Physical activity in chronic respiratory conditions

Assessing risks for physical activity clearance and prescription

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Chronic respiratory diseases such as asthma and chronic obstructive pulmonary disease (COPD) affect more than 3.5 million Canadians, detracting from the physical and mental health, quality of life, and functional capacity of these individuals.[1,2] At least 8% of the Canadian population suffers from asthma, accounting for approximately 2.7 million patients and 150 000 annual emergency department visits; moreover, the prevalence of this condition is increasing.[1] Further, COPD affects more than 750 000 Canadians[1] and is projected to become the third leading cause of death worldwide by the year 2020,[2] driven by demographic and lifestyle factors including an aging population and an increased prevalence of smoking and other environmental triggers.[1-3] North American mortality rates for heart disease, stroke, and cancer decreased between 1970 and 2002, but in contrast, deaths from COPD increased 103% during the same period.[4]

There are a number of challenges to exercise prescription and physical activity (PA) participation in this population, but a large body of evidence demonstrates important health benefits from aerobic exercise, including decreases in dynamic hyperinflation and exertional dyspnea; improved exercise tolerance; and enhanced quality of life, with fewer disease exacerbations and reported sick days. Resistance training has also been shown to increase muscle mass and strength, augmenting patients' ability to perform tasks of daily living and improving health-related quality of life.[5]

This article provides an executive summary of the main findings from a systematic review examining the risks of PA in COPD and asthma.[5] The review was undertaken as part of a comprehensive analysis of the risks of PA in various chronic diseases. The knowledge thus obtained has provided an evidence-based foundation for simple new tools to assist clinicians with exercise clearance and provision of appropriate exercise prescriptions: the revised Physical Activity Readiness Questionnaire (PAR-Q+) and the electronic Physical Activity Readiness Medical Examination (ePARmed-X+) procedure.[6] We briefly discuss available data on the risks of PA in COPD and asthma in this context, presenting decision trees that facilitate the setting of an appropriate PA prescription and developing guidelines for the ongoing supervision of PA programs in these patients.

Patients with respiratory disorders often present a unique challenge for prescribing exercise, given the heterogeneity of exertional symptoms and the high prevalence of comorbidities in patients attending rehabilitation.[7] Cigarette smoking is known to have a causative association with COPD and is also linked to many of the conditions commonly comorbid with COPD; however, COPD can develop in non-smokers as well. The following comorbid conditions, which can affect exercise response, prescription, and safety, are commonly associated with COPD: cardiovascular disease, peripheral vascular disease, lung cancer, diabetes, dyslipidemia, hypertension, osteoporosis, and psychological disorders.[8-10] Corticosteroid use, overuse of bronchodilators, and interactions with other medications can further complicate management of PA programs in these patients.[11] Other concerns during both rest and exercise include pulmonary hypertension, gas-trapping, dynamic hyperinflation, poor gas exchange, and increased respiratory pressure associated with destruction of lung parenchyma and increased airway resistance.[12]

Discussion

Systematic review of the literature on COPD reveals a very low incidence of PA-related adverse events.[5] Among 770 prescreened patients, a total of 26 participants presented with cardiovascular-related events or complications during or immediately following exercise. Desaturation, which is also a serious concern, occurred in only 17 patients. Adverse events in those with asthma are also fairly rare (103 total cases of exercise-induced bronchospasm in 674 patients) and are usually not severe, being resolved with the administration of bronchodilator medication. In contrast with COPD, most patients with asthma are younger, and the prevalence of comorbidities is low. Although asthmatic symptoms can be precipitated by participation in PA, if the asthma is properly controlled, then the risks of exercise in these patients are very similar to those of a population without asthma. There are no reports that patients with lung disease have died as a result of PA participation, and most recorded events have been minor and fairly easily resolved with appropriate equipment and expertise.

Ruling out current contraindications to exercise, as presented by the American Thoracic Society

and the College of Chest Physicians,[13] is generally appropriate for pre-activity screening; the occurrence of PA-related events in patients who have been screened according to these guidelines is low. We now offer evidence-based recommendations to further aid family physicians in determining individualized risk profiles, based on the patient's current health status and desired PA goals (**Table 1**), with associated clinical decision trees for both COPD and asthma (**Figures 1** and **2**).

Conclusion

Current evidence suggests that PA participation should be recommended to patients with chronic respiratory conditions, following appropriate prescreening. Physical activity improves health outcomes and does not substantially increase the risk of harm. The new decision trees offer a simple method to tailor PA prescription and supervision to individual patients, taking into account disease severity, control of the condition, and related or unrelated comorbidities.

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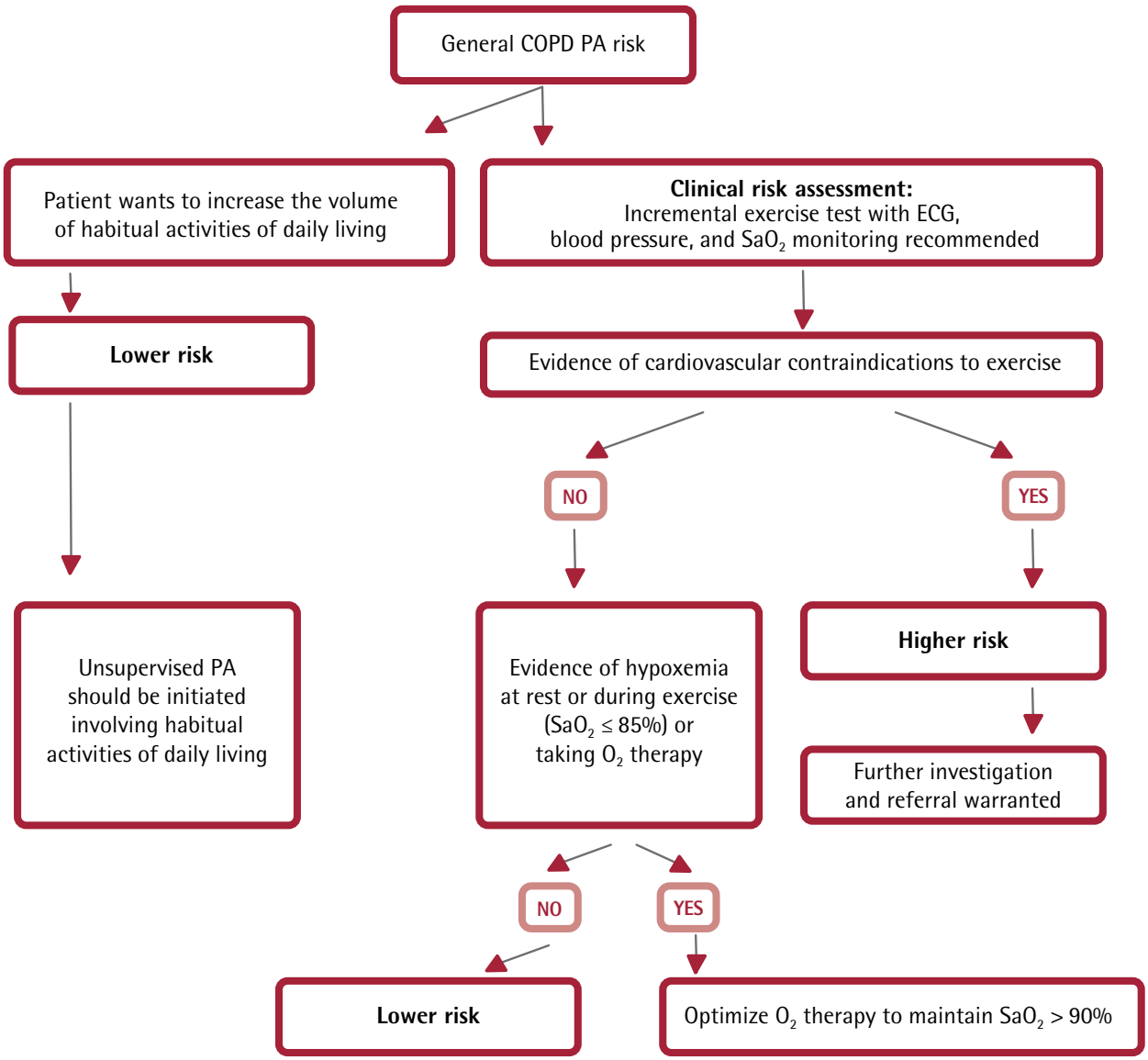
Competing interests
None declared

Table 1. Physical activity and exercise recommendations for prescreening of patients with COPD and asthma

RECOMMENDATION	LEVEL*	GRADE†
Although no direct evidence was found to support any contraindication to exercise in either COPD or asthma, secondary evidence suggests that patients with substantial hypoxemia (SpO_2 < 90%) at rest or during exertion, uncontrolled asthma, or the presence of pulmonary hypertension should be optimally medically managed before starting exercise	IV	C
COPD		
O_2 therapy should be optimized to ensure SaO_2 is maintained > 85% (ideally > 90%) during PA	II	A
Persons with COPD who wish to become more physically active should be evaluated using a graded exercise test including ECG monitoring and pulse oximetry. Remarkable test results and evidence of serious cardiovascular conditions (ie, angina, ischemia, complex ectopy, high-degree AV block, uncontrolled blood pressure) should be seen by the appropriate specialist before commencing PA	IV	C
Supervising exercise professionals should have specific training with and monitor for potential pulmonary-related complications as well as complications related to the common sequelae and comorbidities of COPD	IV	C
Asthma		
Patients whose asthma is well controlled‡ likely have similar PA-related risk to that of healthy individuals without asthma. To reduce the risk of exercise-related adverse events, those with asthma should make sure that their disease is properly controlled before becoming more physically active. Those with poor or partial control of their asthma should see their physicians before becoming more active	II	A
For individuals who develop EIB or asthmalike symptoms with exercise, a rapid-acting β_2-agonist should be taken before exercise. Individuals with asthma should also incorporate a progressive warm-up and should try to avoid exercising in the excessive cold or environments with known asthma triggers	III	C

AV—atrioventricular, COPD—chronic obstructive pulmonary disease, ECG—electrocardiogram, EIB—exercise-induced bronchospasm, O_2—oxygen, PA—physical activity, SaO_2—oxygen saturation in arterial blood, SpO_2—oxygen saturation measured by pulse oximeter.
*Level I evidence includes randomized controlled trials; level II evidence includes randomized controlled trials with important limitations or observational trials with overwhelming evidence; level III evidence includes observational trials; and level IV evidence includes anecdotal evidence or expert opinion.
†Grade A recommendations are strong; grade B recommendations are intermediate; and grade C recommendations are weak.
‡Symptoms on < 2 d/wk, nighttime symptoms < 1 per wk, mild infrequent exacerbations, no absenteeism due to asthma, no limitations to exercise, and < 2 doses of a fast-acting β_2-agonist needed per wk.

Figure 1. Clinical decision tree for assessing the risk of adverse events during PA in patients with COPD: *This decision tree can be used to categorize a patient as higher or lower risk, informing the requirements of PA prescription and the monitoring of exercise programs.*



COPD—chronic obstructive pulmonary disease, ECG—electrocardiogram, O_2—oxygen, PA—physical activity, SaO_2—oxygen saturation in arterial blood.

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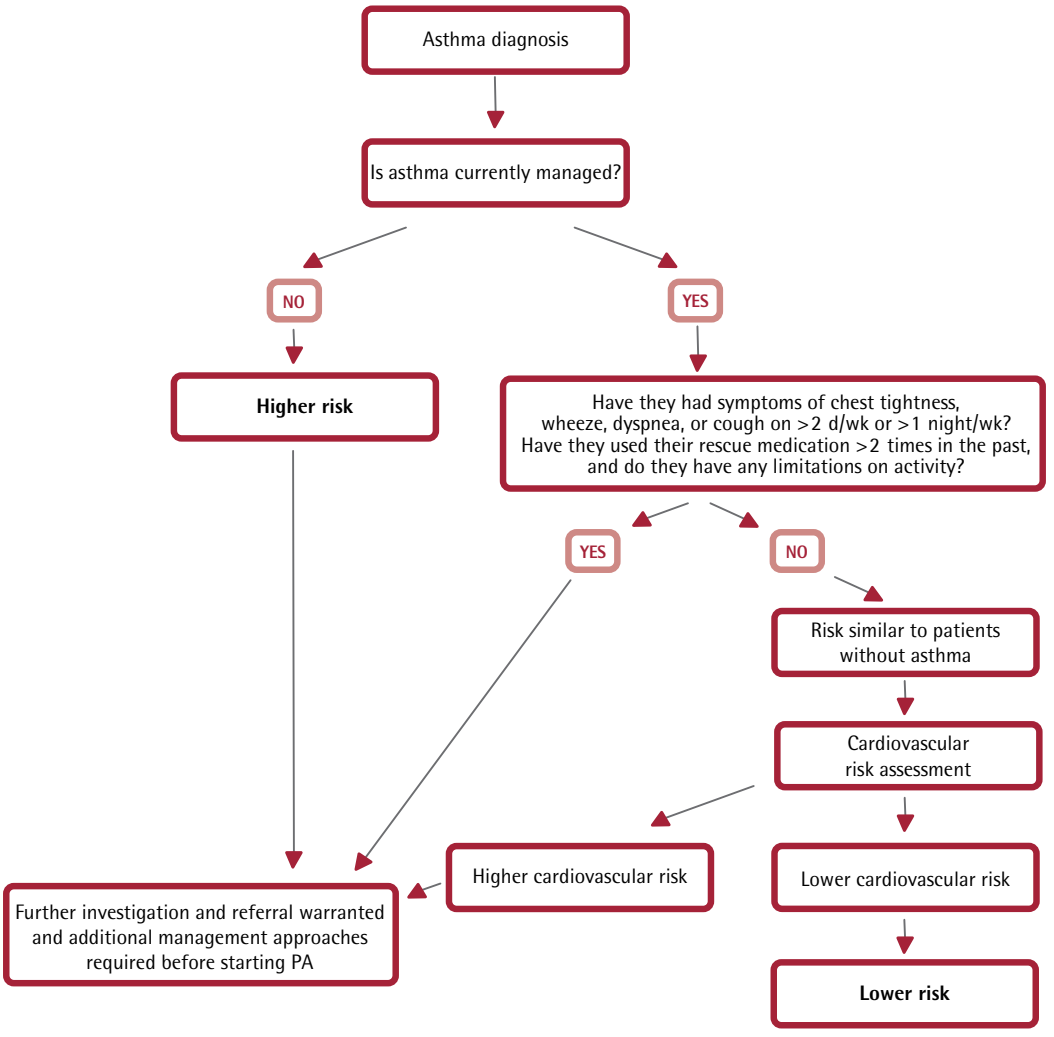
Figure 2. Clinical decision tree for assessing the risk of adverse events during PA in patients with asthma: *This decision tree can be used to categorize a patient as higher or lower risk, informing the requirements of PA prescription and the monitoring of exercise programs.*



PA—physical activity.

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