatric patients is urinary retention,[5] but the definition of acute and chronic urinary retention remains empirical and subject to wide interpretation.[6] Urinary retention commonly is defined as a post-void residual volume of 150 mL or more, but it is difficult to establish a threshold for intervention, because there is no clearly defined point at which the benefits of catheterization outweigh the risks.[6] A recent study defined justified catheterization in patients with urinary retention only if there is a documented decrease in renal function, ureteric dilatation, urosepsis, or patient discomfort.[7] However, this study did not systematically examine bladder volumes.

In the current study, we estimated urine volume in 464 patients aged 70 years or more who were admitted to an internal medicine department, and we determined the

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outcome of patients with increased post-void residual volumes. We hypothesized that post-void residual volumes of 150 mL or more are common in the geriatric hospitalized patient. Second, we examined short-term outcomes in subgroups of patients with various volumes to determine whether there is any suggestion of clinical utility of routine post-void residual volume testing in hospitalized geriatric patients.

CLINICAL SIGNIFICANCE

- Urinary retention is common in hospitalized patients aged 70 years or more.
- The measurement of post-voiding residual volumes in geriatric hospitalized patients has questionable clinical utility.
- The study suggests that restrictive criteria with reinforcement during daily staff meetings could reduce indwelling catheterization rates without adverse consequences.

MATERIALS AND METHODS

Patients and Setting

This is an observational study including patients aged 70 years or more who were admitted to an internal medicine department between October 1, 2011, and April 31, 2012. The patients presented consecutively to a regional 400-bed hospital and were hospitalized in an internal medicine department with 36 general medicine beds, selected by the days when the physician who did the testing (EF) was in house. We excluded patients who were admitted to intensive or surgical care and those with an indwelling catheter (N = 6) before admission. No patients declined to participate.

Measurements

We performed a post-void ultrasound examination in all patients who were admitted without an indwelling catheter within 14 hours after admission. To ensure reliability of post-void residual assessment, all examinations were performed by a single physician (EF) with prior training in the use of the bladder scanner (SonoSite MicroMaxx L38E 10-5 MHZ; SonoSite Inc, Bothell, Wash).The scanner has been shown to be accurate and comparable to other portable scanners.[8,9]

At the time of testing, we accessed the patient's age, gender, serum creatinine concentrations, reason for hospitalization, and medical history (International Classification of Diseases, 9th Revision) from the hospital computerized information system.

Definition of Acceptability of the Use of an In-Hospital Indwelling Catheter and for an In-and-Out Procedure

Indications for a single in-and-out procedure included the inability to give a urine sample in a patient with fever to diagnose urinary tract infections, in patients who needed a toxicological screen, or in patients who presented with macroscopic hematuria. We did not perform intermittent catheterizations.

We used restrictive indications for an appropriate indwelling catheter.[7] Catheterization in patients with urinary retention was only justified if there was a documented decrease in renal function, ureteric dilatation, urosepsis, or patient discomfort. Blood tests for serum creatinine were obtained routinely on admission and before discharge if the test results were above the reference interval or for other clinical indications. We defined a urinary tract infection in a symptomatic patient with 100,000 organisms/mL or more found in the urine culture. Patient discomfort was ascertained during daily rounds that includes pain/discomfort on a visual analogue scale (0 = no pain, 10 = severe pain). For those without urinary retention, justified catheterization included the need for volume monitoring or sampling in an uncooperative patient, prevention of skin irritation in a patient with skin lesions, active urinary bleeding, or patient or family preference if being given palliative care.[7] These indications have been in place since 2007, and the entire staff (physicians and nurses) discusses all admissions, admitted patient's status, and reasons for new urinary catheter insertions.[7]

Follow-up

Outcome variables were the need for an indwelling catheter, catheter-associated urinary tract infection, and complications of urinary retention during the hospitalization. Urology consultation was provided for all patients with urinary retention and sepsis or increases in serum creatinine concentrations. The patient's health provider or family member was contacted at least 14 days after discharge if the catheter was not removed during hospitalization or the patient had a post-void residual of 500 mL or more. An additional follow-up was performed 12 months after discharge.

Data Analysis

We divided post-void residual volumes into 5 groups: $<$150 mL, 150 to 299 mL, 300 to 399 mL, 400 to 499 mL, and $\geq$500 mL, according to what has been considered the upper limit of the reference interval[5,10-13] and extreme values.[14-19] We used the Chronic Kidney Disease Epidemiology Collaboration equation to calculate estimated glomerular filtration rates.[20] The 2-sided chi-square test was used to compare the frequencies of catheterization between groups, with a P value $<$.05 considered significant. Analysis of variance was used to compare differences between the means.

Ethical Approval

The project was approved by the local ethics committee (6/10/11, number 0082-11-LND), whose decisions are

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