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High Rates of Inadequate Urine Volume Cause Failure of Clinic Based Uroflowmetry in Men with Lower Urinary Tract Symptoms

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Abstract

Introduction: Clinic based uroflowmetry is commonly used in the diagnosis and management of lower urinary tract symptoms. AUA (American Urological Association) guidelines recommend 2 separate uroflowmetry tests with a voided volume greater than 150 ml for accurate interpretation. We characterized the interpretability of a series of uroflowmetry tests done at our institution and hypothesized that a significant number were noninterpretable because of inadequate urine volume.

Methods: Uroflowmetry results were collected from male patients at the UH (University of Utah Hospital) and VAMC (George Wahlen Veterans Affairs Medical Center) urology clinics between August 31, 2014 and September 30, 2014. Average time to perform uroflowmetry was determined. Tests with a volume of 150 ml or less were classified as noninterpretable. Data were characterized using descriptive statistics.

Results: During the study period 169 tests were collected, including 104 at UH and 65 at VAMC, of which 107 (63%) were noninterpretable. An estimated total of 1,452 tests were performed at UH and VAMC within a 12-month period. Average time to perform uroflowmetry by health care workers was 2 minutes 18 seconds. The estimated time loss per year for medical personnel due to noninterpretable uroflow studies was 35 hours.

Conclusions: More than 50% of clinic based uroflowmetry tests at our institution had a voided volume of 150 ml or less and were deemed noninterpretable per AUA guidelines. Current clinic based uroflowmetry testing strategies are inefficient and wasteful. Reliable, accurate alternatives to clinic based uroflowmetry for the diagnosis and management of lower urinary tract symptoms should be explored.

Key Words: lower urinary tract symptoms; cost-benefit analysis; urination; monitoring, ambulatory; healthcare failure mode and effect analysis

Abbreviations and Acronyms

LUTS = lower urinary tract symptoms

Qmax = peak urinary flow

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Lower urinary tract symptoms commonly affect men and increase in prevalence with older age. LUTS include urinary hesitancy, post-void dribbling, urgency and nocturia, which affect more than 50% of men older than 50 years.[1,2] These symptoms cause sleep disturbances,[3] depressive symptoms[4] and difficulty in performing daily activities,[5] which negatively impact quality of life.[6–9] An estimated 20% of men reported that benign prostatic hyperplasia/LUTS interfered with 1 or more activities of daily living most or all of the time.[5,8] Appropriate diagnosis and management of LUTS improves quality of life in men affected by this bothersome condition.

Uroflowmetry is a simple outpatient urological test that calculates the urine flow rate with time and is used to diagnose and manage LUTS.[10] Calculating Qmax by uroflowmetry is the best single measure to estimate the probability that a patient has urodynamic obstruction.[10,11] Since uroflowmetry does not alter management of basic LUTS, the AUA guideline describes uroflowmetry as an optional test that is useful for detailed assessment during or after treatment to confirm the response.[10] For an accurate clinical interpretation a minimum of 150 ml voided urine volume is recommended by the AUA guidelines.

Ensuring adequate voided volume during clinic based uroflowmetry poses significant challenges for patients and providers. Patients are often requested to avoid urination before uroflowmetry testing. This is a challenge for patients with urgency and increased urinary frequency who travel a significant distance to the urology clinic and endure long clinic wait times. Additionally, inadequate voided volumes result in wasted time and resources for care providers, patients and insurance companies.

Despite the usefulness of peak urinary flow in the evaluation of men with LUTS prior studies have not identified the failure rate of clinic based uroflowmetry due to inadequate voided volumes. The aim of this study was to quantify the number of noninterpretable uroflowmetry tests due to inadequate voided volumes in men with LUTS at our institutions and assess the impact on the clinical work flow.

Materials and Methods

We analyzed uroflowmetry test data on adult males performed between August 31, 2014 to September 30, 2014 at the urology clinics at UH and VAMC. Institutional board approval was obtained for this study. Indications for uroflowmetry testing in our study were a presentation of complex LUTS, persistent bothersome LUTS refractory to basic management or assessment of LUTS treatment. Qmax, voiding time and total voided volume were determined. Flow tracings were collected and evaluated without patient identifying factors according to institutional review board guidelines. Uroflowmetry tests were stratified by voided volume less than 50, 50 to 100, 101 to 125, 126 to 149 and 150 ml or greater. Total voids greater than 150 ml were subsequently interpreted as obstructed (Qmax less than 12 ml per second and a flattened flow pattern), unobstructed (Qmax greater than 15 ml per second and a bell-shaped curve), straining (staccato peaks), indeterminate or a mixed pattern.[12]

Additionally, we assessed the impact of noninterpretable tests on clinic work flow. Patients selected for uroflowmetry time trials had been diagnosed with LUTS of various etiologies, such as benign prostatic hyperplasia, urethral stricture or prostate cancer. All patients in this cohort were male. Uroflowmetry duration was measured from the time of bathroom entry to the time of exit and included instruction by the staff. The duration and average time to perform 20 uroflow tests were recorded.

Uroflow tests billed between December 2013 to November 2014 at UH were queried based on CPT codes. At VAMC the number of uroflow test billed between December 2013 and November 2014 was calculated by multiplying the total sum of all uroflow tests performed by all urology faculty members at VAMC during September 2014 by 12 months. The estimated time loss for health care providers during a 1-year period at UH and VAMC due to noninterpretable uroflow tests was calculated using the equation, failure incidence $\times$ estimated total number of visits per year $\times$ total uroflowmetry duration. All data were characterized using descriptive statistics.

Results

Voided Volumes, Rates and Patterns

Included in analysis were 169 tests, including 104 at UH and 65 at VAMC. Of the 169 tests 107 (63%) had a voided volume of less than 150 ml and were noninterpretable, including 65% at VAMC and 63% at UH (see figure). Uninterpretable tests had a voided volume of less than 50, 50 to 100, 101 to 125 and 126 to 149 ml in 35 (33%), 47 (44%), 16 (15%) and 9 (8%) cases, respectively. When the voided volume threshold was reduced to 125 ml, 98 (58%) tests were still considered noninterpretable. [F1]

There was no significant difference in the failure rate between the 2 institutions. Of the 62 tests with an interpretable voided volume greater than 150 ml 14 (23%) had an obstructed pattern, 35 (56%) had an unobstructed pattern, 4 (6%) had a straining pattern and 9 (15%) had a mixed pattern. In these patients mean $\pm$ SEM Qmax was