Acceptance testing of uroflowmeters

Abstract #21204

A. Bacon, Clinical Scientist & A. Gammie, Clinical Engineer

Bristol Urological Institute, Southmead Hospital, Bristol, UK

Abstract

It is essential that new flowmeters have been thoroughly tested before they are used to ensure they are accurate and usable.
We developed a protocol to test the Minze Hospiflow flowmeter, seen in image 1, [1] to assess its accuracy, usability, filtering and operation. We describe this protocol in order to enable standardised testing by prospective users of any new flowmeter in the future.
The tests used are summarised in Table 1.
The testing processes detailed here allow users to assess a new flowmeter in several key areas, enabling them to better critically appraise a new flow meter and understand limitations users need to be aware of. We suggest these can be used as a set of guidelines to test any new flow meter.

Introduction

Flow meters allow clinicians to perform flow studies and urodynamics which enables appropriate treatment options to be offered to patients.
It is important that new flow meters have been thoroughly tested before they are used to ensure accuracy.
Our centre has been commissioned to test a new design of flowmeter, the Minze Hospiflow.
We aimed to develop a protocol to test a new flow meter before it is used in a clinical setting.

Image 1. The Minze Hospiflow flowmeter in the male set up

Methods and Materials

The flow meter was tested in four key areas, accuracy, usability, filtering and operation. The methods used to test these areas included the below:

- A constant flow bottle
- A water column with an outlet a the base (this gives a region of constant decay of flow rate)
- Reproducing common artefacts (knocking the flow meter, wagging of the flow and removing the jug from the flow meter)
- Use in a flow clinic
- Feedback questionnaires (areas assessed included the setting up and use of the flow meter, data entry, analysis and reporting)

These tests are summarised in Table 1.

Area to test	Test performed	Reasons for test
Usability	Use in a flow clinic	Operational assessment
	User questionnaires	Operational assessment
Accuracy	Constant flow bottle	Test for artefacts
	Flow column with base outlet	Assess linearity
Filtering	Reproduction of common flow artefacts	Assessing recording response
	Start and stop of flow	Check of volume and maximum flow recorded

Table 1. Test protocol used to test a uroflowmeter.

Results

The above tests showed that the new flow meter has values for maximum flow rate and voided volume within 0ml/s and 2ml respectively. These are within the stated accuracy and ICS recommendations (±0.25ml/s maximum flow rate and ≤5ml voided volume).
It also showed an appropriate response to step changes, well within ICS recommendations.
The flow column test showed some deviations from a smooth decline of flow, so further checks of the linearity test are required.
The differences in the traces in Figure 1 show that filtering needs testing with artefacts to ensure ICS guidelines are met [4].

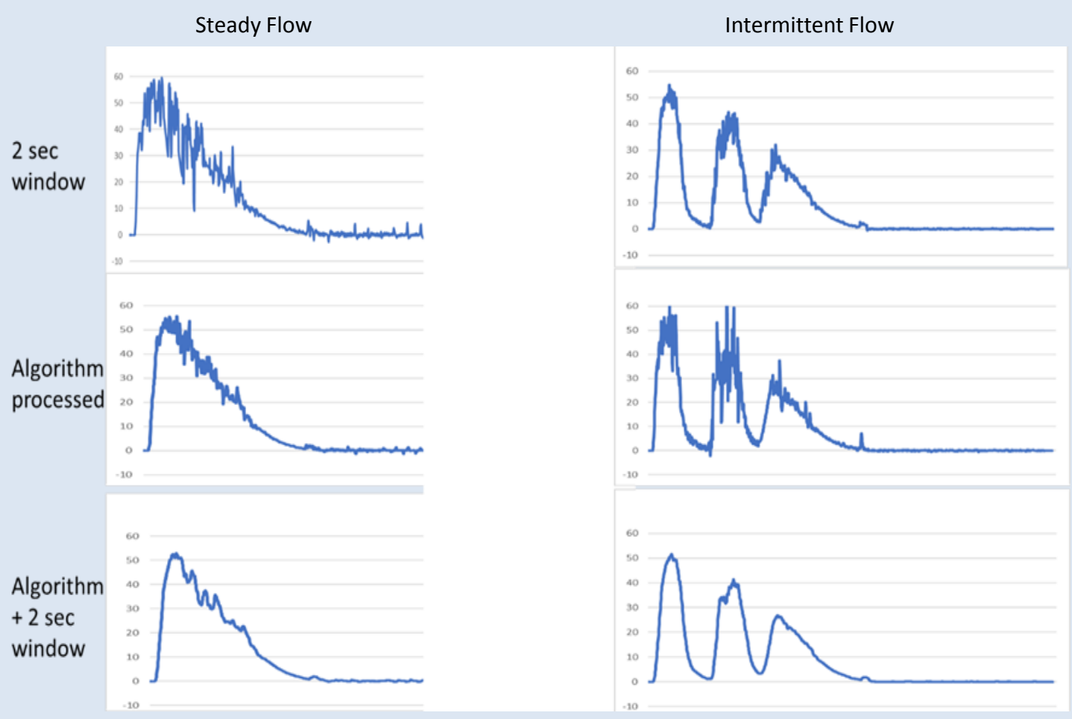

Figure 1. Comparison of steady and artefactual flow, as processed by different filtering.

Conclusions

The testing processes details allow users to assess new flowmeters in several key areas, enabling better critical appraisal and understanding limitations.
We suggest these can be used as a set of protocols to test any new flow meter.

References

[1] Minze, Health at home, Offerandestraat 1 2060 Antwerp, Belgium.
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[3] Good Urodynamics Practices: uroflowmetrey, filling cystometry and pressure-flow studies. Schaefer et al. 2002.
[4] International Continence Society Guidelines on Urodynamic Equipment Performance. Gammie et al., Neurology and Urodynamics.