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Work related asthma

Diagnosis and management

Background

Work related asthma (WRA) is a common condition and is under recognised in Australia. Work related asthma refers to the development of new asthma due to occupational factors (occupational asthma) and the worsening of asthma control due to occupational factors (work exacerbated asthma).

Objective

This article discusses the diagnosis and management of work related asthma in Australia.

Discussion

All clinicians who treat adult patients with asthma should enquire about the patient's occupation. Key features of WRA include: a temporal association between asthma symptoms and work activities (especially an improvement in symptoms when away from the workplace), identification of relevant workplace exposures (eg. use of a known cause of occupational asthma) and the development of respiratory symptoms in coworkers. Optimal management of WRA requires early recognition and accurate diagnosis. Increased awareness of WRA and the introduction of effective workplace control should reduce the prevalence of WRA and the overall burden of asthma in our community.

Keywords: asthma; occupational diseases



Case study

Farid, 18 years of age, has a past history of seasonal hay fever. He presents with almost daily symptoms of itchy eyes, stuffy nose, cough, shortness of breath and wheeze. He says he wakes most days with a wheeze and describes frequent use of salbutamol. He has recently been on holiday and felt better during that time.

On further questioning, Farid reveals that he has been working in a bakery for 12 months. One of his roles is to weigh the flour. His nasal and eye symptoms started 3 months ago, followed by the chest symptoms 2 months later. His symptoms improve modestly over the weekend and recur within minutes of starting work.

Asthma has a high prevalence in the Australian community and certain occupations have the potential to influence the onset and severity of asthma symptoms. Occupational factors need to be carefully considered as part of the diagnosis and management of all working age adults with asthma. The *Case study* is a typical scenario of work related asthma (WRA).

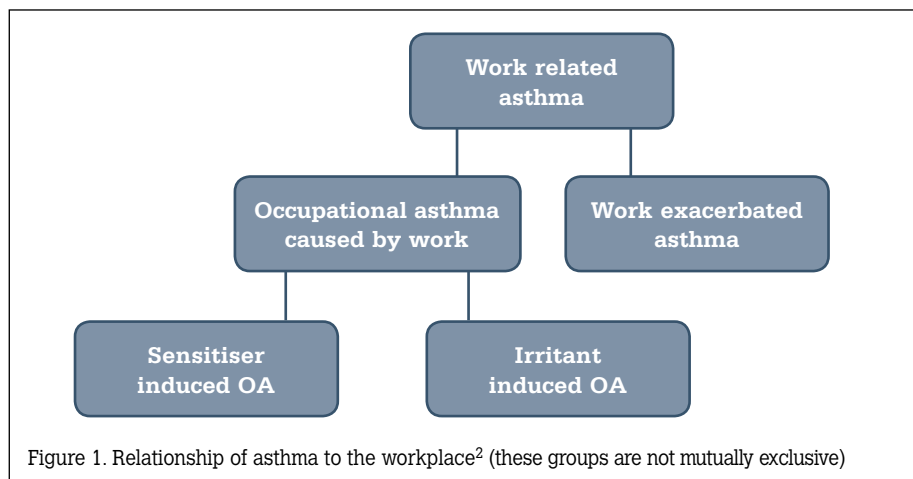
Work related asthma refers to all situations where asthma is influenced by work and encompasses both occupational asthma (OA) and work exacerbated asthma (WEA)¹ (*Figure 1*). Occupational asthma refers to the development of new onset asthma (or the recurrence of previously quiescent asthma) due to exposure to one of a few hundred substances which may be found

in Australian workplaces.^{1–3} Work exacerbated asthma is where control of asthma, which developed before or incidentally during work life, is adversely affected by workplace factors such as dust or exercise, or environmental factors such as working in cold conditions.^{1,4} It is often difficult to differentiate WEA from OA, even after taking a careful history. Occupational asthma is classified into two forms:

- sensitiser induced OA (with latency), and
- irritant induced OA (without latency).

Sensitiser induced OA

Over 90% of OA is sensitiser induced OA.⁵ This form of asthma is due to the development of sensitisation from regular exposure to a specific substance at the workplace, such as an inhaled protein (eg. bakers' flour) or chemical (eg. isocyanates – a group of chemicals with



a wide range of uses including as a hardening agent in some spray paints).¹ This form of OA is characterised by a period of latency between first exposure to the substance and development of asthma symptoms. This period may vary from a few weeks to several years. One study demonstrated 40% of cases developed within 2 years of initial exposure, but 20% after 10 years.⁶ A history of atopy is a risk factor for sensitiser induced OA due to certain agents (eg. animal and flour antigens).⁷

Irritant induced OA

Irritant induced OA develops following an inflammatory (nonimmunological) response of the lower respiratory tract to an irritant exposure encountered at the workplace.^{8,9} The worker will characteristically develop respiratory symptoms within minutes to hours of the exposure (without latency). Reactive airways dysfunction syndrome (RADS) is the clearest example of irritant induced OA and develops following a single massive exposure, such as a spill.¹⁰ Recurrent lower levels of irritant exposure may also lead to the development of irritant induced OA.⁸

Epidemiology

A cross sectional population survey conducted in New South Wales estimated that occupational exposures account for 9.5% of adult onset asthma in that region.¹¹ However, international data has reported that at least 15% of adult asthma is likely to be due to occupational exposure.¹² Based on a population attributable risk of 9–15% and 20 570 new cases of asthma occurring in working aged Australians each year, the Australian Institute of Health and Welfare (AIHW) expect an annual

incidence rate of 195 to 325 cases of asthma/million workers/year due to workplace exposure.¹³ By contrast, in the Victorian and Tasmanian Surveillance of Australian workplace Based Respiratory Events (SABRE) program, the incidence of asthma was only 30.9 (95% confidence interval 26.8–35.5) cases/million workers/year.² Similarly, national compensation statistics report only about 70 compensated cases of asthma per year (accepted claims that result in death, permanent disability or temporary disability involving 5 or more days off work).¹³ Surveillance and workers compensation data has limitations; WRA is likely to be a much greater problem in Australia than is currently suggested by epidemiological studies.¹³

Barriers to the diagnosis of WRA

Asthmatics often perceive airflow obstruction poorly, therefore may not report asthma symptoms to their general practitioner for further evaluation.^{14,15} Lack of enquiry about work relatedness of respiratory symptoms by GPs has also been identified as a reason for delay in diagnosis of WRA.¹⁶ Other barriers include workers' compensation system issues and patient fears of job loss and reduction in income.¹⁶ Unfortunately, these fears are not without foundation, as diagnosis of OA may lead to considerable socioeconomic decline.¹⁷

Failure to correctly identify OA leads to ongoing poor asthma control, the need for higher doses of asthma medication, and a substantial, possibly irreversible, decline in lung function and associated disability.¹⁸ Although uncommon, deaths from OA have been reported.¹⁹ In addition, failure to identify individual cases of OA may leave other

workers at risk of exposure and development of this preventable occupational disease.¹

Diagnosis of WRA

Even practitioners with substantial experience in asthma care may find the diagnosis of WRA difficult. The first step is to confirm the presence of asthma (Table 1). Other conditions that may cause work associated respiratory symptoms include nonspecific airway irritation (such as that associated with solvent exposure), upper airway dysfunction, and hypersensitivity pneumonitis.

History

There are features on history that should raise the suspicion of WRA (Table 2). These features vary between the different types of WRA and may be difficult to differentiate from nonasthma causes of work associated respiratory symptoms.

The main areas of enquiry should include: general asthma symptoms and control, the temporal association between symptoms and work, presence of coworkers with similar respiratory symptoms, and detailed information about exposure history.

The American College of Chest Physicians recommends these key questions to be asked of

Table 1. National Asthma Council of Australia recommendations for the diagnosis of asthma²¹

There is no 'gold standard' for the diagnosis of asthma

Diagnosis is based on history, physical examination and supportive diagnostic testing, including spirometry

A diagnosis of asthma can be made with confidence in an adult when the person has variable symptoms (especially cough, chest tightness, wheeze and shortness of breath) and spirometry shows significantly reversible airflow limitation (FEV₁ at least 12% and 200 mL higher than baseline)

Challenge tests (eg. methacholine challenge) may help confirm a diagnosis of asthma. These should be performed only in specialist facilities

Consider referral to a specialist respiratory physician when the diagnosis is uncertain and for patients in whom occupational asthma is suspected

Table 2. Features of various forms of work related asthma⁵

| | Work exacerbated asthma | Sensitiser induced occupational asthma | Irritant induced occupational asthma |
|---------------------------|--|---|--|
| Symptoms of asthma | Yes | Yes | Yes |
| Onset | Before or during working life | Onset or recurrence during working life. Usually first develops some weeks to months after first exposure | Usually within 24 hours of exposure to large quantity of respiratory irritant |
| Relation to work schedule | Worse on one or more days while at work | Symptoms worse during or after a work shift and improve when away from work | Often none |
| Other | Exposure at work to asthma exacerbating factors such as dust, smoke, fumes, cold | Exposure to a known sensitiser | Persistence of symptoms for at least 12 weeks, but no previously documented asthma or chronic lung disease |

any patient with asthma starting or worsening during their working life^{1,20}:

- were there changes in work processes in the period preceding the onset of symptoms? This may result in the introduction of or increased exposure to a sensitising agent
- was there an unusual work exposure within 24 hours before the onset of initial asthma symptoms? This is a key feature of irritant induced OA. Symptoms will often be severe enough to require urgent medical treatment and other exposed workers may be affected
- do asthma symptoms differ during times away from work such as weekends or holidays or other extended times away from work? Identification of a temporal association between work activities and asthma symptoms is a good marker of WRA. It is more useful to enquire about an improvement in asthma symptoms when away from the workplace, especially for an extended period such as a holiday, rather than a recurrence with return to work. The recurrence of asthma symptoms will depend on exposure to the specific sensitising agent. However, a temporal association will not discriminate between sensitiser OA and WEA, and a negative response does not exclude sensitiser OA. The association may be lost with severe and long standing OA¹
- are there symptoms of rhinitis and/or conjunctivitis symptoms that are worse with work? Especially with sensitiser induced OA due to agents such as bakers' flour and animal dander, workers will often develop symptoms of rhinitis (eg. sneezing, nasal congestion) at the workplace before or concurrent with asthma symptoms.

Identification of a sensitising agent or irritant

Currently there are over 400 known sensitising agents. These can be found in a wide range of jobs and industries (*Table 3*) and the list is continually expanding. Lists of identified agents are available online (see *Resources*). Material safety data sheets (MSDS) are forms containing information about the constituents and properties of substances used at the workplace. These forms are valuable sources of information regarding toxicity and known health effects of products and should be provided to workers by their employer on request. Lack of identification of a sensitising agent or high risk job (eg. baker) does not exclude the diagnosis of OA. An in depth occupational history, beyond the scope of a standard consultation, is often required to identify the responsible agent. A workplace visit may be necessary to obtain reliable information on suspected chemicals, to observe how they are being used, and the adequacy of control measures.

The most widely accepted form of irritant induced OA follows a single high level exposure event (RADS), which usually enables accurate identification of the irritant. However, multiple lower level irritant exposures may also cause asthma.^{8,9} This remains a controversial area; suspected affected workers should be referred for further specialist evaluation.

Investigations and referral

The accurate diagnosis of WRA requires a complex combination of investigations, including bronchial provocation testing, which are best performed while the patient is still working.¹ We recommend that asthmatic patients suspected of having WRA are referred to a specialist (eg. respiratory

physician, occupational physician and/or allergist) with expertise in this field. We acknowledge that in many areas of Australia improvements are required to allow more timely access to such specialists. The Thoracic Society of Australia and New Zealand (TSANZ) and the Australasian Faculty of Occupational and Environmental Medicine (AFOEM) can provide assistance in locating specialists (see *Resources*).

Management

General asthma management of patients with WRA, including use of asthma medications, should adhere to best practice asthma guidelines (see *Resources*).^{1,5,21} Beyond standard asthma management, patients with WRA also require advice regarding the effect of workplace exposure on their asthma control.

Unless asthma is severe, patients with WEA and irritant induced OA can usually remain in their job if measures are taken to limit exposure to workplace triggers and respiratory irritants.¹ Measures may include substitution for another product, changes in ventilation or work processes, or using an appropriate face mask (respirator) for short term exposures.^{3,8}

The optimal management of sensitiser induced OA requires complete early avoidance of the sensitiser.^{1,3,5,8,20} Rather than removing the worker from the workplace, the best management strategy is to remove the sensitiser from the workplace. This should allow the worker to retain his/her position and eliminate the hazard for the safety of other workers. Unfortunately removing the sensitiser is often hard to achieve as it may be an integral component of the work process. Removing the patient from the workplace is therefore often

Table 3. Common sensitising agents and occupations where workers may be exposed^{2,3}

| Agent | Example occupations |
|---|--|
| Low molecular weight agents | |
| Wood dust (eg. western red cedar, redwood, oak) | Carpenters, builders, sawmill workers, sanders, model builders |
| Isocyanates | Automotive industry, mechanics, painters, adhesive workers, chemical industry, polyurethane foam workers |
| Formaldehyde | Cosmetics industry, embalmers, foundry workers, hairdressers, laboratory staff, medical personnel, paper industry, plastics industry, rubber industry, tanners |
| Platinum salts | Chemists, dentists, electronics industry, photographers, metallurgists |
| High molecular weight agents | |
| Latex | Health care workers, textile industry, toy manufacturers |
| Flour and grain dust | Bakers, cooks, pizza makers, grocers, farmers, combine harvester drivers |
| Animal allergens (eg. urine, dander) | Veterinary surgery workers, animal care workers, laboratory workers, jockeys, animal breeders, pet shop employees |

required, as ongoing exposure to the sensitiser, even at low levels, is likely to have a negative impact on asthma control and long term respiratory function. The decision to advise the patient to leave their workplace is difficult and requires assessment by a specialist in this field.

An essential component of the management of all forms of WRA is effective communication between: treating physicians, patient, employer, the workplace occupational health and safety system, and workers' compensation organisations.

Summary of important points

- Work related asthma is a common condition, which is under recognised and under diagnosed in Australia.
- An occupational history should be a standard component of primary health care.
- Patients with respiratory symptoms should be specifically questioned about the relationship of symptoms to work, particularly if a high risk profession or exposure is identified.
- It is essential that all clinicians who treat adults with asthma enquire about their patients' occupation.
- The first step in diagnosing WRA is to confirm the presence of asthma, which should be undertaken while the patient is still working.

- The diagnosis of WRA can be difficult and may require referral to a specialist.

Resources

- Lists of identified sensitising agents: www.remcomp.fr/asmanet/asmapro/agents.htm and www.hse.gov.uk/asthma/asthmagen.pdf
- The Thoracic Society of Australia and New Zealand (TSANZ): www.thoracic.org.au/
- The Australasian Faculty of Occupational and Environmental Medicine (AFOEM): <http://afoem.racp.edu.au/>
- National Asthma Council of Australia guidelines: www.nationalasthma.org.au/cms/content/view/29/32/.

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