

Effective health surveillance for occupational asthma in motor vehicle repair

James Mackie

Grosvenor Health, Grosvenor House, Prospect Hill, Redditch B97 4DL, UK

Correspondence to: James Mackie, Grosvenor Health, Grosvenor House, Prospect Hill, Redditch B97 4DL, UK. Tel: +44 845 260 0690; fax: +44 845 094 6513; e-mail: james.mackie@grosvenorhealth.com

Abstract

Background Diisocyanates are the commonest reported cause of occupational asthma (OA) in the UK. Health surveillance should play an important part in the early detection of disease and the prevention of long-term morbidity.

Aim To assess the efficacy of a UK-wide health surveillance programme provided to the motor vehicle repair industry.

Methods Analysis of respiratory questionnaire and spirometry results during the period 1995–2000 and more detailed assessment of the outcome of cases suggestive of OA between 1998 and 2000.

Results Approximately 3700 employees underwent health surveillance each year. As a result, a number (27%) required further assessment; information on 92 employees who were referred to their general practitioner (GP) for further assessment was examined. Half of these employees subsequently failed to see their GP and of those referred to a specialist only 63% attended that appointment. Of the 20 employees who did see a specialist, nine (45%) were subsequently diagnosed as having OA due to isocyanates, indicating a mean annual incidence rate of 0.79 per 1000 workers identified by surveillance. A year after identification, five of the diagnosed employees were still working in the same job.

Conclusions Health surveillance is only one part of a process for identifying OA. In this programme, the high drop out rate of employees in the medical investigation process initiated by surveillance was a significant problem. Recommendations are suggested for the future operation of respiratory health surveillance programmes.

Keywords Health surveillance; isocyanates; motor vehicle repair; occupational asthma

Introduction

Occupational asthma (OA) is among the most frequently reported occupational respiratory diseases in westernized industrial populations with an estimated incidence in the UK of 3000 new cases per year [1]. Occupational factors are believed to account for 9–15% of all cases of adult-onset asthma [2]. Of these factors, diisocyanates, widely used in two-pack polyurethane paints throughout the motor vehicle repair (MVR) industry, are one of the most frequently reported causative agents [3].

There is good evidence to suggest that early case identification in OA is important in improving prognosis [4,5]. Health surveillance includes processes designed to detect early occupational disease and in the UK is required for workforces with exposure to respiratory-sensitizing agents where there is a significant identifiable residual health risk [6]; in the MVR industry, this generally includes spray painters and panel beaters. Thus, health surveillance is a key activity undertaken by many occupational health (OH) professionals. Despite this, there is limited evidence supporting its effectiveness and benefits in the context of OA. While it has been suggested that surveillance detects OA at an earlier stage and improves outcome for workers included in such a programme [7], there is evidence to suggest that it may be insensitive in detecting all cases [8].

Workers in MVR may be exposed to a variety of hazards including diisocyanates, metals in paint, solvents, acid anhydrides, amines, dust and noise. Two-pack polyurethane paints containing diisocyanates are widely used because they produce a high gloss, wear-resistant finish very similar to the original paint without the need for heat curing. Diisocyanates are present in the hardener component which is mixed, by stirring, with a paint (undercoat or topcoat) resin and a quantity of thinner. Previous studies have shown poor levels of hazard control in typical repair shops [9,10]. In the UK, the Health & Safety Executive has recently attempted to raise awareness of the health risks, and in particular the risk of isocyanate-induced OA in the MVR industry through a series of roadshows [11]. A recommendation has also been made to assess post-shift urinary isocyanate metabolites as a means of ensuring satisfactory exposure control [12].

Since 1995, an external OH company has provided a nationwide health surveillance programme for garage workers in the MVR industry. Annual surveillance consists of a nurse- or technician-administered questionnaire and spirometry for those workers identified to be at risk. Workers who answer in the negative to all key respiratory questions (inquiring into asthma, rhinitis, conjunctivitis and symptoms of wheeze or shortness of breath) and who are deemed to have normal spirometry (forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV_1) >80% of predicted and forced expiratory ratio (FER) >70%) are passed fit at the time of surveillance. When significant symptoms or significant decrements in lung function are identified, a paper review by an occupational physician (OP) is undertaken and if necessary further referral via the worker's general practitioner (GP) to a specialist in occupational lung disease is recommended. OPs are all qualified to Associateship (AFOM), Membership (MFOM) or Fellowship (FFOM) of the Faculty of Occupational Medicine level or are specialty registrar grade. Employees are also provided with the opportunity to be seen by an OP.

The aims of this study were to assess the effectiveness of the programme at identifying cases of OA and to make recommendations for its future operation.

Methods

Health records for employees who underwent health surveillance—and the outcomes of this—during the years 1995–2000 inclusive were studied. No individual was seen more frequently than annually. Surveillance comprised a comprehensive respiratory health questionnaire, completed by the employee with the assistance of a screening nurse or a technician, and spirometry recorded according to American Thoracic Society standards. The respiratory questionnaire was modified in 1997 but both versions contained a core of respiratory questions relating to asthma symptoms and developed from the Medical Research Council Respiratory Questionnaire [13]. Information gathered in this way was entered into an Excel spreadsheet for analysis.

Employees surveyed in 1998, 1999 or 2000 who had surveillance outcomes suggestive of possible OA were identified and the OH record for each individual was examined; outcome data for earlier

years were less complete and were not included in this analysis. For each employee where an OH record could be obtained the following information was extracted:

Age of employee (years).

Length of time working with MVR-related respiratory sensitizers (years).

Job.

Whether the employee attended their GP as recommended following health surveillance.

Whether the employee was subsequently referred to a specialist in respiratory medicine and whether the employee attended for this opinion.

The specialist's diagnosis and, where applicable, the length of time taken to be made.

Whether the employee was in the same job the next year (obtained indirectly by ascertaining whether the employee attended for health surveillance the following year).

Results

Each year, 400 garages were visited by mobile health surveillance vehicles. The majority of workplaces employed 10 or fewer employees engaged in work with respiratory sensitizers. There was a gradual increase in the number of employees seen between 1995 and 1997, with a roughly equal number seen in subsequent years. Increasing numbers often reflected additional staff taken on in the garages from one year to the next. Participation rates were not routinely calculated but it was the norm for nearly all at-risk staff to attend; non-attendees were generally limited to those who were off sick or on holiday. Twenty seven per cent of employees were referred for an OP paper review following on site surveillance; such review was provided by several physicians who did not participate equally or necessarily in every year.

Between 1995 and 2000, 250 of those employees who were reviewed by an OP were considered possibly to have OA ([Table 1](#)). Their median age was 32 years and their mean duration of employment in the industry 12 years with a range from 2 to 30 years.

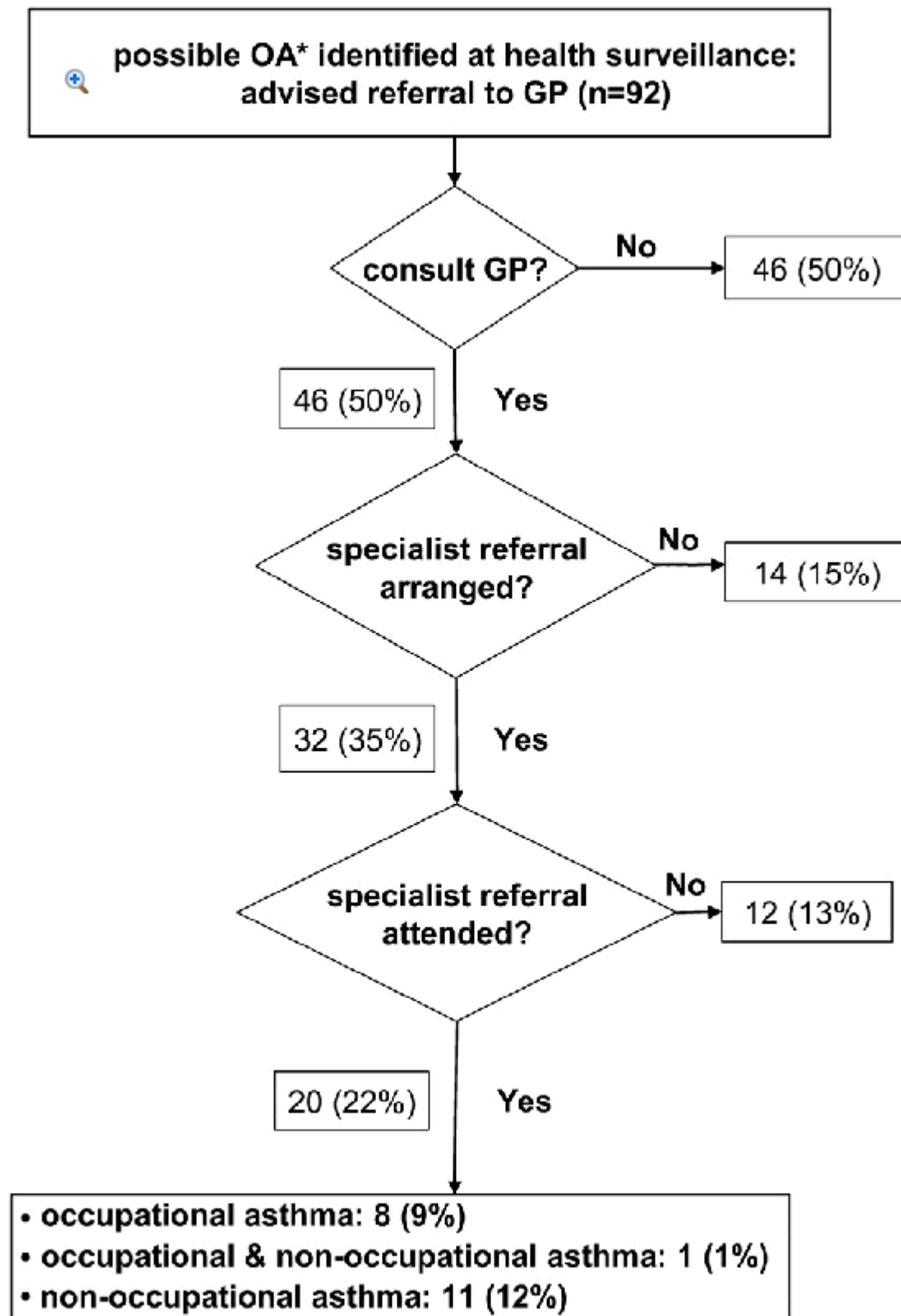
Table 1. Summary of health surveillance data 1995–2000

	Total attending for health surveillance	Possible OA <i>n</i> (%)	Confirmed OA (<i>n</i>)
1995	2900	40 (1.4)	NA
1996	3140	21 (0.7)	NA
1997	3766	65 (1.7)	NA
1998	3824	67 (1.8)	5
1999	3746	48 (1.3)	3
2000	3730	9 (0.24)	1
Total 1995–2000		250 (1.2)	
Total 1998–2000		124 (1.1)	

During the period 1998–2000, 124 cases where further investigation was recommended following OP review were identified. Information on the outcomes of surveillance and GP referral was available for 92. Of these, none was recommended for GP review on the basis of abnormal spirometry alone. In eight cases (9%), there was a combination of abnormal spirometry and a positive history, and in the other 84 cases (91%), a positive history only.

[Figure 1](#) details the outcomes further. Only 50% of workers identified as possible OA from the surveillance programme were known to have seen their GP as recommended, only 63% of those subsequently referred to a specialist attended that appointment. Bronchial challenge testing was undertaken in one employee. It was recommended in a further two cases; however, both failed to attend. Of those who were assessed by a specialist, 45% (nine cases) received a final diagnosis of OA. The mean time lapse between surveillance and diagnosis for this group was 9 months (range 6–12 months).

Figure 1. Analysis of referred (possible OA) cases 1998–2000. Percentages are of the original 92 possible cases.



*OA = occupational asthma

All workers with confirmed OA were employed as spray painters using two-pack diisocyanate-containing paint mixtures. In eight cases, diisocyanates were thought to be the likely sensitizing agent; in the remaining case, sensitization to acid anhydrides within an epoxy resin system was thought likely. In this case, the available personal protective equipment consisted of disposable

paper masks.

Over half (five out of nine) of the employees diagnosed with OA remained in the same employment 12 months later.

In these ways, the health surveillance programme identified five cases of OA in 1998, three in 1999 and one in 2000. Estimated incidence rates were 1.31 per 1000 employees per year for 1998, 0.80 per 1000 per year for 1999 and 0.27 per 1000 per year for 2000; equivalent to a mean incidence rate of 0.79 per 1000 per year for the period 1998–2000.

Had the health surveillance programme worked as planned whereby all workers requiring further investigation were actually seen and assuming that the individuals who did not attend for GP or specialist appointments were no different in terms of disease profile than those who did attend, then applying a specialist diagnosis rate of 45% to the group of 92 workers would have resulted in 41 cases of OA. This would indicate an estimated annual incidence rate of 3.42 per 1000 for the period 1998–2000.

Discussion

The principal findings of this study were the ability of the programme to detect cases of OA, high initial participation rates in health surveillance but lowered subsequent participation rates as medical investigation proceeded, a relatively quick time to diagnosis following symptom onset when compared to other studies and varying advice regarding fitness for work following a diagnosis of OA.

This study highlights some of the benefits and difficulties associated with routine health surveillance. A positive and encouraging aspect was the relatively early identification of some cases of OA. A major problem, however, was the fact that despite a high participation rate in the initial phase of surveillance, many employees subsequently failed to complete the process of medical investigation. Where the outcome of health surveillance was recommendation of a GP appointment in order to consider and if necessary arrange specialist investigation, then many individuals did not attend. Any subsequent medical investigation was also associated with high non-attendance rates. Following the study, the health surveillance process was reviewed with enhancements made to the respiratory questionnaire, staff training and reporting process. Enhancements to the respiratory questionnaire also took account of the findings of the British Occupational Health Research Foundation (BOHRF) OA evidence review [5]. Questions aimed more at eliciting symptoms of chronic bronchitis were removed and a question asking specifically ‘whether symptoms improve while away from work’ was added. This question augmented the existing questions enquiring about the timing of symptoms and whether these occurred at work or away from work. The term ‘shortness of breath’ was introduced instead of ‘breathless’. Written referral guidance was produced for staff at technician, occupational health (nursing) advisor (OHA) and OP levels. The written information provided to employers and GPs was also reviewed and enhanced, in particular emphasizing the availability of OP assessment.

The health surveillance programme presented here identified nine cases of OA over a 3-year period. We believe that the true number (and hence the incidence in MVR in general) is likely to be significantly higher; our estimated incidence rate is reflective of this but itself is likely an underestimate. The estimated incidence rate for 2000 (0.27 per 1000) was lower than that in 1998 or 1999 (1.31 and 0.80, respectively). The reasons for this variation are not obvious, but could be

explained by different approaches of the reviewing OP (a different physician undertook the majority of the work in 2000 compared to previous years) or alternatively a true reduction in disease incidence consequent on the identification of prevalent cases in previous years. The observation that in the period 1998–2000 all of those individuals who were eventually seen by a specialist were subsequently diagnosed with asthma (either occupational or non-occupational) is notable as other causes of symptoms might have been expected. Arguably, this observation suggests the need to retain a low threshold for referral.

Current legislation in the UK obliges employers to assess risks to health at work and to provide respiratory health surveillance where the assessment identifies a significant risk to health. In the case of OA, this is normally where residual occupational exposure to a respiratory sensitizer occurs. If the primary purpose of health surveillance is to detect and prevent work-related disease, then these findings suggest that there is a problem with some current surveillance approaches. Many employers, and in particular perhaps those in the small and medium sized employers (SME) sector, may interpret current UK legislation as obliging them only to provide the initial health surveillance but not necessarily the whole process including definitive diagnosis; there are likely to be understandable reasons for this, principally cost. The latter part is therefore left to state-funded health services and employees generally need to surmount several referral hurdles before further investigation is possible. This process adds to delay in diagnosis and, as this study identifies, increases the risk of non-diagnosis through non-attendance at each of its stages. Letters from primary care services to the surveillance provider suggested some confusion as to whether they should or should not arrange and fund further investigation for workers following surveillance; this too does not assist workers. Better communication between OH and primary care professionals, together with strategies to improve the understanding of OH among primary care professionals (and vice versa), is recommended.

An alternative and more efficient and efficacious overall process would be one that included a close working relationship between the health surveillance provider and a specialist physician in either occupational medicine or occupational respiratory medicine with the facility for direct referral. While the scheme described here offered employers the opportunity of a prompt consultation with a specialist in occupational medicine following surveillance, this was (and still is) very rarely taken up suggesting that employers and employees fail to understand the benefits of this approach.

Almost half of those with confirmed OA continued to work in the same job following diagnosis. The fact that in some cases, this might be occurring with the full knowledge of the employer raises significant doubt about the level of knowledge that exists among employers (and employees) with regards to OA and the purpose of health surveillance in the MVR sector. There was evidence from our review of the medical reports of referred workers that the medical advice provided to workers diagnosed with OA varied significantly, with not all recommending avoidance of further exposure. Unfortunately, such variation in advice is likely to compound any misunderstanding that employers and employees might have about surveillance. It is to be hoped that evidence reviews such as the recent BOHRF OA guidelines [5] and other consensus statements might lessen such variation. Financial and related factors are also likely to be significant determinants as to whether an employee stays in post following diagnosis. It is perhaps understandable that an individual who is presented with unclear medical advice as to whether they should remain at work or not, and who faces financial loss if they leave, may choose to remain. It is therefore particularly important that such individuals are given clear, correct and consistent medical advice.

The finding that spirometry appeared to play only a minor part in the OP decision to recommend referral for further investigation is of note. Historically, spirometry has been recommended as an essential part of health surveillance [14] but a recent evidence review concluded that spirometry would detect few cases of OA that would not otherwise be detected by respiratory questionnaire [5]. We would agree with this conclusion and would recommend that guidelines for OH staff emphasize

this point so that the focus of surveillance activity is not on spirometry but on symptoms and any temporal relationship to work.

To date, few studies have reported on the effectiveness of health surveillance in OA. In this study, the mean time from health surveillance to confirmed diagnosis was 9 months (range 6–12 months), a favourable comparison with the figure (44 months) reported by Fishwick *et al.* [15] in a survey where very few patients were subject to regular health surveillance. Our findings therefore add weight to the evidence that routine health surveillance can lead to earlier diagnosis, but unless mechanisms can be put in place to encourage workers not to default from the complete process then workers with OA will remain undetected.

As health professionals committed to minimizing work-related ill-health, our challenge is to promote and deliver services that help to achieve this. For many OH professionals, surveillance is a core activity on which much time is spent. How effective, however, is this time? This study supports the view that effective health surveillance requires a seamless and timely process between initial contact and a definitive (specialist) opinion. In our experience, the current regulatory and health care approaches in the UK can prevent this from happening. OA should be considered in all exposed workers with symptoms of variable airflow limitation. We would conclude that it is inappropriate and ineffective to leave the burden of diagnosis with primary care health services and that mechanisms should be in place for any worker with symptoms indicating a possibility of OA to be seen promptly by either a specialist in occupational medicine or occupational respiratory medicine. Such specialists should be competent at diagnosing the disease. Uniformity in the subsequent advice provided to the worker and their employer should also be achieved. On the basis of our findings, we believe that in the UK there is still some way to go to achieve effective workplace surveillance for OA.

Key points

Health surveillance can enable the early detection of cases of OA but requires a co-ordinated approach between OH, primary care and secondary health care.

Health surveillance should focus primarily on respiratory symptoms and any temporal relationship with work, as opposed to spirometry.

Health surveillance should involve as few steps as possible between symptom detection and final diagnosis.

Conflicts of interest

The author is an employee of the OH provider.

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