

Don't pay for poor quality spirometry tests

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The most important goal when performing and interpreting spirometry tests is to minimise misinterpretation rates. The reason for performing spirometry (and all other diagnostic tests) is to inform medical decision-making, so it follows that misleading interpretations often harm the patient and cost money. Following false positive interpretations, some patients lose jobs which support their family, while others are prescribed expensive, unnecessary inhalers which may have serious side-effects. Following false negative interpretations, no interventions are made to eliminate the exposures causing lung disease (such as occupational factors or cigarette smoking). In our experience, pulmonary specialists have been as likely to make these mistakes as have primary care providers. Rare is an investigator who wishes to "air the dirty laundry" by measuring and reporting these clinically-important adverse outcome rates.

In this issue of the *PCRJ*, Seyedmehdi and co-workers report a dramatic improvement in spirometry quality in an occupational setting following an educational intervention.¹ The success rates of two technicians in meeting the goal of obtaining a 6-second forced expiratory time with a flat volume-time curve for three manoeuvres went from 34% before the 16-hour course to 92% afterwards. Correct interpretation of a restrictive pattern by three general practitioners (GPs) improved from 42% to 99% after 6 hours of training. Knowing that generalist physicians especially tend to miss restrictive patterns when interpreting spirometry tests,² this is an important improvement.

The most common settings where spirometry is performed may be divided into outpatient clinics, hospital-based pulmonary function laboratories, primary care practices, occupational screening settings, and as part of research studies (into asthma, COPD, or pulmonary fibrosis). We and other consultants have commonly encountered all of these settings where only half of the spirometry tests successfully met widely-accepted spirometry standards. We then often provide a spirometry course and are sometimes asked to monitor the quality of

spirometry performance for a year or more.

In the USA, training for spirometry testing usually involves one or more of the following: 15 minutes reading the operator's manual; a 30-minute onsite instruction from the manufacturer's sales representative; 70 minutes viewing an interactive CD-ROM or DVD; 4 hours attending a hands-on course at a national meeting; or 16 hours attending a National Institute for Occupational Safety and Health-(NIOSH)-approved³ (or similar) didactic plus hands-on spirometry course. Sadly, when spirometry quality is measured, none of these initial training and certification methods have provided sustainable quality.⁴ During the 12 months after training, only about half of the tests meet quality goals, even when the spirometer provides instant messages about manoeuvre quality and test session quality grades (A-F).

Centralised expert reviews with monthly quality reports sent to each person after their initial training do improve overall spirometry quality rates for large multi-site research studies. However, experience with such "continuous quality improvement" programmes suggests that about 1 in 5 technologists continue to meet quality goals for less than 60% of the patients they test.⁵⁻⁷ In primary care settings good initial training plus regular feedback regarding quality are apparently inadequate to prompt many medical care providers to take the extra time and effort required to obtain good quality spirometry tests.⁸⁻¹²

During the five years before his retirement, the first author of this editorial was involved in a large occupational lung disease surveillance programme for thousands of workers sent to hundreds of primary and secondary care clinics throughout the USA for assessments which included spirometry testing. The results will never be submitted for publication due to contractual constraints (and the excess of lawyers in the USA); however, he will take the risk of summarising them here. All spirometry tests (including the graphs and numbers from the best three manoeuvres) were quickly reviewed centrally (upon receipt) and about 60% initially met quality goals. Payment for performing the assessment was denied until spirometry was repeated with good quality tests. More than 95% of the tests then met ATS quality goals, indicating that performance feedback together with a financial incentive seems to be a powerful tool to improve spirometry quality.

The ATS/ERS spirometry quality goals were set so that 90% of tests done by experienced technologists could meet them. It is now clear that these quality goals can also be met for 9 of every 10 patients in primary care settings when adequate incentives ('carrots and sticks') are provided.^{13,14} There is a caveat: it remains unclear how often tests which do not meet ATS/ERS goals cause misclassification of the interpretation. It is possible that 95% of test sessions with quality grade C will provide the same interpretation as those with quality grade A. Tests with suboptimal quality are most likely to cause misclassification when the results are near the lower limit of the normal range, so poor quality testing of relatively healthy workers will result in higher misclassification rates than poor quality testing of patients consulting a primary care physician or admitted to a hospital with dyspnoea or an abnormal chest x-ray.

The consequences of false positive interpretations differ from the

consequences of false negative interpretations. Making a false positive diagnosis of COPD in a smoker with normal lung function differs from the consequences of falsely interpreting "restriction" (due to inadequate inhalations or short FVC manoeuvres) in a worker exposed every day to airborne silica as a sandblaster or underground miner. Apart from the (unnecessary) impact on the "diagnosed" in terms of the individual's state of mind, the costs of follow-up testing (such as lung CT scans), loss of work, expensive drugs with the potential of serious side-effects, and other interventions must be considered.

Poor quality spirometry is expensive. Good quality spirometry can be obtained more than 90% of the time when payment is only provided for good quality tests. This is an important message for those paying for the increasing use of spirometry in occupational and primary care settings.

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