Role of spirometry in primary care

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Since the turn of the 20th century, a sphygmomanometer has been considered essential in the diagnosis and management of hypertension, as has the measurement of blood glucose to diagnose and manage diabetes more recently. In contrast, chronic obstructive pulmonary disease (COPD) and asthma are frequently diagnosed and managed purely on the basis of history and physical findings.[1] This can result in misdiagnosis, overdiagnosis, underdiagnosis, and inappropriate management.[2,3] A Canadian study[2] found that 30% of physician-labeled asthma patients did not have asthma based on reversible airflow obstruction or airway hyperreactivity. An Australian study[4] found that only 56% of patients previously diagnosed with and treated for COPD by primary care physicians had the diagnosis confirmed when spirometry was done, while 37% of these patients appeared to have restrictive lung function. As a measure of disease severity, spirometry can be used to guide both treatment and the decision of whether to refer the patient to a specialist.[5,6] The Canadian Thoracic Society (CTS) COPD[5] and asthma[6] guidelines and European diagnostic spirometry guidelines[7] make it clear that spirometry should be considered part of the standard of care. There is evidence that spirometry might be used successfully to motivate patients in the early stages of COPD to quit smoking; 13.6% of those provided with interpreted spirometric data quit smoking, verified by salivary cotinine levels, versus 6.4% of those for whom there was no interpretation of the raw spirometric data.[8]

Office spirometry

To meet the standard of care for the diagnosis of asthma[6] and COPD,[5] family physicians need timely access to good-quality spirometry either through a testing centre or through in-office testing. Spirometry in the primary care setting avoids wait times for testing at hospital-based pulmonary function laboratories, is much more convenient for patients, and provides more timely data to physicians.

Office spirometry can be a viable option for primary care physicians when proper equipment is used and there is appropriate training for the technical performance of the test and its interpretation.[9] Potential barriers relate to training and equipment costs.

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Spirometers that meet selection criteria are available for between $2000 and $4000, with consumables costing $5 to $10 per test.[9] In most provinces, fee codes offset this cost. The CTS position statement has criteria for selection of spirometers as per guidelines proposed in primary care, as well as criteria for quality control, including calibration.[9]

Spirometry training courses

Training courses teaching individuals working in a primary care facility who might not have a health care background to conduct quality spirometry are available. These include the CTS-endorsed SpiroTrec course, which has pre-workshop learning and 8 hours of hands-on instruction and practice, followed by quality assurance reviews of 5 to 10 spirometry tests per month for 3 months. A 2009 review found that untrained personnel performing spirometry in primary care met the standards 44% of the time, while trained personnel met the standards 76% of the time.[7] Pulmonary function laboratories do not meet all spirometry standards 100% of the time. For example, some patients complete 2 tests with acceptable results but are unable to complete a third test. However, there is often useful clinical information derived from tests that do not meet all standards.

Training programs vary in comprehensiveness and practice time, and the results might not always be comparable. In some courses, training on how to conduct spirometry is combined with spirometry interpretation in one short session. Such courses might not be sufficient for development of either skill set. A Spanish study using a 2-part training course found that 91% of primary care spirometry was conducted and interpreted correctly following the course and, a year later, the success rate was maintained at 83%.[10] Key to these programs is the ongoing evaluation of quality; if the evaluation is not done, quality might decline in the months following successful completion of the course.

Programs that train primary care physicians and nurse practitioners in the interpretation of spirometry are also available, including the Ontario Lung Association Provider Education Program. Similar programs are available in other provinces. Although not uniform across the country, many provincial health systems are providing compensation for the cost of doing the test and for the time taken to do the interpretation. Clearly a group practice setting makes the establishment of a spirometry program much easier, as 1 or 2 staff working with 1 modern spirometer can serve the needs of many physicians, analogous to what is now done with electrocardiograms.

Spirometry in primary care

Recently the CTS published a position statement on spirometry in primary care that can serve as a guide to primary care physicians wishing to introduce spirometry into their practices.[9] The statement is a composite of worldwide best practices designed to assist in the development of office spirometry. The document covers patient preparation, equipment selection, task performance, and quality assessment. For safety, there is an emphasis on contraindications for forced expiratory maneuvers and appropriate patient teaching so the maneuver might be done with accuracy and repeatability without unduly tiring the patient. There are quality assurance guidelines and a focus on data presentation that minimizes extraneous values. There is an emphasis on the use of the lower limit of normal (LLN) based on age, sex, height, and ethnicity, as opposed to empirical approximations using percentages predicted in the interpretation, where fixed values have erroneously been interpreted as dividing normal from abnormal.[11] The LLN is defined as the lower fifth percentile and corresponds to 1.64 SDs below the mean. It is analogous to the upper limit of normal and LLN for measurements such as blood chemistry and electrolyte levels, with the exception that abnormally high values for spirometry are not considered "abnormal" and 1.64 SDs below the mean encompasses the lower fifth percentile. It has clinical correlations in that the current definition of *severity,* or risk of dying from COPD,[11] is predicated on the *z* score, or SDs from the mean, the interpretation of which is greatly facilitated by the visual analogue scale.[9,12] There is a sample requisition form that has a checklist for relative contraindications and prompts for considering smoking history and current medication. The statement is designed to facilitate the introduction of accurate spirometry to the primary care setting. The document is available through the CTS.[9] The European guidelines provide more detail in other aspects of spirometry and include interpretation.[7]

Conclusion

Spirometry in the primary care setting is useful for diagnosing obstructive lung disease. Obstructive conditions are common and there are simplified algorithms that can help with the distinction between obstruction and other conditions based on spirometry alone.[11] Somewhat less common are restrictive disorders that might require the measurement of lung volumes and diffusing capacity of carbon monoxide. The diagnosis of mixed conditions often needs more elaborate testing, as do conditions of respiratory muscle weakness. These measurements require a full pulmonary function laboratory. Consultation with a specialist in the field might facilitate both diagnosis and treatment.

Good-quality spirometry requires a high-quality spirometer used by a well trained person, with results being interpreted by a trained practitioner. All of the factors should also operate under appropriate quality assurance practices. Detailed publications provide guidance on all 4 of these aspects in the primary care setting.[7,9] The role of spirometry is to provide a physiologic measurement to assist in the diagnosis and management of lung disease. The hope is that primary care providers incorporate the use of spirometry into their daily practice.

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Competing interests

Dr Coates is Past Chair and **Dr Graham** is Current Chair of the Canadian Thoracic Society Pulmonary Function Standards Committee. Both are members of the American Thoracic Society Proficiency Standards for Pulmonary Function Laboratories Committee.

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