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Title: Spirometer – Pass ATS/ERS test, but fail in real life

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Body: The 2005 ATS/ERS guidelines on spirometry recommend validating the quality of a spirometer by simulating forced expirations with computerized syringes. It was recently shown, that these test-curves have non-physiological flow spikes of approximately 150 mL/s instead of a slow drop towards the end of the expiration⁽¹⁾. Spirometers vary in their minimal detectable flow, especially turbine type spirometers. Due to the spiky flow, such difference might not be detected by the current ATS/ERS waveform tests. We used the interpolated form of the ATS curves⁽¹⁾ to calculate the effect on the measured FVC of the curves with varying lowest detectable flows. We evaluated flow cut-offs of 10 – 150 mL/s in 10 mL/s increments. Only flows that were above this cut-off were integrated for volume.

Figure 1: Underestimation of FVC at different cut off flows (the ATS/ERS repeatability limit is shown for comparison) The effect on FVC was high for those ATS curves that have a low tapering end (e.g. curves 3, 17, 19), while those curves that end suddenly had small effects (e.g. curves 7, 16). The deviations in FVC become larger than the ATS/ERS repeatability criterion even with lowest detectable flows of 50 – 100 mL/sec. But those failures would be missed by the currently used ATS/ERS waveforms. We recommend to urgently adapting the test curves to the interpolated version to avoid missing poor performing spirometers in the future. (1): Reinstaedtler J. ATS congress 2012, Abstract 31123.