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‘Is it okay for me to ... ?’

Assessment of recreational activity risk in patients with chronic lung conditions

Background

Recreational activities, including travel, can be associated with risks to health. Assessing and advising on these risks can be an important part of travel planning for a person with a chronic lung condition when they ask, ‘Is it okay for me to ... ?’

Objective

This article discusses the respiratory considerations important in the assessment of, and advice for, a proposed activity in a person with a chronic lung condition.

Discussion

Patients with chronic lung disease can safely engage in a range of recreational, sporting and other activities. However, there are a number of general factors that should be taken into account, including access to, and the standard of, medical care available and the travel destination and medication availability. Guidelines based on limited evidence and expert opinion are available for some activities, but not all. Simple precautions and a common sense approach guided by knowledge of the particular risks in each setting should ensure a satisfactory outcome for the patient who asks, ‘Is it okay for me to ... ?’

Keywords

lung diseases; asthma; sleep apnoea syndromes; travel; diving; altitude



Case study

A woman, 55 years of age, with moderate chronic obstructive pulmonary disease (FEV₁ 59% predicted, SpO₂ 95% on room air) and mildly reduced exercise tolerance is planning a vacation to Machu Picchu, which is 2430 m above sea level. She has had one previous exacerbation of her COPD and asks, ‘Is it okay for me to travel with my lung disease?’

There are a number of general factors that should be taken into account when patients with chronic lung disease plan to travel. As with any chronic illness, it is important to ascertain how easy access will be to medical care; what standard that care is likely to be and the availability of medications at the planned destination.

Documentation of the patient’s medical conditions, medications and allergies should occur before the travel commences. Sufficient supply of regular as well as emergency ‘rescue’ medications is important. Intended activities while travelling should be discussed, as some of these may require a degree of physical exertion beyond what is customary for that patient. Climatic factors may impact on conditions such as asthma and chronic obstructive pulmonary disease (COPD), while travelling to high altitude may impact on all travellers, given the concomitant decrease in partial pressure of inspired oxygen (PiO₂); this may be particularly problematic for individuals with lung disease. It should be noted that many of the recommendations published in this area do not have a strong evidence base and are often based on expert consensus opinion and common sense.

Flying with chronic lung disease

In the pressurised air cabin of a commercial aircraft, PiO₂ may fall to a value that would be the equivalent of breathing 15% oxygen at sea level. This results in consequential falls in partial pressure of arterial oxygen (PaO₂). In healthy travellers, the concomitant fall in oxygen saturation of around 5%¹ is generally well tolerated, and similarly, most patients with lung disease travel on aeroplanes uneventfully without the need for supplemental oxygen. Nonetheless, patients with significantly impaired exercise capacity (respiratory distress after <50 m) and known severe obstructive or restrictive lung disease, especially with hypoxaemia (resting saturation <95%) and/or hypercapnia, may be advised to consider oxygen supplementation in-flight. Such patients may benefit from a high altitude simulation test (HAST), which can be performed in most



respiratory laboratories, to determine the required oxygen flow during flight. British Thoracic Society guidelines suggest no supplemental oxygen will be required if SpO₂ is >95%. However, other studies suggest that neither resting SpO₂ nor forced expiratory volume in 1 second (FEV₁) reliably predict hypoxaemia or complications during air travel. Therefore, for patients in whom the risks appear significant or where there is doubt, a specialist respiratory opinion is appropriate and further testing may be performed as deemed necessary.² A recent survey of commercial airlines found that most will provide oxygen for patients to use in-flight and many allow patients to provide their own oxygen via cylinder or portable concentrator.³ As availability and costs vary, early planning is recommended. British Thoracic Society recommendations for patients with stable respiratory disease cite infectious tuberculosis, ongoing pneumothorax with persistent air leak, major haemoptysis and a usual oxygen requirement of more than 4 L/min as contraindications to commercial air travel.

Flying with obstructive sleep apnoea

Patients with obstructive sleep apnoea (OSA) who use nocturnal continuous positive airway pressure (CPAP) should ideally use their CPAP during sleep on long haul flights. However, only half of the airlines surveyed in a recent study were able to support patients with in-flight CPAP use, including battery powered devices.⁴

Altitude travel

With increasing elevation above sea level, barometric pressure decreases, leading to a lower PiO₂ and reduced arterial oxygen tension. Air density and ambient temperature also decrease, with a reduction in absolute humidity. These factors lead to a compensatory increase in ventilation, higher pulmonary arterial pressures and a shift in the haemoglobin-oxygen dissociation curve. Disorders associated with high altitude travel include acute mountain sickness, high altitude cerebral oedema (HACE) and high altitude pulmonary oedema (HAPE). All have been described in healthy travellers, usually after rapid ascent to at least 2500 m above sea level. If untreated, the outcome may be fatal. Prophylactic acetazolamide, dexamethasone and nifedipine have been shown to be effective in these conditions.⁵⁻⁷

The effect of high altitude travel in patients with pre-existing lung disease is less well-known. Some studies suggest that patients with COPD living long term at high altitude have a higher mortality rate.⁸ Observations on the effects of acute changes in altitude mostly come from studies of commercial air travel. However, these generally address only changes in PiO₂ and do not take into account the lower air density and ambient temperature that also occur at high altitude. It is likely that patients with COPD and a degree of pulmonary hypertension will have a higher risk of developing HAPE and right heart failure. Luks et al⁹ recommended that patients with a baseline FEV₁ of <1.5 L be assessed and provided supplemental oxygen during high altitude travel if their predicted PaO₂ (using HAST or a regression equation) is <50–55 mmHg. Given that vacations at altitude also commonly involve trekking, it should be noted that patients with COPD have been shown

to have further falls in PaO₂ on walking (above the initial fall due to altitude) and a reduction in their exercise capacity compared to that at sea level. Based on our current understanding of the pathophysiology of HAPE and pulmonary hypertension, patients with significant pulmonary hypertension from any cause should be advised against high altitude travel. If such travel is necessary, nifedipine 20 mg twice per day should be used as prophylaxis.⁹

While studies have shown an association between living at high altitude and both a reduction in asthma prevalence and better asthma control, short term travel may be associated with more exacerbations. It is not clear if worsening asthma symptoms during short term travel is due to the altitude attained or to other factors. Patients with mild asthma should encounter minimal problems but should be compliant with their medications, carry a supply of rescue medications and consider using a balaclava or bandana over their mouth to warm and humidify inspired air.

There have been a few studies with small numbers of patients that show little change in radiographic size of bullae under simulated conditions of increasing altitude. No pneumothoraces were seen in any of these studies and it is concluded that travelling to altitude with lung bullae is generally safe.⁹

Case study conclusion

Although the change in altitude approaching Machu Picchu is gradual, it should be noted that visitors will need to ascend to as high as 3400 m above sea level en route. This patient should extend her visit in order to acclimatise to the change in altitude and minimise the risk of altitude sickness. As her SpO₂ is 95% she should not require oxygen. She should be advised to carry adequate supplies of her regular medications as well as emergency antibiotics and prednisolone. Although her COPD is moderate by FEV₁ criteria, FEV₁ does not correlate well with dyspnoea and it is recommended that she optimises her fitness by regular walking before she travels. If there is significant hypoxaemia at baseline or signs or symptoms of pulmonary hypertension, she should undergo further evaluation before planning her trip.

Altitude travel and obstructive sleep apnoea

Patients with OSA requiring continuous positive airway pressure (CPAP) should continue to use their CPAP at altitude. Some CPAP machines have a pressure compensating feature that ensures that the same pressure is delivered at higher altitudes. Noncompensating machines will require a higher set pressure.¹⁰

Patients with obesity hypoventilation syndrome should be advised against high altitude travel due to an increased risk of HAPE, acute mountain sickness and acute right heart failure.⁷

Case study

A man, 25 years of age and with a history of asthma, is keen to take up scuba diving. He has not had an exacerbation for 2 years and is currently not taking preventive medication. He is worried about the potential risks of diving and asks, 'Is it okay for me to scuba dive with my lung condition?'



Scuba diving with pre-existing lung conditions

Self-contained underwater breathing apparatus (SCUBA) diving is an increasingly popular recreational sport. Rapidly changing ambient water pressure related to the depth of the dive may lead to serious physical implications, especially in patients with pre-existing lung conditions.

Pulmonary barotrauma and decompression sickness are the two most commonly described complications from diving and can occur in individuals with no prior history of lung disease. A history of asthma was traditionally thought to be an absolute contraindication to diving, as airway obstruction, air trapping and hyperinflation were thought to increase the risk of pulmonary barotrauma. In addition, compressed gas (which is often cold and dry), increased gas density and physical exertion may be triggers for asthma in susceptible individuals.¹¹ However, there is a paucity of data showing a substantial increase in adverse outcomes from SCUBA diving in patients with asthma.¹² Prospective divers with asthma may be so well controlled by current medications that their airways are no longer reactive to stimuli such as exercise and salt water. These individuals may be at no greater risk from diving than individuals without asthma. If this is so, the implication is that people with asthma who are asymptomatic and show normal lung function on testing with spirometry and bronchial provocation may be able to dive with an acceptable level of risk. Patients with active wheeze or moderate-to-severe persistent asthma should be dissuaded from diving.^{13,14} In cases of doubt, specialist medical opinion should be sought. Patients with past spontaneous pneumothorax, existing lung cysts or bullae should be advised not to dive.¹⁵

Case study conclusion

This patient should undergo assessment of current lung function with spirometry. A bronchial provocation test should be performed if spirometry is normal. If airflow obstruction or bronchial hyper-responsiveness are demonstrated, these indicate inadequately controlled asthma and the patient should be counselled against diving, at least until his asthma is better controlled. If lung function and bronchial provocation testing are normal, he should be provided with a written asthma action plan and undergo review of his peak flow meter and inhaler techniques. Caution would dictate monitoring of symptoms and peak flows during the period of diving, with subsequent increases in short-acting beta agonist use, addition of a preventer and cessation of diving as required if symptoms or lung function deteriorate.

Summary

Patients with chronic lung disease can safely engage in a range of recreational, sporting and other activities. Guidelines based on limited evidence and expert opinions exist for certain activities but not all. Simple precautions and a common sense approach guided

by knowledge of the particular risks in each setting should ensure a satisfactory outcome.

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