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STABILITY OF THE EASYONE ULTRASONIC SPIROMETER FOR USE IN GENERAL PRACTICE

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INTRODUCTION

- Spirometry is recommended for the diagnosis & management of COPD and asthma.
- Spirometer accuracy is an important factor in obtaining quality spirometry. Recent spirometry guidelines (ATS/ERS, 2005) state that the accuracy of a spirometer must be checked at least daily using a syringe. However, in Australia only 22% of general practices use a syringe to check accuracy and only 1.5% actually perform this on a daily basis (see poster No: 89).
- The EasyOne™ is a handheld spirometer that the manufacturer claims will maintain its accuracy throughout its operational life and therefore does not require regular calibration.
- If this claim is true it has the potential to improve the accuracy of spirometry in general practice.

AIM

To assess the accuracy and stability of the EasyOne spirometer using a certified 3 litre syringe in a general practice setting.

EASYONE SPIROMETER

- The EasyOne spirometer utilises an ultrasonic sensor, has no moving parts and measures respired gas velocity from the transit-times of bidirectional ultrasonic pulses directed diagonally across the gas stream.
- Providing the cross-sectional area of the gas stream is fixed, the only variable requiring accurate measurement is the transit-time of the ultrasonic pulses.

METHODS

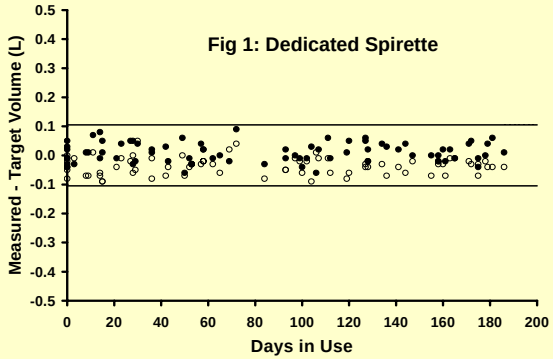
- Six EasyOne spirometers were used routinely in primary care by trained nurses. Trained nurses carried out the calibration checks periodically according to clinical usage.
- Calibration checks were carried out using a calibration syringe (Hans Rudolph, USA) with a certified accuracy of ±0.5% to deliver 3.00 litres through the spirometer (expiratory calibration check) then withdrawn back into the syringe (inspiratory calibration check).
- To meet the accuracy requirements the volume recorded by the spirometer using a 3.00 litre syringe should be within the range 2.895 - 3.105 L.
- The spirometer uses a disposable mouthpiece assembly (spirette). For each spirometer, paired syringe calibrations were performed using a single dedicated spirette reserved for calibration and also a new spirette randomly selected on each occasion.

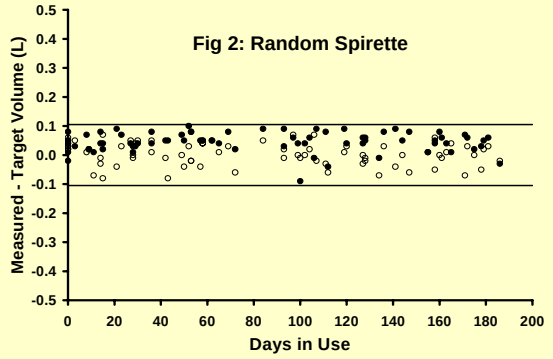
RESULTS

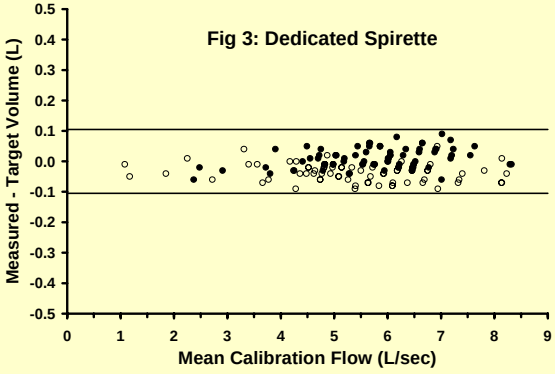
- Six spirometers were used in clinical practice for between 15.1 – 26.6 weeks (mean 23.9)
- A total of 1,141 spirometry tests were performed and 75 paired calibration checks.
- All expiratory and inspiratory calibration checks on each of the six spirometers using either the dedicated or a random spirette met the ATS/ERS accuracy criteria of 3.00±0.105 L, and there was no of deterioration in accuracy over time (Figs 1&2).
- Accuracy was not dependent on mean flow generated during the calibration (Figs 3&4).
- There was a significant difference ($p<0.001$) between inspiratory and expiratory calibration test volumes, with expiratory volumes higher than inspiratory volumes.

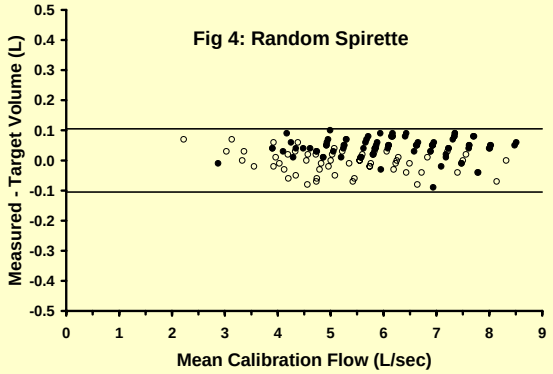
Acknowledgements: *We wish to thank Sue Davoren and Elizabeth Hammer for their assistance in carrying out the calibrations. Dr Julia Walters is the recipient of a GSK Postgraduate Support Grant.*

Figures: Pooled data from six spirometers (n=75). Horizontal lines show the upper and lower ATS/ERS accuracy limits when delivering 3.00 litres. Solid circles = expiratory calibration and open circles = inspiratory calibration.









		Dedicated Spirette (n = 75)				Random Spirette (n = 75)			
		Flow (L/s)	Measured Vol (L)	Deviation from 3 L Abs (L)	Deviation from 3 L %	Flow (L/s)	Measured Vol (L)	Deviation from 3 L Abs (L)	Deviation from 3 L %
Expiration	Mean	5.768	3.011	0.011	0.373	6.117	3.044	0.046	1.523
	Range	2.3 - 8.32	2.94 - 3.09	-0.06 - 0.09	-2.00 - 3.00	2.87 - 8.51	2.91 - 3.10	-0.09 - 0.10	-3.00 – 3.33
	SD	1.175	0.033	0.033	1.111	1.235	0.036	0.034	1.125
Inspiration	Mean	5.411	2.964	-0.036	-1.209	5.513	3.003	0.003	0.090
	Range	1.08 - 9.28	2.91 - 3.05	-0.09 - 0.05	-3.00 - 1.67	2.22 - 8.32	2.92 - 3.07	-0.08 - 0.07	-2.67 - 2.95
	SD	1.575	0.030	0.030	0.992	1.323	0.039	0.039	1.303

CONCLUSION

These results provide strong evidence that the EasyOne spirometer is accurate and maintains its accuracy during routine clinical use for at least 26 weeks. This has practical implications in general practice, as it implies that this spirometer does not require a daily calibration check as recommended by the ATS/ERS. Spirometer guidelines may need to be reviewed to reflect this. This finding does not negate the need to regularly check overall performance using a healthy subject.