Home uroflowmetry in men

W36B, 30 August 2011 16:00 - 17:30

Start	End	Topic	Speakers
16:00	16:05	Introduction	• Michael Drinnan
16:05	16:20	Uroflowmetry guidelines and best practices	• Robert Pickard
16:20	16:35	Tools and devices for home uroflowmetry	• Alison Bray
16:35	16:50	Clinical value of home uroflowmetry: evidence and experience	• Wendy Robson
16:50	17:00	Break	None
17:00	17:30	Discussion	All

Aims of course/workshop

There has been recent rapid development of cheap, often disposable devices for home uroflowmetry, and also portable, electronic flowmeters potentially suited to home use. Our group has had a long-term interest in these tools; we recently performed a review of the devices available and the clinical value of home uroflowmetry. The aim of this workshop is to:

Review the current best practice in uroflowmetry, and show where home measurements are likely to fit in the framework.

Describe the range of home tools available to document urine flow and other lower urinary tract symptoms.

Discuss the potential clinical value of these tools, and where they fit in the diagnostic pathway.

Educational Objectives

Recent hard hitting documents such as the 'High quality care for all' Darzi report made it clear that we need to improve the efficacy and patient experience of our diagnostic pathways. At the same time, health services are being subject to growing financial pressures caused by a worldwide recession. Home assessment tools offer the promise of providing cost-effective and high quality data on which to base diagnostic decisions. The recent developments in home uroflowmetry now make it a realistic alternative to in-clinic measurements.

Our group has spent the past 5 years studying, assessing and trying to improve the value of home uroflowmetry. In this workshop we will describe the tools available and the evidence for their use, against the backdrop of best practice set down in recent standards published by the standards bodies.

This workshop will be of direct and practical value to nurses, urologists and technologists involved in the provision of diagnostic uroflowmetry services.

Abbreviations:

AUA	American Urological Association
BOO	Bladder outlet obstruction
ICUD	International Consultation on Urological Disease
LUTS	Lower urinary tract symptoms
NICE	National Institute for Health and Clinical Excellence
Q_{max}	Maximum flow rate
RCT	Randomised controlled trials
TURP	Transurethral resection of the prostate
V_{void}	Voided volume

Topic 1: Uroflowmetry guidelines and best practices

Clinicians involved in helping men with LUTS manage their symptoms have a somewhat mystical relationship with uroflowmetry. We all feel comforted by the presence of a flow trace when assessing a patient but would struggle to justify its influence on clinical decision making. This situation was exemplified by the statement that high level evidence was lacking in the recent UK NHS NICE review (nice.org.uk). However, a lack of evidence does not mean lack of benefit. The aim of this workshop is to discuss the worth of uroflowmetry and suggest ways in which higher level evidence could be obtained.

What is uroflowmetry?

Uroflowmetry was developed to quantify the physiological process of voiding (bladder emptying). One of the quantities measured is urine flow rate (in ml/s), determined by the balance between the opposing pressures of detrusor contraction and urethral closure (outlet resistance). The recording of urine flow is displayed as a graph of flow rate (ml/s) on the vertical axis against time (s) on the horizontal axis. For a normal individual, this is a bell-shaped curve (Figure 1). The technical aspects of recording and reporting flow information are covered by an ICS Standardization Report [1]. The most studied and routinely used quantity from this flow curve is Q_{max}.

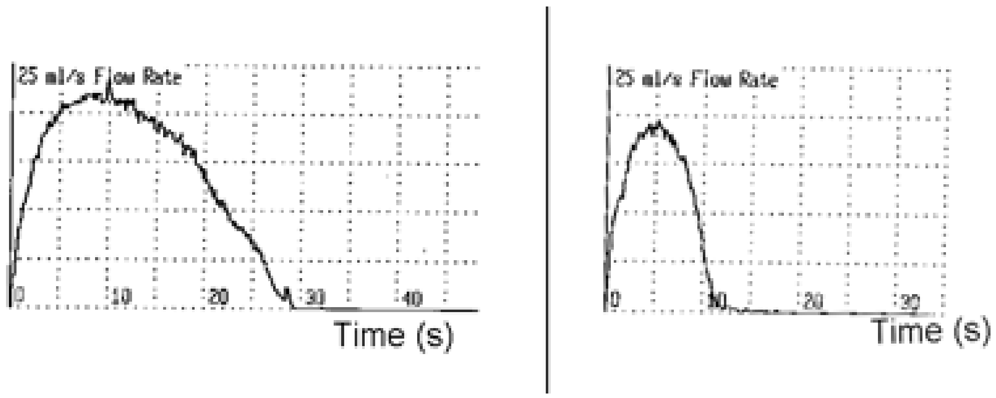


Figure 1. Urine flow curves from a man with no urinary symptoms. Note Q_{max} of 20 – 25 ml/s, the bell shaped curve and the variation in voiding time due to different V_{void} indicated by the area under the flow curve.

What is uroflowmetry for?

Uroflowmetry can be used to help identify obstruction (diagnosis); to inform discussion about treatment options (communication); to predict outcome from treatment (prognosis); and as an outcome measure in clinical trials.

What makes a good test?

A worthwhile test makes you more certain about a diagnosis – such as BOO, or a treatment outcome – such as TURP, than you were before you did the test. One of the best ways to measure this is by calculating the positive likelihood ratio (LR+) defined as:

$$LR+ = \frac{sensitivity}{1 - specificity}$$

The LR+ for Q_{max} < 10 ml/s in diagnosing BOO has been estimated at between 1.5 and 3.8, which suggests a poor to moderately good test; a good test has a LR > 10. Other aspects of a good test are that it should measure what it is meant to measure (validity), it should do so consistently (reliability), it should be appropriate to the setting where it is used (acceptability) and it should be worthwhile (cost-effective). Since uroflowmetry has been round for a long time it has not been subjected to many well conducted studies to show that it fulfils these criteria. However, the fact that it is widely used does suggest that it has value (face validity).

How should uroflowmetry be used?

In recent years, professional organisations such as the AUA and the ICUD and funders of healthcare such as the UK Government NICE have produced practice guidelines in order to encourage best practice and enforce standardised care pathways. The first step in formulating a guideline is to summarise the evidence for each component and make recommendations based on the strength and quality of that evidence. The strictness of this approach varies with guidelines from professional organisation generally using even the lowest level of evidence (expert opinion; Level 4) whilst those from NICE only really consider the highest levels of evidence from methodologically robust studies such as RCTs (Level 1). This tends to result in the AUA/ICUD guidelines being more pragmatic and thus more widely followed by clinicians whereas compliance with NICE guidelines tends to be imposed from above by restrictions in funding.

International Consultation on Urological Disease

http://www.icud.info/

Abrams P et al. J Urol 2009; 181: 1779-1787.

"Urinary flow rate measurement is useful in the initial diagnostic assessment and during or after treatment to determine response. Because of the non-invasive nature of the test and its clinical value, it is recommended as part of the specialized evaluation to be performed before embarking on any active therapy. Q_{max} *is the best single measure but a low* Q_{max} *does not distinguish between obstruction and decreased detrusor contractility. Because of the intra-individual variability and the volume dependency of the* Q_{max}*, at least two flow rates should be obtained, ideally both with a volume greater than 150 ml voided urine. If such a voided volume cannot be obtained by the patient despite repeated recordings the* Q_{max} *results at the available voided volumes should be considered."*

American Urological Association

http://www.auanet.org/content/guidelines-and-quality-care/clinical-guidelines.cfm

"Urinary flow rate measurement is optional. It is useful in the initial diagnostic assessment and during or after treatment to confirm response. Despite the non-invasive nature of the test and its clinical value, it is an optional test in the detailed evaluation to be performed before embarking on any invasive therapy."

National Institute for Health and Clinical Excellence

http://www.nice.org.uk/

"Do not routinely offer flow-rate measurement to men with LUTS at initial assessment."

"Offer men with LUTS who are having specialist assessment a measurement of flow rate and post void residual volume."

Summary

The fact that uroflowmetry is widely used suggests that it does have overall value. From a clinician standpoint that value seems to lie with deciding on treatment options and is primarily based on thresholds of Q_{max} that best define BOO. From a scientific standpoint there is currently only weak evidence that knowledge of Q_{max} improves outcome from treatment. Studies of effectiveness and cost-effectiveness in appropriate settings are needed to inform better our use of this test.

Topic 2: Tools and devices for home uroflowmetry

Techniques and devices through the years

A number of home uroflowmetry techniques and devices have been reported in the literature. These include:

Timing methods

- Simplest method.
- Time a void of given volume (right) or measure volume voided over a given time.
- Low-cost – only a jug and watch needed!
- Average flow rate over the timed period obtained rather than the recommended parameter Q_{max}.

Funnel devices

- User voids into funnel, urine flows out through a hole in the bottom into a measuring container.
- The maximum level to which urine rises during a void gives an indication for Q_{max}.
- Some indicate whether Q_{max} is above or below a certain value (A and B below).
- Other categorise Q_{max} into a range (C and D below).
- Some are single-use and mark Q_{max} automatically (E below).
- Low-cost (≈ £10 / €11 / $16).

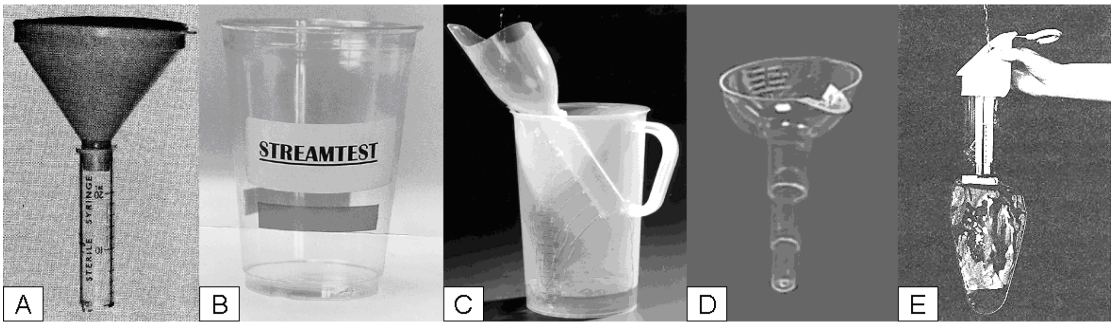


Figure 2. A) Smith's device [2], B) Streamtest cup [3], C) PEL device [4], D) Uflow Meter® [5, 6], E) Peakometer [7-9].

Electronic devices

- Based upon similar technology to clinic-based flowmeters.
- Obtain the full flow traces / voided volumes / dates / times of multiple voids.

Commercial availability

Funnel devices

To our knowledge, the only simple funnel home flow device commercially available at present is the Uflow Meter® (right), distributed by MDTi, Wolverhampton, UK. The Uflow Meter® comprises a funnel of progressively narrower chambers with the aperture and diameters calibrated to indicate Q_{max} ranges: <10ml/s, 10-15ml/s, >15ml/s: http://www.mdti.co.uk/Male-Health/uflow.html

Electronic devices

A number of urodynamic equipment companies retail portable, electronic flowmeters priced in the region of £2,000–£3,000 (€2,300–€3,400, $3,200–$4,900), suitable for home use. Examples are:

- FloPoint Elite by Verathon (A below)
  http://www.verathon.co.uk/products/verathon_BladderScan_FloPointElite.html
  Wireless, spinning disc flowmeter
- Portaflow by Mediwatch (B below)
  http://www.mediwatch.com/Portaflow.php
  Wireless weight transducer flowmeter
- Urocap III by Laborie (C below)
  http://www.laborie.com/incontinence/Urodynamics/Urocap-III-9.aspx
  Wireless weight transducer flowmeter

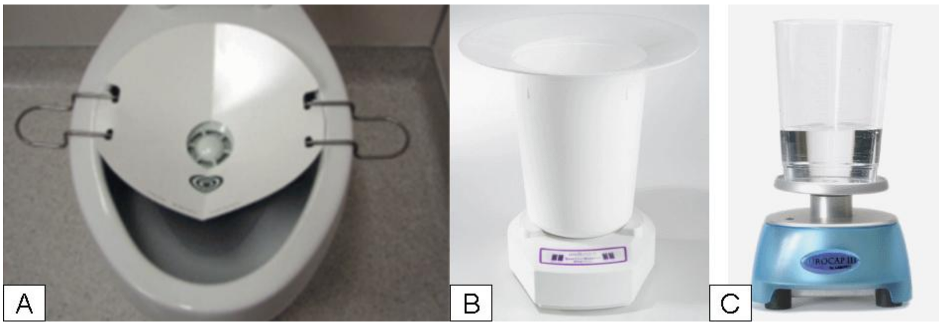


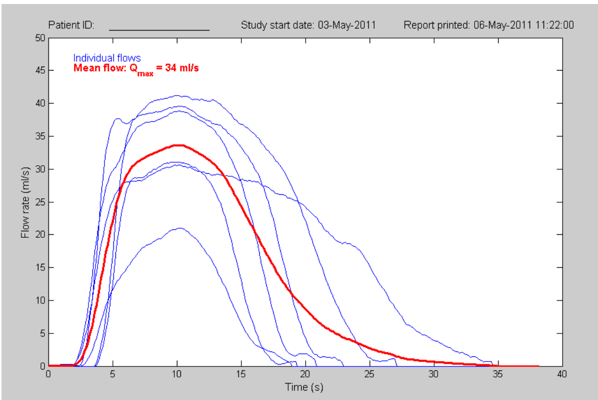
Figure 3. A) FloPoint Elite by Verathon, B) Portaflow by Mediwatch, C) Urocap III by Laborie.

Devices on the horizon

There are some new devices for home uroflowmetry being trialled:

PeePod®

We are developing a low-cost, single patient use, electronic home flowmeter. The device can be used at home by a patient for up to two weeks and then returned via post.



Diary for continence

This device is being developed by Devices for Dignity (D4D) in conjunction with MDTi, Wolverhampton. The electronic diary is used by the patient to record details of their urination activity: times, volumes passed and urgency.

Topic 3: Clinical value of home uroflowmetry: evidence and experience

Low-cost, simple methods and devices

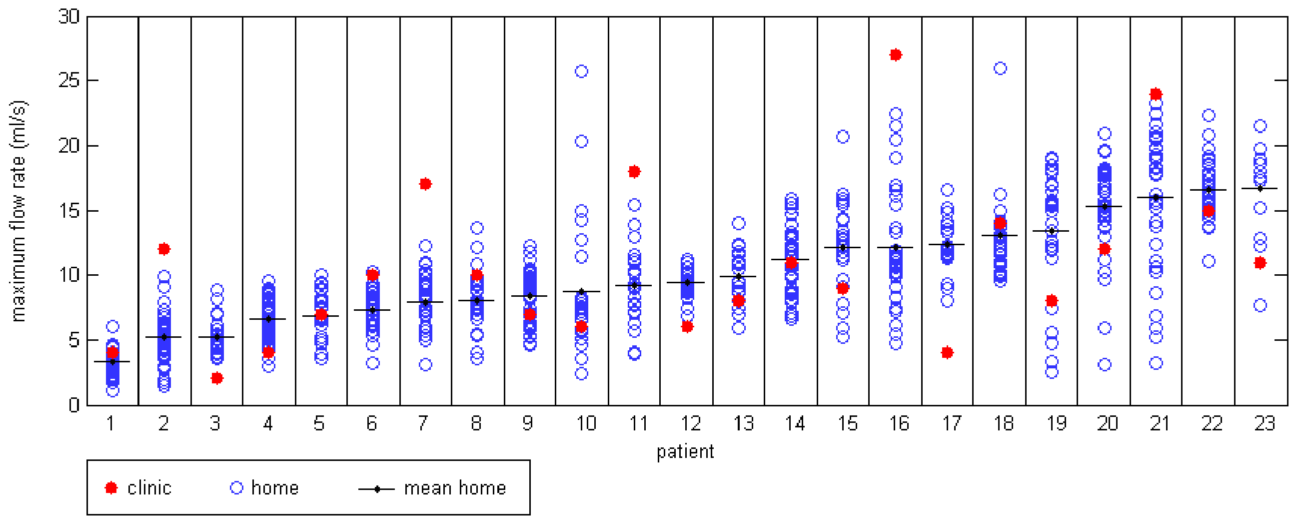
Low-cost techniques such as timing methods and funnel devices may be valuable...

- as first-line screening tests
- for long-term self monitoring
- for use in remote / underdeveloped areas

In fact, we have shown that by averaging multiple measurements from a seemingly imprecise funnel device, a precise value for average Q_{max} can be obtained [6].

Obtaining representative measurements

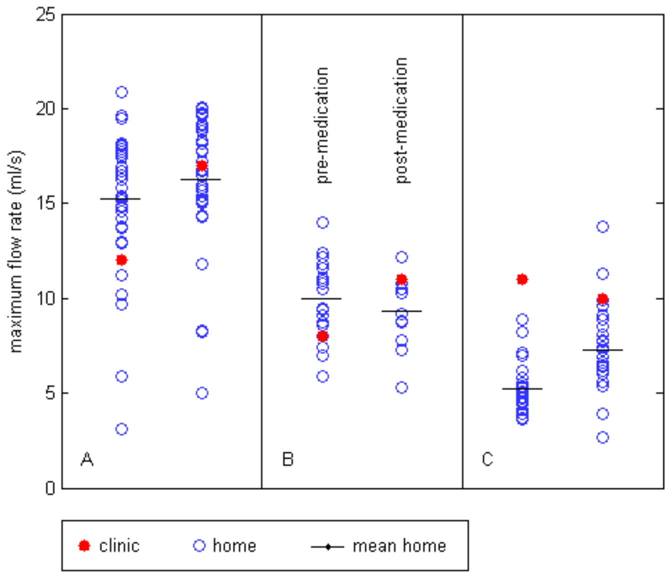
The clinic is not an ideal environment in which to obtain representative voids. The figure below compares Q_{max} from a clinic void to multiple values measured at home, for 23 patients. It can be seen that some patients voided in the clinic with Q_{max} much higher or lower than any void at home.



What are the practical implications of being able to estimate a patient's average Q_{max} more accurately? It implies that the diagnostic accuracy of Q_{max} for diseases such as BOO should improve. Further studies are required to confirm and quantify this improvement.

Measuring treatment outcome

Q_{max} is the most common objective indication of the outcome from treatments for BOO. We hope that what we measure in the clinic is a reflection of what is really happening to the patient's flow rate, as in A below. But, variation in Q_{max} within the individual may be larger than the difference we expect to see from treatment. This may lead to a situation where we measure in the clinic a change in the patient's flow rate that hasn't really happened, as in B below. This may also occur if the flow rate measured in the clinic is unrepresentative, as in C below.



Improving patient experience

Would patients prefer to measure flow in the clinic or at home? This has yet to be determined, but some of the patients we have studied have a clear preference:

"I live about as far away from the hospital whilst still living in the catchment area and it's extremely inconvenient to get there particularly in rush hour. I should be grateful but the urine flow test seems so trivial a test to be coming so far."

"I was in for a flow test recently, I was there for several hours and they didn't even get the measurement because as soon as I needed the toilet I had to go straight away. With my chronic heart condition it's not a good experience. Why couldn't they give me a home device?"

References

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