

Variability in the diagnosis of occupational asthma and implications for clinical practice

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Purpose of review

The purpose of this review is to provide a summary of recent evidence relating to occupational asthma diagnosis.

Recent findings

Recent evidence suggests that whilst prolonged asthmagen exposure worsens the prognosis, many steps in the diagnostic process are problematic for workers with possible occupational asthma. Certain workers suffer delay prior to specialist assessment, and assessment itself may be of variable quality. Emerging evidence suggests that whilst experts agree about certain aspects of case assessment, there is still likely to be variation in clinical practice. Implications of this variation for the workers assessed are relatively under researched.

Summary

Future research needs to focus not only on improving diagnostic testing, but also on improving consistency and agreement over diagnosis.

Keywords

accuracy, asthma, diagnosis, occupation, variability

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Introduction

‘If you want to cure their asthma, ask about their job’. The title of this recent editorial [1] relating to occupational asthma sums up the diagnostic importance of this disease. Despite consistent evidence to suggest a significant occupational influence on adult onset asthma [2], case identification and diagnosis can remain difficult [3].

The paradigm of thought is shifting, however. Whilst ‘traditional’ evidence relating to causation, underlying mechanisms, and markers of inflammation in occupational asthma develops, another area of research is emerging. Investigating the diagnostic process, and its variation and accuracy, has come of age. Indeed, many of the current key questions for occupational asthma relate to variations in definition and application of traditional and newer diagnostic techniques [4].

Workers who wheeze are at risk of occupational asthma, and likely to be identified by one of two routes. First, the workplace may have a process in place to spot new onset work-related respiratory symptoms. Second, most workers will have primary care physicians, to whom they may report such symptoms, particularly if a workplace surveillance scheme is absent. These two groups of workers represent those likely to be referred through

healthcare systems for confirmation or exclusion of a diagnosis of occupational asthma. The journey followed by such workers from the onset of work-related symptoms to a diagnosis of occupational asthma is potentially complex [5], involving many steps and interactions with a range of healthcare professionals, introducing opportunities for variable practice at each stage. The type of worker eventually referred to a specialist will therefore be dictated by clinical decision making at each of these ‘steps’.

This review summarizes recent published evidence relating to this entire journey, and the implications of variation in practice.

Health surveillance

Recent data from flour-exposed workers [6] suggest that workplace-based health surveillance schemes may significantly underestimate those workers potentially developing occupational asthma. Health surveillance information was compared with the findings of a research study in a similar flour-exposed population. As there was a difference in numbers of workers identified as being at risk of occupational asthma, the authors reasonably concluded that workplace-based health surveillance programmes may miss workers at risk of (or with established) occupational asthma.

This finding was at least suspected from earlier work, when specialist referral of a small number of bakers with no respiratory symptoms (but suspected of having respiratory problems by a workplace-based nurse) confirmed a diagnosis of asthma in a significant proportion [7]. This study also confirmed that some bakers admitted falsifying questionnaire responses.

Reasons for this finding are unclear, although they may in part be explained by individual worker's attitudes to and perception of health surveillance, and ultimately a fear of losing their jobs [8^{*}]. This paper sought views on personal and organizational issues related to health surveillance, many of which were not complimentary.

Other reasons behind the differences identified may relate to the nature of the medical documentation. Questionnaires are often used in this setting, and whilst there are many good publications in this area (for example, healthcare workers [9]), there is little or no consensus on the best approach, and no data assessing questionnaire usage for occupational asthma across varying worksites and regions. Furthermore, it does rely on the individual being able to identify symptoms early and associate them with workplace exposure. This will be determined by a number of nonmedical factors such as training, workplace culture and workforce demographics.

Differing health surveillance approaches will deliver a varying profile of workers for specialist assessment. As individual physicians rely not only on evidence bases but also their clinical experience, regional differences in referred workers will inevitably make it more difficult to offer nationally consistent approaches to this condition. This fact will have consequences for knowledge sharing between experts, and also for multicentre research. This interesting area is currently not researched.

Accelerated forced expiratory volume in 1 s (FEV₁) decline may be seen in workers with occupational asthma, supported by recent evidence from workers with a variety of exposures to workplace asthmagens [10^{*}]. This study also identified that once exposure ceased in the workplace, FEV₁ decline partially normalized. Specifically, in 90 patients with FEV₁ measurements for at least 1 year before removal from exposure, the mean rate of decline in FEV₁ was significantly greater than the decline seen 1 year after removal from exposure. This finding has implications for health surveillance. Earlier [11] and current work [12^{*}] on repeated FEV₁ measures in the workplace, however, reveals this to be a complex area in which measurement accuracy is key to identifying workers with excessive early FEV₁ falls. Consequently, workplace measurement inaccuracy introduces another (as yet under researched) variable to consider when defining those at risk of occupational asthma.

Primary care

Once identified in workplaces, workers with clinical features suggestive of occupational asthma are normally referred on for a specialist assessment, due to their complex nature, and the important consequences of a confirmed diagnosis. There are virtually no data to help identify the predominant route of such referrals, but recent evidence suggests this is normally by the primary care physician [13^{**}].

Therefore, primary care has a key role in initiating early investigations and referring on in an appropriate and timely manner. Indeed, recent evidence confirms that not all workplaces have access to occupational health services [14], making the primary care link all the more important.

UK workers with possible occupational asthma suffer referral delays to a specialist. A recent study estimated delays in assessment and referral to a specialist in 97 workers suspected of having occupational asthma [13^{**}]. These workers suffered delays of an estimated median of 45 months between onset and date of first attendance in hospital, and a median delay between first attending their primary care physician and reaching hospital assessment of approximately 48 months.

Similar delays have been documented recently in Canada [15^{**}], where it appeared that factors such as being male, unmarried, having poor education and a lack of symptom awareness, increasing age, being the sole earner, and lack of knowledge of the local legislation all contributed to this delay.

These delays must be placed in context. Recent guidance [16] for occupational asthma, cited here importantly as the first formal evidence based review of this subject, identified better outcome in occupational asthma to be associated with reduced duration of exposure to asthmagens in the workplace. More specifically, this guidance suggests that sensitization is most likely in the first years following onset of exposure to a relevant asthmagen.

Furthermore, a recent link between severity of occupational asthma and duration of harmful workplace exposure has been identified [17^{*}], emphasizing the need for early diagnosis and avoidance of exposure.

The above could be interpreted as being critical of primary care. Whilst the recently published Standard of Care for Occupational asthma [18^{**}] suggests educational strategies for all relevant healthcare workers, these findings almost certainly also reflect (at least) the major difficulties of distinguishing significant work-related respiratory problems from the high background level of respiratory symptoms in the general population.

The need for education to reduce such variation in practice is also highlighted in a recent Canadian publication [19[•]]. This study assessed the practice patterns, barriers and needs for early diagnosis of occupational asthma among respiratory physicians and primary care doctors. Eight percent of respiratory physicians and 7% of primary care doctors reported seeing more than 20 patients a year with occupational lung disease. The most commonly stated barrier to obtaining a workplace exposure history was time constraints, and the reasons identified for referral to specialists included personal lack of expertise, lack of access to testing facilities and knowledge about workers' compensation. Most physicians identified a need for further education. The need for education is further supported by recent evidence [20^{••}] that occupational history taking is usually inadequate in patients with asthma suspected of having an occupational cause.

Almost irrespective of causation, significant diagnostic referral delays will have implications for specialist clinical practice. Not only will workers have more severe symptoms as a consequence of delay, and thus make treatment effects difficult to exclude, but additionally it is more likely that workers will be removed from the work environment prior to specialist assessment. As investigations used to confirm or refute a diagnosis of occupational asthma often rely on assessing differences between periods of work or rest [18^{••}], the opportunity to investigate appropriately may be lost.

Specialist assessment

Recent evidence will be discussed relating to both facilities available for diagnosis of occupational asthma, and the medical diagnosis itself.

Facilities

Very few studies have addressed the issue of specialist requirements to allow appropriate assessments of such patients. A recent RAND consensus (modified Delphi) technique [21] identified a set of 18 resources which should be available to a specialist occupational asthma service. These included prebronchodilator percentage predicted FEV₁ and forced vital capacity, appropriate peak expiratory flow monitoring, nonspecific provocation challenge in the laboratory and specific immunoglobulin E to a wide variety of occupational agents.

Subsequent analysis of how nonspecialist centres in the UK conform to these identified requirements was reported recently [22]. In this study, 66% of respiratory physicians interviewed had seen a case of occupational asthma in the previous month, and 76% reported referring a patient with suspected occupational asthma to a specialist centre for further investigation. All the depart-

ments were able to perform the investigations previously deemed an 'absolute necessity', although the availability of 'in-house' facilities that were deemed as 'must be available' varied between 3% and 100%. It is clear that some respiratory departments did not have direct access to investigations routinely required to investigate occupational asthma, and that access to specialist occupational respiratory centres varied within the UK. It is not clear if this is the case in other countries.

Medical diagnosis

Diagnosis of occupational asthma may be difficult to secure even with a full complement of available investigations, and normally involves interpretation of more than one piece of clinical information.

Whilst various guidance exists to assist the diagnostic process (for example, from the American Thoracic Society [23] and British Thoracic Society – http://www.brit-thoracic.org.uk/Guidelinessince%201997_asthma_html), they ultimately lack step-by-step approaches for difficult cases, and advice about interpreting conflicting results. Indeed, despite the importance for a worker of a diagnosis of occupational asthma, it is intriguing how infrequently diagnostic process has been researched. Recent work has also identified how combinations of diagnostic tests perform against a gold standard diagnosis for occupational asthma, based on previous literature [24].

The contribution of traditional and newer diagnostic techniques continues to attract evidence base. Whilst not within the scope of this article, controversy still remains concerning how best to apply these tests singly, or in combination, to confirm or exclude a diagnosis.

For example, whilst serial peak expiratory flow (PEF) measures are probably regarded as one of the best first estimates of work effect for those with asthma [18^{••}], and being a relatively sensitive and specific investigation for occupational asthma diagnosis [25], their ability to discriminate between occupational asthma and asthma aggravated by work has recently been questioned [26]. This paper reports whether serial PEF can readily distinguish between workers with asthma due to exposures at work, and those with asthma aggravated by the work environment alone, and concludes that this is not easy to do. Additionally, recent data also contest the use of serial PEF as a first assessment, reporting a better association between specific inhalation challenge testing and sputum eosinophilia at and away from work, in comparison to serial PEF, for diagnosing occupational asthma [27].

Similarly, the role of airway hyperresponsiveness is under continuing debate, and recent data [28] suggest asymptomatic hyperresponsiveness is a risk factor for developing

respiratory problems (not associated with work) when exposed to occupational allergens.

The role of new techniques for the diagnosis of occupational asthma is also under regular review and the subject of many recent publications, including the use of exhaled nitric oxide [29,30], the role of induced sputum [31] and diagnostic probabilistic modelling [32].

More research is required in this field to best define the predictive and diagnostic properties of each commonly used test.

Specifically within the area of specialist agreement, very few studies have assessed variation in interpretation of diagnostic results to make a confident diagnosis of occupational asthma. This type of study is outnumbered by the 'traditional' studies assessing the use of a particular investigation (normally in a particular specialist centre).

One of the first studies to assess expert variation in assessment of investigation for occupational asthma concentrated on serial PEF measures [33]. Using 35 serial PEF records, seven experts rated these recordings for likelihood of asthma and occupational asthma. Considerable variation in agreement was seen in expert interpretation, and the authors concluded that this could lead to inconsistencies in diagnosis of occupational asthma. To our knowledge, no other published data assess agreement between experts assessing other single investigations.

Two recent studies [34,35^{••}] have assessed diagnostic agreement between physicians using real case scenarios, one based in nonspecialist and one in specialist practice. The former assessed diagnostic approaches to a single case (based on a real case of occupational asthma) by a group of nonspecialist respiratory physicians. Each physician was posed a set of detailed questions in relation to the case, assessing diagnostic approaches, and showed marked variation in their suggested investigative strategies.

In the latter, 12 UK-based experts were asked to rate probability of occupational asthma from 19 case summaries, developed from real cases of possible occupational asthma. Whilst agreement between the physicians for all 19 cases was generally good, it was uncommon to see an 'on balance' consensus diagnostic view. Possible reasons for this disagreement are many, although this may in part reflect the absence of a normal clinical consultation, and in part differences in interpretation of investigations.

Finally, lack of 'diagnostic' agreement is not limited to physicians. Once a firm diagnosis is given to workers,

their perception and understanding of this is variable. Recent work [13^{••}] suggests that only 74% of workers with a given firm diagnosis of occupational asthma actually confirmed this as their diagnosis, whilst 36% of those confirmed as not having occupational asthma actually thought they had the condition.

Conclusion

Each step of the worker journey towards a diagnosis of occupational asthma is associated with a potential for variation in practice. Inevitably, this will lead to differences in specialist referral patterns nationally and internationally. Whilst our understanding of the pathophysiology of occupational asthma continues to broaden, we must invest in research to understand the diagnostic process more fully, so that a more consistent international perspective is developed. Whilst observed inconsistencies may partially relate to differing medico legal and compensation requirements, policymakers in this area need to be assured that a consistent approach to diagnosis is being adopted to enable appropriate national (and potentially international) interventions to be developed and evaluated.

The title of a recent review [36] sums up the rather uncertain state of play. In 'Occupational lung disease: under-recognised, underestimated and poorly managed, even today' the authors conclude that occupational asthma is poorly recognized, difficult to diagnose and difficult to manage. Very recent data from the USA [37] confirm that workers with suspected occupational asthma still do not receive appropriate diagnostic care. This review has highlighted the need to better understand variations in diagnostic practice, and hence develop a more consistent approach to the overall management of this condition.

References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

Additional references related to this topic can also be found in the Current World Literature section in this issue (p. 189).

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