



# Urodynamic Studies

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## This article is for **Medical Professionals**

Professional Reference articles are designed for health professionals to use. They are written by UK doctors and based on research evidence, UK and European Guidelines. You may find the **Urodynamic Tests** article more useful, or one of our other **health articles**.

Treatment of almost all medical conditions has been affected by the COVID-19 pandemic. NICE has issued rapid update guidelines in relation to many of these. This guidance is changing frequently. Please visit

**<https://www.nice.org.uk/covid-19>** to see if there is temporary guidance issued by NICE in relation to the management of this condition, which may vary from the information given below.

Urodynamic studies assess the function of the bladder and urethra and are often useful in the assessment and diagnosis of patients presenting with lower urinary tract symptoms (LUTS). Urodynamic tests such as cystometry, uroflowmetry, pressure flow studies, electromyography and video-urodynamics tests provide objective information regarding the normal and abnormal function of the urinary tract and pelvic floor and, therefore, a better understanding of the cause of LUTS.

Urodynamic studies are particularly recommended if LUTS are persistent and suggest detrusor overactivity or sphincter incompetence<sup>[1]</sup>.

# Initial assessment<sup>L4J</sup>

## Frequency volume charts (voiding diaries, bladder diaries and charts)

Information from a voiding diary can provide valuable additional information but should not be used in isolation.

- Voiding diaries are often part of the initial evaluation of patients complaining of LUTS, especially those who have storage symptoms such as increased [urinary frequency](#) and [urinary incontinence](#).
- Voiding diaries are also known as micturition time charts, frequency/volume charts and bladder diaries.
- Diaries provide an indication of the voiding pattern and the severity of symptoms.
- It is recommended that a diary should be used between 3 and 7 days.

Diaries that have been defined by the International Continence Society (ICS) include<sup>[3]</sup>:

- **Micturition time chart:** records only the times that voids occur with no data on volume.
- **Frequency/volume chart:** records the time and volume of each micturition.
- **Bladder diary:** records the time and volume of each micturition and may also include other data such as incontinence episodes, pad usage, fluid intake and urgency.

Findings may include:

- Increased frequency and normal volumes - an increased 24-hour production of urine, suggesting a high fluid intake. This may be related to [diabetes mellitus](#) or [diabetes insipidus](#) but is more often habitual (psychogenic polydipsia).

- Reduced volumes with minimal variation in the volume voided, suggesting bladder wall pathology such as carcinoma in situ or [interstitial cystitis](#).
- Reduced volumes with variation in the volume voided, suggesting underlying detrusor overactivity.
- Increased nocturnal production. See separate [Nocturia](#) article.

## Pad tests

- A non-invasive objective method for detecting urinary incontinence. It may be useful to confirm the presence of incontinence when other tests have failed to demonstrate any urinary leakage.
- The principal aim of the test is to determine the amount of urine lost during a specified period (eg, one hour), as the degree of incontinence is often unclear from the history.
- The usefulness of pad tests in quantifying severity and predicting outcome of treatment is uncertain, although early postoperative testing may predict future continence in men after prostatectomy.
- The trampoline pad stress test is simple to perform and has been shown to detect leakage in over 90% of women who did not leak during the jumping pad stress test<sup>[4]</sup>.

## Urinary flow rate

The need for an initial assessment of flow rate is sometimes disputed in primary care and the presence of a reduced flow rate can usually be gained by a thorough clinical history.

- Uroflowmetry is useful in the assessment of voiding function for a wide range of urological conditions. Uroflowmetry is a non-invasive test that measures the rate of flow of voided urine.
- It can often be used to suggest the presence of bladder outlet obstruction or a

poorly functioning detrusor muscle.

- Uroflowmetry is performed using a flow meter to measure the quantity of fluid voided per unit of time - expressed in millilitres per second (ml/s).
- Patients are instructed to void normally, either sitting or standing, with a comfortably full bladder.
- A flow rate based on a voided volume of under 150 ml is insufficient for reliable interpretation.
- Men aged under 40 years generally have maximum flow rates over 25 ml/s. Flow rates decrease with age and men aged over 60 years, with no urinary obstruction, usually have maximum flow rates over 15 ml/s.

## Post-void residual measurement<sup>[1]</sup>

Post-void residual (PVR) volume is an important part of the assessment of patients with symptoms of voiding dysfunction or recurrent urinary tract infections, which may be due to incomplete bladder emptying.

- It is important because it may worsen symptoms and, more rarely, may be associated with UTI, upper urinary tract dilatation and renal insufficiency.
- Both bladder outlet obstruction and detrusor underactivity contribute to the development of PVR.
- Portable ultrasound devices can be used to scan and calculate the volume of urine in the bladder (whether in urinary retention or after micturition).
- The results of studies investigating the best method of measuring PVR have led to the consensus that ultrasound measurement of PVR is actually better than catheterisation<sup>[5]</sup>.
- PVR volume should be measured in patients with urinary incontinence who have voiding symptoms. It should also be measured when assessing patients with complicated urinary incontinence.

- PVR volume should be monitored in patients receiving treatments that may cause or worsen voiding dysfunction.

## Multichannel cystometry

- Simultaneous measurement of bladder pressure and flow rate allows the best assessment of the presence or absence of bladder outlet obstruction.
- Cystometry provides information regarding the function of the lower urinary tract during both the storage and voiding phases of the bladder cycle and often supports a definitive diagnosis for LUTS.
- Cystometry can help inform decisions about future management, including possible surgery for bladder outlet obstruction or detrusor overactivity, and neurological lower urinary tract dysfunction.
- Multichannel cystometry may also help to characterise bladder compliance, sensation and capacity.

## Leak point pressure

- While the bladder is being filled during cystometry, it may suddenly contract and squeeze some water out without warning. The manometer records the pressure at the point when the leakage occurred.
- The patient may also be asked to apply abdominal pressure to the bladder by coughing, shifting position, or trying a Valsalva manoeuvre. These actions help to evaluate the sphincter muscles.

Urethral pressure profilometry is also used to assess urethral function<sup>[6]</sup>. It is highly accurate in diagnosis, grading and localisation of bladder outflow obstruction in men with voiding dysfunction<sup>[7]</sup>.

## Pressure flow study

- After cystometry, the patient is asked to empty the bladder. The catheter can

measure the bladder pressures required to urinate and the flow rate that a given pressure generates.

- This pressure flow study helps to identify bladder outlet obstruction that men may experience with prostate enlargement.
- Bladder outlet obstruction is less common in women but may occur as a result of genitourinary prolapse or after a surgical procedure for urinary incontinence.

## Ambulatory urodynamics

Ambulatory urodynamics may detect unexpected physiological variance from normal more often than conventional cystometry but the clinical relevance of this is uncertain. In practice it is not often undertaken<sup>[1]</sup>.

The ICS Urodynamics Committee recommends its use as a second-line diagnostic tool when office laboratory urodynamics have failed to achieve a diagnosis<sup>[8]</sup>.

- Urine is initially passed into a special toilet which records the volume of urine passed and the urine flow rate.
- An ultrasound scan can then check whether the bladder has been emptied.
- Two fine tubes are then passed, one into the bladder to measure pressures within the bladder and one into the rectum to measure abdominal pressure.
- An electronic continence pad is worn to record any leaks of urine.
- The patient is then asked to get dressed, walk around and eat, drink and go to the toilet normally.
- The test should be continued until the patient has passed urine on at least two occasions and the patient is asked to record when they passed urine and when they experienced any symptoms such as urgency (and what they were doing at the time).

### FURTHER READING AND REFERENCES

1. [Guidelines on Urinary Incontinence](#); European Association of Urology (2015)
2. [Lower urinary tract symptoms in men: assessment and management](#); NICE Guidelines (June 2015)
3. [Dynamic Testing](#); International Continence Society
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8. [Digesu GA, Gargasole C, Hendricken C, et al](#); ICS teaching module: Ambulatory urodynamic monitoring. *Neurourol Urodyn.* 2015 Nov 23. doi: 10.1002/nau.22933.

## ARTICLE INFORMATION

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