

Rhinitis and its impact on work

Olivier Vandenas^a, Vinciane D'Alpaos^a and Philippe Van Brussel^b

^aDepartment of Chest Medicine, Mont-Godinne Hospital, Catholic University of Louvain, Yvoir, Belgium and ^bService Externe de Prévention et Protection CESI, Brussels, Belgium

Correspondence to Dr Olivier Vandenas, Service de Pneumologie, Cliniques Universitaires UCL de Mont-Godinne, B-5530 Yvoir, Belgium
Tel: +32 81 42 33 63; fax: +32 81 42 33 52;
e-mail: olivier.vandenas@pneu.ucl.ac.be

Current Opinion in Allergy and Clinical Immunology 2008, 8:145–149

Purpose of review

Health-related work disability has been increasingly recognized as an important component of the economic and societal burden of a disease. The purpose of this review is to summarize recently published data pertaining to the impact of rhinitis on work disability.

Recent findings

Recent studies have investigated the impact of rhinitis on both the amount of time missed from work (absenteeism) and the level of work effectiveness while on the job (presenteeism). These studies have shown that rhinitis has a rather modest effect on absenteeism, with estimated productivity losses of approximately 1–4% resulting from missed work time. By contrast, rhinitis is associated with substantial impairment in at-work performance. Estimates of lost productivity attributable to reduced on-the-job effectiveness ranged from 11 to 40%. The impact of rhinitis on work productivity is affected by symptom severity, and allergen exposure, and it can be reduced by second-generation antihistamines.

Summary

The impact of rhinitis on work productivity should be further characterized and taken into account for establishing cost-effective management strategies.

Keywords

economics, rhinitis, work productivity

Curr Opin Allergy Clin Immunol 8:145–149
© 2008 Wolters Kluwer Health | Lippincott Williams & Wilkins
1528-4050

Introduction

Rhinitis was often regarded as a trivial condition until the pioneering studies, published in the mid 1990s, by Professor Jean Bousquet and co-workers [1]. These investigators provided convincing evidence that rhinitis can exert a substantial impact on the physical, social, and emotional functioning of patients. In addition, there is accumulating evidence indicating that rhinitis may interfere with work performance, since the condition is associated with sleep disturbances, daytime fatigue, and impairments in cognitive and psychomotor abilities [2]. These impairments can be further aggravated by sedative H1-antihistamines.

Work disability resulting from rhinitis has, however, received little attention until recent years. Considering the scattered number of publications that have addressed this topic, the current review aims to summarize relevant articles published from 2000 to 2007.

Work productivity

The primary components of work productivity are absenteeism and presenteeism. Absenteeism represents

the number of days/hours missed from work due to the illness, whereas presenteeism refers to illness-related reductions in performance while the person is at work. These two components of work productivity can be evaluated using self-report methods and objective measures. Several self-report productivity instruments have been developed over the past few years to quantify the impact of illness on productivity at work and/or in nonwork activities [3]. These instruments rely upon respondents' self-report in assessing time missed from work and on-the-job productivity losses due to a specific health condition over a given time period, generally ranging from 1 week to 1 month. The Work Productivity and Activity Impairment (WPAI) questionnaire (website: <http://www.reillyassociates.net>) [4] is the most frequently used instrument and it has been modified to measure productivity reductions associated with specific conditions, including allergic diseases (Allergy-Specific WPAI). Work efficiency can also be measured through objective indices (e.g., number of telephone calls handled, number of claims processed, amount of data entered into a computer) [5,6]. Both approaches raise a number of methodological issues. Self-reporting may be affected by recall failure and attribution bias (e.g. confusion about whether rhinitis is the cause of the work

impairment). There is concern about whether data on work productivity can be translated into monetary terms. The relationship between employee-specific performance and the company's productivity may not be linear, since slight impairment in an individual performance may result in substantial productivity loss for a company. For instance, the output of a worker can affect the ability of an entire team to function properly. On the other hand, the information collected using objective indices is specific to a particular job and may not be extrapolated to other work settings.

In addition, disease-related work disability can take other forms, including reduced labour force participation, restrictions in job duties or working time, and changes in job [7,8]. These outcomes have almost never been evaluated in subjects suffering from rhinitis. Noticeably, Yelin and co-workers [9] compared the duration of work life in a random sample of US subjects aged 55 to 75 with or without a physician-based diagnosis of chronic obstructive pulmonary disease, asthma, or rhinitis. Those with rhinitis (without asthma) were not less likely than the healthy population to have ever worked. Among those with some work history, however, individuals reporting any of the quoted respiratory conditions had an increased risk of leaving work prior to age 65 relative to those without chronic conditions, even when adjusting for demographic and work characteristics. The hazard ratio for cessation of work associated with rhinitis was significantly elevated relative to subjects without chronic health conditions [1.34, 95% confidence interval (CI) 1.06–1.69], although to a lesser extent than chronic obstructive pulmonary disease (1.99, 95% CI 1.66–2.39) and asthma (1.48, 95% CI 1.13–1.94).

Magnitude of work impairment

Several cost-of-illness studies have attempted to quantify the magnitude of the work impairment caused by allergic rhinitis. These data were derived from large population-based health surveys conducted in the US population, including the 1987 National Medical Expenditures Survey [10], the 1988 National Health Interview Survey (NHIS) [11], the 1993–1994 NHIS [12] and the 1995 NHIS [13]. Estimates of the annual number of work days missed because of allergic rhinitis varied from 0.03 day [10] to 0.25 day [11,13] and 0.8 day [12] per employed person. The average annual number of days with restricted activity (defined as days during which the respondents reported having reduced their usual activities by more than half of the day) ranged from 0.18–0.20 [10,13] to 0.40 [11] days per worker. These estimates of the indirect costs attributable to rhinitis are, however, limited by the lack of precise assessment of at-work performance; the authors assumed a 25% reduction in productivity for each reported cut-down day [10,11,13].

These studies provided a wide range of estimates of the indirect costs of allergic rhinitis, ranging from 7% [10] to 25% [11] of the total costs. A more recent survey conducted in 1999–2000 in Germany found that the indirect costs resulting from missed work days accounted for 58% of the total costs (€1543) of seasonal allergic rhinitis among adults, although impairment in at-work productivity was not evaluated [14]. In addition, treatment of rhinitis can have adverse consequences on work productivity that may not be directly attributed to the disease. Thus, it has been consistently documented that patients taking sedating antihistamines are more likely to sustain work-related injuries leading to work absence [15].

Goetzel and co-workers [16] reviewed and combined data from five large-scale US surveys in which estimates for both absenteeism and presenteeism due to multiple disease conditions were obtained using various objective or self-report methods. Three of these surveys provided data on productivity losses associated with 'allergies' (i.e. the Employer Health Coalition Healthy People/Productive Community Survey; the American Productivity Audit; and the Work Productivity Short Inventory survey conducted in a telecommunication company). The authors concluded that 'allergy' (excluding asthma) was associated with an average 4% productivity loss (8.2 days per year per capita) due to work absence and an average 11% loss due to reduced performance (0.9 h lost per day). These figures were similar to those attributed to more 'serious' diseases, such as asthma, arthritis, or heart disease. Presenteeism-related costs accounted for 82% of the total health-related and productivity-related expenditures attributable to 'allergy'. Despite the imprecision of their estimates, these studies indicate that reduced at-work performance could represent a prominent determinant of productivity losses and indirect costs associated with allergic rhinitis.

A French survey of patients consulting general practitioners for seasonal exacerbation of allergic rhinitis found that 79.2% experienced some impairment in their professional life [17], although the extent of this impairment was not formally quantified. Sick leave from work or school for 5.7 ± 4.8 days was ordered because of the severity of the symptoms in 4.6% of the patients. The study by Blanc and co-workers [18] was the first epidemiological survey that was specifically designed to quantify the impact of allergic rhinitis on both absenteeism and presenteeism. The authors carried out a population-based survey of adults in Northern California aged 18 to 50 years. They interviewed 125 persons with a physician-based diagnosis of asthma (with or without concomitant rhinitis) and 175 persons with rhinitis alone. Any labour force participation since condition onset was

lower among those with asthma (88%) than among those with rhinitis alone (97%). In contrast, among those still employed, a decrease in self-rated job effectiveness (below 90% of usual effectiveness) was more frequently reported in individuals with rhinitis (36%) than in those with asthma (19%). Condition-attributed lost work was common in both groups, with more than 20% reporting one or more complete or partial work days lost in the 4 weeks previous to interview. This study demonstrated that both asthma and rhinitis have a similar adverse effect on absenteeism, while rhinitis has a more prominent impact on job effectiveness. More recently, the Work Productivity Short Inventory questionnaire was used to evaluate absenteeism and presenteeism attributable to various medical conditions in a large population of volunteers employed in a broad range of US companies [19[•]]. On average, employees who experienced symptoms of allergic rhinitis missed 3.6 work days per year and were unproductive 2.3 h per work day when experiencing symptoms. The mean total productivity losses attributable to allergic rhinitis were US\$593 per employee per year. This figure was higher than those obtained for the other conditions, such as migraine (US\$277), depression (US\$273), or respiratory infections (US\$181). These findings suggest that allergic rhinitis is a major contributor to the total cost of health-related absenteeism and presenteeism. In this study, however, the cost of health conditions might have been overestimated, due to the mode of recruitment of participants attending health fairs who are likely to be more concerned by health conditions. In a recent survey assessing work productivity through the WPAI instrument, 577 adults with allergic rhinitis from a US managed care organization reported, on average, 1 h of work missed per week because of rhinitis symptoms [20[•]].

Only a few studies have assessed work performance using objective measures. One study showed that health claims processors who filled a prescription for a first-generation antihistamine were 7.8% less productive than average during the following 3 days whereas those who filled a prescription for a second-generation antihistamine were 5.2% more productive than average for the following 3 days [5]. Another study examined the work effectiveness of telephone customer service operators suffering from allergic rhinitis (without asthma) before, during, and after the ragweed pollen season, using an objective measure of performance derived from an electronic time-keeping system [6]. Operators who reported having allergic rhinitis but did not use medication were 10% less likely to meet the productivity standard as compared with those without allergic disorders. Workers suffering from allergic rhinitis who used medication were 3% less likely to meet the standard. There was no difference in work performance according to the type of medication used by the workers.

Determinants of work impairment

Recent studies have explored disease-related factors that may affect the impact of rhinitis on work productivity, including severity of symptoms, allergen exposure, and medication use.

Severity of symptoms

In the above-quoted French survey of allergic rhinitis in general practice [17], patients with persistent symptoms (i.e. symptoms for more than 4 days per week and for more than 4 consecutive weeks per year) reported more frequent impairment at work (81.7%) than other patients (77.4%). Absence from work was associated with more severe nasal and general symptoms, such as posterior rhinorrhea, sleep disturbance, difficulty in concentrating, and loss of appetite. The relationship between the severity of rhinitis graded according to the ARIA classification [21] and impairment in work productivity assessed with the Allergy-Specific WPAI instrument has been investigated in another large sample of French patients with allergic rhinitis recruited over a one-year period by general practitioners [22^{••}]. Noticeably, there was no work day lost because of rhinitis. By contrast, at-work productivity (presenteeism) was reduced in all four ARIA categories, but the severity of rhinitis symptoms was more important than their duration. Similar decrements in work productivity were reported by patients classified as having mild intermittent (20%, 25th–75th percentiles 10–30%) and mild persistent (20%, 25th–75th percentiles 0–40%) rhinitis. Patients with moderate/severe intermittent or persistent rhinitis had significantly higher impairments (40%, 25th–75th percentiles 20–70% and 40%, 25th–75th percentiles 20–60%, respectively). Among managed care organization members suffering from allergic rhinitis, multiple regression analysis of WPAI data revealed that work productivity was negatively affected by some specific symptoms (i.e. sneezing, nasal congestion, and watery eyes), sleep disturbance, and general health-related quality of life [20[•]].

Allergen exposure

Kessler *et al.* [23] evaluated prospectively the impact of exposure to outdoor allergens on work productivity among persons suffering from allergic rhinitis. This study was based on the MacArthur Foundation National Survey of Daily Experience, a US daily diary survey that included a nationally representative sample of 739 employed persons, each of whom provided daily reports on work performance for one randomly assigned week of the calendar year. The survey collected daily data on sickness absence and restricted work performance. The final productivity score was expressed on a 0 to 10 scale, in which 0 was coded for respondents who reported sickness absence, 10 for respondents who reported no cutback, and in the range 0–9 for respondents who

reported cutback on the quality or amount of work. Individual data on work productivity were combined with archival data on time-space variations in pollen and mould counts obtained from the National Allergy Bureau monitoring sites located throughout the country. This study design made it possible to assess the relationship between exposure to outdoor allergens and daily work impairments separately among people with or without allergic rhinitis. In addition, the data were collected independently from the participant perception about the reasons for their work impairment, thus avoiding the problem of attribution bias. The potential for recall bias was also minimized, since data were collected contemporaneously. The results of this study showed that work impairment was significantly correlated with outdoor pollen/mould levels only among respondents with self-reported allergic rhinitis. High grass-pollen counts showed the largest odds ratio in predicting impaired work quality (odds ratio 9.9, 95% CI 3.3–29.8), whereas high mould levels had the highest odds ratio in predicting impaired work quantity (odds ratio 18.1, 95% CI 4.1–72.9). The average cost of work impairment associated with high pollen/mould exposure, expressed in monthly salary-equivalent terms, was estimated between US\$109 and US\$156 for individuals suffering from allergic rhinitis. Unfortunately, the study did not gather data on medications, which would have allowed for investigating how much of the work impairment resulted from the side effects of sedating antihistamines. The association between an increase in ragweed pollen counts and a decrease in productivity was also documented through objective measures of work performance in telephone customer service operators [6]. Although the burden of work-related rhinitis has been recently emphasized [24], only one study [25•] has specifically addressed the impact of exposure to occupational allergens on work productivity. The authors evaluated rhinitis-related quality of life among greenhouse workers during and outside the bell-pepper flowering period. The activities that were most frequently reported as being limited by rhinitis symptoms were work-related activities and sports, although the magnitude of work impairment was not quantified. Multiple regression analysis showed that sensitization to bell-pepper pollen, but not sensitization to common allergens, had a negative effect on all domains of the quality of life questionnaire. In addition, the bell-pepper flowering period was associated with a significant decrease in all quality of life domains. The potential effect of indoor allergen levels on work productivity in patients with allergic rhinitis has never been evaluated.

Medication

In recent years, work productivity has been increasingly acknowledged as an important outcome in treatment trials. The Allergy-Specific WPAI instrument has been used in several clinical trials assessing the effectiveness

of second-generation oral antihistamines in seasonal [26–30] and persistent rhinitis [31]. Baseline average figures ranged from 0.3 to 4.5% for missed work time, from 37 to 40% for loss of at-work performance, and from 39 to 42% for overall work productivity impairment. These studies found that the overall work impairment significantly improved by approximately 5–8 percentage points as compared with placebo [15]. Information on the effect of other therapeutic options on work productivity is currently lacking.

Conclusion

Recent studies have provided further evidence that rhinitis is associated with substantial adverse effects on work productivity, mainly in terms of reduced work performance. The overall impact on work productivity may be similar to that resulting from health conditions that have been traditionally considered as being more severe from a medical perspective. Despite the inherent imprecision in assigning a monetary value to impaired productivity, available data indicate that decreased work productivity attributable to rhinitis may cause a substantial economic burden for patients and society. Estimating the impact on work should become an important consideration in the management of this highly prevalent, though often trivialized, condition.

Acknowledgement

This work was supported by a grant from the Fonds Scientifique CESI.

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. 190).

- 1 Bousquet J, Bullinger M, Fayol C, *et al.* Assessment of quality of life in patients with perennial allergic rhinitis with the French version of the SF-36 Health Status Questionnaire. *J Allergy Clin Immunol* 1994; 94 (2 Pt 1):182–188.
- 2 Nathan RA. The burden of allergic rhinitis. *Allergy Asthma Proc* 2007; 28: 3–9.
- 3 Prasad M, Wahlqvist P, Shikier R, Shih YC. A review of self-report instruments measuring health-related work productivity: a patient-reported outcomes perspective. *Pharmacoeconomics* 2004; 22:225–244.
- 4 Reilly MC, Zbrozek AS, Dukes EM. The validity and reproducibility of a work productivity and activity impairment instrument. *Pharmacoeconomics* 1993; 4:353–365.
- 5 Cockburn IM, Bailit HL, Berndt ER, Finkelstein SN. Loss of work productivity due to illness and medical treatment. *J Occup Environ Med* 1999; 41:948–953.
- 6 Burton WN, Conti DJ, Chen CY, *et al.* The impact of allergies and allergy treatment on worker productivity. *J Occup Environ Med* 2001; 43:64–71.
- 7 Vandenplas O, Toren K, Blanc PD. Health and socioeconomic impact of work-related asthma. *Eur Respir J* 2003; 22:689–697.
- 8 Vandenplas O, Henneberger PK. Socioeconomic outcomes in work-exacerbated asthma. *Curr Opin Allergy Clin Immunol* 2007; 7:236–241.
- 9 Yelin E, Katz P, Balmes J, *et al.* Work life of persons with asthma, rhinitis, and COPD: a study using a national, population-based sample. *J Occup Med Toxicol* 2006; 1:2.

- 10 Malone DC, Lawson KA, Smith DH, *et al.* A cost of illness study of allergic rhinitis in the United States. *J Allergy Clin Immunol* 1997; 99 (1 Pt 1):22–27.
 - 11 McMenamin P. Costs of hay fever in the United States in 1990. *Ann Allergy* 1994; 73:35–39.
 - 12 Ward MM, Javitz HS, Smith WM, Whan MA. Lost income and work limitations in persons with chronic respiratory disorders. *J Clin Epidemiol* 2002; 55: 260–268.
 - 13 Crystal-Peters J, Crown WH, Goetzel RZ, Schutt DC. The cost of productivity losses associated with allergic rhinitis. *Am J Manag Care* 2000; 6:373–378.
 - 14 Schramm B, Ehlken B, Smala A, *et al.* Cost of illness of atopic asthma and seasonal allergic rhinitis in Germany: 1-yr retrospective study. *Eur Respir J* 2003; 21:116–122.
 - 15 Hanrahan LP, Paramore LC. Aeroallergens, allergic rhinitis, and sedating antihistamines: risk factors for traumatic occupational injury and economic impact. *Am J Ind Med* 2003; 44:438–446.
 - 16 Goetzel RZ, Long SR, Ozminkowski RJ, *et al.* Health, absence, disability, and presenteeism cost estimates of certain physical and mental health conditions affecting U.S. employers. *J Occup Environ Med* 2004; 46:398–412.
 - 17 Demoly P, Allaert FA, Lecaesle M. ERASM, a pharmacoepidemiologic survey on management of intermittent allergic rhinitis in every day general medical practice in France. *Allergy* 2002; 57:546–554.
 - 18 Blanc PD, Trupin L, Eisner M, *et al.* The work impact of asthma and rhinitis: findings from a population-based survey. *J Clin Epidemiol* 2001; 54:610–618.
 - 19 Lamb CE, Ratner PH, Johnson CE, *et al.* Economic impact of workplace productivity losses due to allergic rhinitis compared with select medical conditions in the United States from an employer perspective. *Curr Med Res Opin* 2006; 22:1203–1210.
- This survey compared the impact of rhinitis on work productivity with that resulting from other health condition. The survey was, however, based on convenience sample, which might have bias the findings.
- 20 Szeinbach SL, Seoane-Vazquez EC, Beyer A, Williams PB. The impact of allergic rhinitis on work productivity. *Prim Care Respir J* 2007; 16:98–105. This study provides interesting information on the factors that determine the impact of allergic rhinitis on work productivity in a large sample of a managed care organization members.
 - 21 Bousquet J, Van Cauwenberge P, Khaltaev N. Allergic rhinitis and its impact on asthma. *J Allergy Clin Immunol* 2001; 108 (5 Suppl):S147–S334.
 - 22 Bousquet J, Neukirch F, Bousquet PJ, *et al.* Severity and impairment of allergic rhinitis in patients consulting in primary care. *J Allergy Clin Immunol* 2006; 117:158–162.
- This survey evaluated the impact of the severity and duration of rhinitis symptoms on quality of life and work productivity in a large population of patients seen by general practitioners.
- 23 Kessler RC, Almeida DM, Berglund P, Stang P. Pollen and mold exposure impairs the work performance of employees with allergic rhinitis. *Ann Allergy Asthma Immunol* 2001; 87:289–295.
 - 24 Gautrin D, Desrosiers M, Castano R. Occupational rhinitis. *Curr Opin Allergy Clin Immunol* 2006; 6:77–84.
 - 25 Groenewoud GC, de Groot H, van Wijk RG. Impact of occupational and inhalant allergy on rhinitis-specific quality of life in employees of bell pepper greenhouses in the Netherlands. *Ann Allergy Asthma Immunol* 2006; 96: 92–97.
- This is the first attempt at characterizing the impact of exposure to occupational allergens on quality of life in workers suffering from rhinitis.
- 26 Sussman GL, Mason J, Compton D, *et al.* The efficacy and safety of fexofenadine HCl and pseudoephedrine, alone and in combination, in seasonal allergic rhinitis. *J Allergy Clin Immunol* 1999; 104:100–106.
 - 27 Meltzer EO, Casale TB, Nathan RA, Thompson AK. Once-daily fexofenadine HCl improves quality of life and reduces work and activity impairment in patients with seasonal allergic rhinitis. *Ann Allergy Asthma Immunol* 1999; 83:311–317.
 - 28 Tanner A, Reilly M, Meltzer EO, *et al.* Effect of fexofenadine HCl on quality of life and work, classroom, and daily activity impairment in patients with seasonal allergic rhinitis. *Am J Manag Care* 1999; 5:S235–S246.
 - 29 Murray JJ, Nathan RA, Bronsky EA, *et al.* Comprehensive evaluation of cetirizine in the management of seasonal allergic rhinitis: impact on symptoms, quality of life, productivity, and activity impairment. *Allergy Asthma Proc* 2002; 23:391–398.
 - 30 Okubo K, Gotoh M, Shimada K, *et al.* Fexofenadine improves the quality of life and work productivity in Japanese patients with seasonal allergic rhinitis during the peak cedar pollinosis season. *Int Arch Allergy Immunol* 2005; 136:148–154.
 - 31 Bachert C, Bousquet J, Canonica GW, *et al.* Levocetirizine improves quality of life and reduces costs in long-term management of persistent allergic rhinitis. *J Allergy Clin Immunol* 2004; 114:838–844.