

Outcome of work-related asthma exacerbations in Quebec and Ontario

To the Editor:

There are differences in the management of workers with work-related asthma within Canadian provinces. In Quebec, the compensation of a case of occupational asthma is usually based on the positivity of a specific inhalation challenge, whereas in Ontario, the diagnosis is usually based on serial peak expiratory flow (PEF), provocative methacholine concentration causing a 20% decrease in forced expiratory volume in 1 s (PC₂₀) monitoring at and away from work, and specific skin-prick tests (that is, less often on specific inhalation challenges) [1]. We aimed: 1) to compare the delay between the onset of work-related asthma symptoms and the diagnosis of occupational asthma and work-exacerbated asthma between Quebec and Ontario; and 2) to assess and compare the healthcare utilisation in subjects with occupational asthma and work-exacerbated asthma between the provinces before and after the first assessment in two tertiary clinics in Quebec and Ontario that specialise in work-related asthma.

To identify eligible subjects, a retrospective chart abstraction study of the subjects investigated for work-related asthma between 2000 and 2007 was conducted at those clinics in Quebec and Ontario. Once the study population was identified, record linkage was conducted with provincial health administrative databases to assemble health service use outcomes 1 year prior to and 2 years after the initial assessment. This study was approved by research ethics boards at Hôpital du Sacré-Coeur de Montréal (Montreal, QC, Canada) and Toronto Western Hospital (Toronto, ON, Canada).

Frequency of acute health service use for asthma (emergency department visit or hospital admission) before (1 year prior) and after (1 and 2 years) the initial assessment at each of the provincial clinics was captured and compared.

Rate ratios (RRs) and 95% confidence intervals before and after the initial assessment within each province were calculated. Statistical difference of crude RRs between provinces was calculated using the Breslow–Day test of homogeneity of odds. Mean differences in number of outpatient claims for the groups within province, between time-points and between provinces, were calculated and the paired t-test (or Wilcoxon Signed Rank test) was used to measure statistical significance. Differences in proportions between time-points and within each province were compared using McNemar's test.

We conducted a Poisson regression with repeated measures using generalised estimating equations for assessing whether acute health service (emergency department visits and/or hospitalisations) use in the year before and the 2 years after the first assessment in patients with occupational asthma and work-exacerbated asthma differed between provinces. Regression models were adjusted for potential important factors (age, sex, smoking history, asthma medications, duration of exposure, duration of asthma, forced expiratory volume in 1 s, PC₂₀, type of agent (low (chemicals) *versus* high (proteins) molecular weight agents), referral doctors, performance of specific inhalation challenges and performance of specific skin-prick testing) and their interaction effects. Regression models were repeated for: occupational asthma alone; work-exacerbated asthma alone; and work-exacerbated asthma and occupational asthma combined.

The medical records of 434 workers referred for work-related asthma were identified in Quebec and 131 in Ontario. There was a greater proportion of subjects diagnosed with occupational asthma in Ontario (55.0%) than in Quebec (44.2%). The delay between onset of symptoms and diagnosis was similar in occupational asthma (mean±SD 4.3±4.7 years in Quebec *versus* 4.6±5.5 years in Ontario) and in work-exacerbated asthma (4.1±4.3 years in Quebec *versus* 3.6±4.5 years in Ontario).

There were mainly specialist referrals in Ontario whereas referrals were made primarily by general practitioners or the workers' compensation board in Quebec ($p < 0.001$). A greater percentage of patients were treated with combination therapy (inhaled corticosteroids and long-acting β_2 -agonists) in Ontario than Quebec. The type of investigation differed substantially by province. In Quebec, 97.9% of patients underwent specific inhalation challenges compared with <3% in Ontario ($p < 0.001$).

In both provinces, there was a reduction in acute health care utilisation for patients with occupational asthma and work-exacerbated asthma following the initial assessment at the specialist clinic visits compared with the previous year.

In Quebec, there was a significant overall decrease in acute health service utilisation (emergency visits or hospital admissions) for asthma from the year prior to the initial assessment to the 1 and 2 years after that assessment in occupational asthma patients. A slightly smaller, but statistically significant, decrease from 1 year prior to 2 years after the initial assessment was also observed in work-exacerbated asthma patients in Quebec (table 1). In Ontario, there was also a decrease in acute health service use in occupational asthma patients at 1 and 2 years after compared with the year preceding the first assessment. A significant decrease from 1 year prior to 1 and 2 years after the initial assessment was also observed in work-exacerbated asthma patients. Ontario showed a greater reduction in acute health services use for asthma at 1 year after compared with Quebec among work-exacerbated asthma patients.

After adjusting for relevant covariates, the decreased RRs from 1 year prior to 1 year after remained significantly different between the two provinces, with Quebec showing a 57% higher reduction than Ontario (RR 0.43, 95% CI 0.20–0.93) in patients with occupational asthma. Among patients with work-exacerbated asthma, there was a significant overall decrease in acute health service use for asthma from 1 year prior to 1 year after (unadjusted RR 0.64, 95% CI 0.46–0.88), but there was no significant difference between the provinces after adjusting for potential confounders.

Subjects were referred to the tertiary asthma clinics mostly by specialists in Ontario and mostly by primary care doctors or the workers' compensation board in Quebec. In addition, subjects from Ontario were treated with combination therapy more often than in Quebec, potentially reflecting the greater referral rate from specialists in Ontario. In Ontario, investigation consisted mainly of serial PEF and PC20 monitoring along with the performance of specific skin-prick testing when relevant, whereas specific inhalation challenges [2] were performed in the vast majority of workers in Quebec. Despite those differences, the duration of exposure to the agents as well as the delay in diagnosing occupational or work-exacerbated asthma were similar in both provinces.

There was a significant reduction in emergency visits for asthma in both provinces in the year following the diagnosis of occupational asthma, which confirmed previous findings [3–5]. There was a 1.58-fold greater reduction in the rate of acute health service use for asthma in Quebec compared with Ontario 1 year after the initial assessment to the clinics compared with the year preceding the assessment in occupational asthma cases, which was not observed in work-exacerbated asthma cases. We hypothesise that the difference in asthma-related health service utilisation between the two provinces may be explained by several factors. The more frequent management of cases of occupational asthma by specialists in Ontario than in Quebec may have led to the lower number of asthma exacerbations prior to the initial assessment in Ontario compared with Quebec. The removal from exposure may have been more effective in Quebec than in Ontario, when the causal agent was confirmed by the performance of specific inhalation challenges [6].

TABLE 1 Unadjusted relative risk of asthma emergency visits or hospitalisation in patients with occupational asthma and work-exacerbated asthma

	Ontario	Quebec	p-value [#]	Total
Occupational asthma				
1 year prior	24/72 (33.33)	75/192 (39.06)		99/264 (37.50)
1 year after	12/72 (16.67)	16/192 (8.33)		28/264 (10.61)
2 years after	<6/72	13/192 (6.77)		Not calculated [¶]
1 year after <i>versus</i> 1 year prior	0.50 [0.27–0.92]	0.21 [0.13–0.35]	0.0372	0.28 [0.19–0.41]
2 years after <i>versus</i> 1 year prior	0.13 [0.04–0.40]	0.17 [0.10–0.30]	0.7116	0.16 [0.10–0.27]
Work-exacerbated asthma				
1 year prior	23/59 (38.98)	54/242 (22.31)		77/301 (25.58)
1 year after	8/59 (13.56)	41/242 (16.94)		49/301 (16.8)
2 years after	<6/59	24/242 (9.92)		Not calculated [¶]
1 year after <i>versus</i> 1 year prior	0.35 [0.17–0.71]	0.76 [0.53–1.09]	0.0383	0.64 [0.46–0.88]
2 years after <i>versus</i> 1 year prior	0.17 [0.06–0.47]	0.44 [0.28–0.69]	0.0521	0.36 [0.24–0.54]

Data are presented as n/N (%) or relative risk (95% CI), unless otherwise stated. [#]: indicating statistical differences between Ontario and Quebec based on Breslow–Day test for homogeneity; [¶]: to safeguard data confidentiality due to small number in Ontario.

In conclusion, the diagnosis and management of workers with work-related asthma was associated with a significant subsequent decrease in the health service utilisation related to asthma independently of the investigations performed in Ontario and Quebec. Occupational asthma patients in Quebec showed better outcomes at 1 year post-diagnosis, while work-exacerbated asthma patients in Ontario fared better at 2 years post-diagnosis. Both provinces showed similar change in health services used at 2 years post-diagnosis in patients with occupational asthma patients and at 1 year post-diagnosis in work-exacerbated asthma patients. The pattern of change of acute health resource utilisation in subjects with occupational asthma was different in Quebec than in Ontario, with higher pre-diagnosis health resource utilisation and a greater fall in these post-diagnosis. This difference might relate to the type of investigation conducted for diagnosing occupational asthma or to other differences in the populations between these provinces that might not have been accounted for in the statistical model.



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Diagnosing work-related asthma decreased asthma-related healthcare utilisation in Quebec and Ontario <http://ow.ly/CFrPk>

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Received: April 10 2014 | Accepted after revision: Sept 29 2014 | First published online: Oct 30 2014

Support statement: This study was funded by AllerGen NCE as part of the “Work-related Asthma: Prevention and Early Detection Research Program” team grant.

Conflict of interest: Disclosures can be found alongside the online version of this article at erj.ersjournals.com

Acknowledgements: Provincial population-based administrative data were made available for record linkage of the study populations. In Ontario, record linkage was conducted by the Institute for Clinical Evaluative Sciences and in Quebec, the Régie de l'assurance maladie du Québec. The opinions, results, and conclusions reported in this paper are those of the authors and are independent of these agencies: The authors want to thank Suzanne Dostaler for her administrative support of the AllerGen NCE grant.

References

- 1 Tarlo S, Liss G, Corey P, *et al.* A workers' compensation claim population for occupational asthma. *Chest* 1995; 107: 634–641.
- 2 Vandenplas O, Suojalehto H, Aasen TB, *et al.* Specific inhalation challenge in the diagnosis of occupational asthma: consensus statement. *Eur Respir J* 2014; 43: 1573–1587.
- 3 Lemiere C. Occupational and work-exacerbated asthma: similarities and differences. *Expert Rev Respir Med* 2007; 1: 43–49.
- 4 Baur X, Aasen TB, Burge PS, *et al.* The management of work-related asthma guidelines: a broader perspective. *Eur Respir Rev* 2012; 21: 125–139.
- 5 Tarlo SM, Lemiere C. Occupational asthma. *N Engl J Med* 2014; 370: 640–649.
- 6 Vandenplas O, Dressel H, Wilken D, *et al.* Management of occupational asthma: cessation or reduction of exposure? A systematic review of available evidence. *Eur Respir J* 2011; 38: 804–811.

Eur Respir J 2015; 45: 266–268 | DOI: 10.1183/09031936.00096114 | Copyright ©ERS 2015