



ORIGINAL ARTICLE

Using health insurance administrative data to explore patch testing utilization in Ontario, Canada—An untapped resource

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Background: Patch testing is the key diagnostic test for diagnosing allergic contact dermatitis, but there is limited information on the use of patch testing at the population level.**Objectives:** To utilize Ontario Health Insurance Plan (OHIP) data to analyse trends in the rate of patch testing in Ontario.**Methods:** Patch testing billing data submitted to the OHIP between 1992 and 2014 were analysed. Two patch test billing codes were investigated: one for work-related testing (G198), and one for non-work-related testing (G206). Rates of patch testing overall were calculated, and trends over time were described.**Results:** There were 51 576 patch test billings: 48 416 non-work-related and 3160 work-related. The annual rate of non-work-related patch testing (G206) ranged from 11.9 per 100 000 people to 25.9 per 100 000 people, increasing over time. The rate of work-related patch testing (G198) ranged from 0.17 to 2.32 per 1 000 000 people, and was relatively stable. The overall distribution of billing by specialty was 70% dermatology, 19% other medical subspecialties, and 10% paediatrics and family medicine.**Conclusions:** Administrative health data can contribute to a more complete understanding of patch test utilization at the population level and, over time, can be used to track patch testing practices.**KEYWORDS**

allergic contact dermatitis, allergists, contact dermatitis, dermatologists, health administrative data, health services, patch testing, work-related contact dermatitis

1 | INTRODUCTION

Patch testing is the key diagnostic test for determining a diagnosis of allergic contact dermatitis.^{1,2} There is limited information on the utilization of patch testing in general, and most of the information comes from surveys of physicians regarding their practice. Such surveys have been conducted in several jurisdictions, including the United States,^{3–8} Scotland,⁹ and China,¹⁰ but there has been no examination of administrative health data as they relate to patch testing.

Patch testing is conducted primarily by dermatologists, but an increasing number of allergists are undertaking patch testing in their clinics. Studies of patch test practices have surveyed both dermatology and allergy associations.^{3–8} These studies are limited, as they include only those who respond to the surveys, and thus represent only a proportion of physicians who perform patch testing, and also

do not allow direct comparisons between different specialties, geographical regions, or work-related and non-work-related patch testing.

An alternative source of information is provided by health insurance data, particularly in jurisdictions with a government-funded health system (single payer). There is one study of United States Medicare recipients reporting substantial utilization and geographical variation in patch testing.¹¹ As there are other public and private health insurance programmes in the United States, the authors note that further research is needed “across broader patient populations of varying sociodemographic characteristics”.¹¹

The province of Ontario, Canada has a publically funded health-care system with billings submitted to the Ontario Health Insurance Plan (OHIP). Within the OHIP billing system, there are two codes for patch test billing, one for work-related and one for non-work-related patch tests, providing an opportunity to investigate work-related

occurrences of patch testing specifically. The objective of this study was to describe the occurrence of patch testing across Ontario over time by patient age, patient sex, specialty of the physician performing patch testing, and the geographical region where patch testing was performed, by utilizing the OHIP billing data.

2 | METHODS

The study was approved by the Research Ethics Board of St Michael's Hospital, and was reviewed and approved by the Institute for Clinical and Evaluative Sciences (ICES). The study involved the use of billing data from the OHIP, provided by the ICES, an Ontario research institute that holds a number of healthcare administrative databases (www.ices.on.ca). All billing records with a fee code of either work-related patch testing (G198) or non-work-related (G206) patch testing from 1992 to 2014 were extracted from the OHIP billing database and de-identified by ICES staff.¹² Population size data were also provided by the ICES, stratified by age, sex, and local health integration network (LHIN), to identify the region of the province in which the patch testing was provided. Researchers accessed the data through a secure online virtual environment.

The extracted OHIP billing data included the following information of interest: fee code (either G198 or G206), year in which the service was provided, patient age (2-year age categories), patient sex, patient LHIN (the province is divided into 13 LHINs by geography), and provider specialty. Additional provider information (eg, age, sex, and LHIN) was available but was largely incomplete, and thus was not investigated further.

To facilitate reporting and avoid suppression (owing to small cell sizes) where possible, variables of interest were grouped. Specifically, for provider specialty, three groups were created: (a) dermatology, (b) family medicine and paediatrics, and (c) other medical subspecialties, including all of general internal medicine, occupational medicine, clinical immunology, and rheumatology (these groups all use the same OHIP provider discipline billing code). By use of the LHIN information, five geographical areas were created to approximate the regions of the province: (a) Southwest—Erie St Clair and South West LHINs; (b) Central—Waterloo Wellington, Hamilton Niagara Haldimand Brant, Central West and Mississauga Halton LHINs; (c) Central East—Toronto Central, Central, Central East and North Simcoe Muskoka LHINs; (d) East—South East and Champlain LHINs; and (e) North—North East and North West LHINs.¹³

The number of patch tests completed and rate of patch testing per 100 000 people were calculated for each fee code in the province of Ontario by calendar year to describe trends over time. Annual rates stratified by patient age and sex were also calculated. Analyses of geographical areas and provider specialty was limited to adults aged 19 to 64 years. Rates of patch testing were calculated for each fee code annually by geographical area. The percentage of patch test fee codes reported by provider specialty was calculated for 4-year calendar periods across the provider groups. All analyses were performed in SAS v9.2 (SAS Institute, Cary, North Carolina) through the secure ICES Data & Analytic Virtual Environment (iDAVE). Analyses were descriptive in nature; no statistical testing was conducted.

3 | RESULTS

3.1 | Description of patch test billing data 1992 to 2014

Table 1 shows the overall results. There were 51 576 patch test billing records: 48 416 non-work-related (G206) and 3160 work-related (G198). The majority of patients represented in the data had only one billing record for each fee code: 93% for non-work-related G206 and 96% for work-related G198. The maximum number of billing records that any individual patient had for G206 was seven; the maximum number of billing records for G198 was five. Subsequent analyses were limited to each patient's first occurrence of fee codes G206 and G198.

The majority (74%) of non-work-related patch tests (G206) were billed for women. This sex difference was less obvious for work-related patch tests (G198), 53% of which were billed for women. Work-related patch tests were most common (95%) among those of working age (19–64 years); 79% of non-work-related patch tests were performed among those of working age. For non-work-related patch testing (G206), billing by specialty was 72% dermatology, 17% other medical subspecialties, and 11% paediatrics and family medicine (Table 1). This provider distribution was markedly different for work-related patch tests: 46% dermatology, 46% other medical subspecialties, and 11% paediatrics and family medicine (Table 1). The majority of patch testing was completed in the Central West and Central East regions, which are the most populous areas of the province (Table 1).

3.2 | Trends over time in patch test billing data 1992 to 2014

The rate of non-work-related patch testing (G206) ranged from 11.9 per 100 000 people to 25.9 per 100 000 people, with an increasing trend over time from 1992 to 2014 (Supporting Information Figure S1). For work-related patch testing (G198), the rate was lower and relatively stable over time, ranging from 0.17 to 2.32 per 1 000 000 people. Similar trends were seen when patch tests were limited to those of working age (Figure 1).

For work-related patch testing (G198), the rates for men and women were remarkably similar over time (Figure 2). The rates were lowest between 1996 and 2004: <1 per 100 000. For non-work-related patch testing (G206), women had consistently higher rates, with a sharper increase being observed from 2008 onwards than for men (Figure 3). The rate of patch testing by geographical location varied by year and whether the patch testing was work-related or non-work-related. There was no consistent pattern in the rates over time (Supporting Information Figure S2). Across all years, the average rate of patch testing was lowest in the Eastern region for both work-related and non-work-related patch testing.

3.3 | Physician specialty

Overall, the majority (72.0%) of non-work-related patch tests were performed by dermatologists, with 17.5% being performed by other

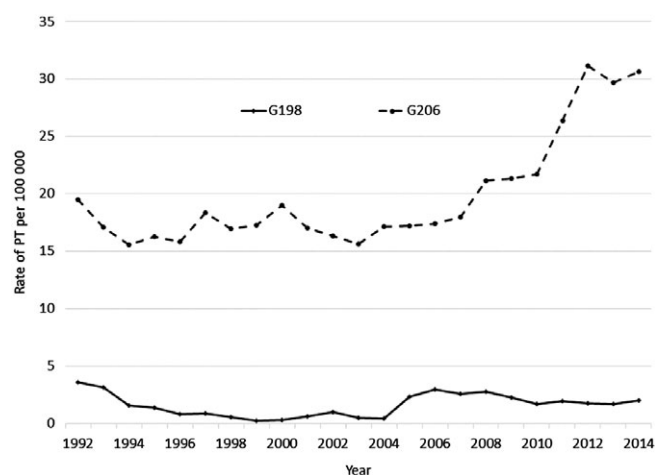
TABLE 1 Description of patch test billing data for non-work-related (G206) and work-related (G198) patch testing (PT)

	Either code, n (%)	Non-work-related PT (G206), n (%)	Work-related PT (G198), n (%)
Overall			
All records	51 576 (100)	48 416 (100)	3160 (100)
First record only	48 157 (100)	45 143 (100)	3014 (100)
Sex			
Female	35 026 (73)	33 430 (74)	1596 (53)
Male	13 131 (27)	11 713 (26)	1418 (47)
Age (y)			
<19	3463 (7)	3409 (8)	54 (2)
19–64	38 386 (80)	35 525 (79)	2861 (95)
>64	6308 (13)	6209 (14)	99 (3)
LHIN groups			
South West	4080 (8)	3610 (8)	470 (16)
Central West	18 628 (39)	17 602 (39)	1026 (34)
Central East	20 823 (43)	19 604 (43)	1219 (40)
East	2873 (6)	2727 (6)	146 (5)
North	1753 (4)	1600 (4)	153 (5)
Medical specialty			
Dermatology	33 872 (70)	32 494 (72)	1378 (46)
Family medicine and paediatrics	5005 (10)	4761 (11)	244 (8)
Other specialties	9280 (19)	7888 (17)	1392 (46)

Abbreviation: LHIN, local health integration network.

medical subspecialties and 12.3% by family medicine and paediatrics (Table 1). For work-related patch testing, the split was more equal, with 45.7% being performed by dermatologists, 46.2% by other medical subspecialties, and 13.7% by family medicine and paediatrics.

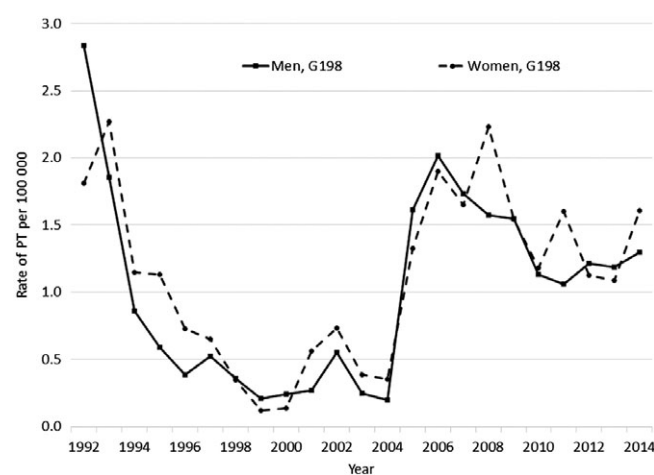
Over time, there was an increase in the proportion of work-related and non-work-related patch tests performed by other medical subspecialties (Table 2). For non-work-related patch testing, dermatologists performed the majority of patch tests across all years. For work-related patch testing, dermatologists completed the largest proportion in the earlier years (1992–2003), but this was not the case in the later years, when other medical subspecialties performed the majority of work-related patch tests.

**FIGURE 1** Rates of non-work-related (G206) and work-related (G198) patch testing (PT) per 100 000 people from 1992 to 2014, limited to adults aged 19 to 64 years in the province of Ontario

4 | DISCUSSION

Over time, there appears to have been an increase in the rate of non-work-related patch testing in the province of Ontario, particularly among women. For work-related patch testing, the rates for men and women were very similar, and there was no apparent increasing or decreasing trend. These results show the value of administrative health data for monitoring the utilization of patch testing at the population level.

The majority of non-work-related (G206) patch testing billed was for female patients, and the rate of non-work-related patch testing increased more rapidly over time among women. This may be

**FIGURE 2** Rate of work-related (G198) patch testing (PT) per 100 000 people from 1992 to 2014 shown for men and women, limited to adults aged 19 to 64 years in the province of Ontario

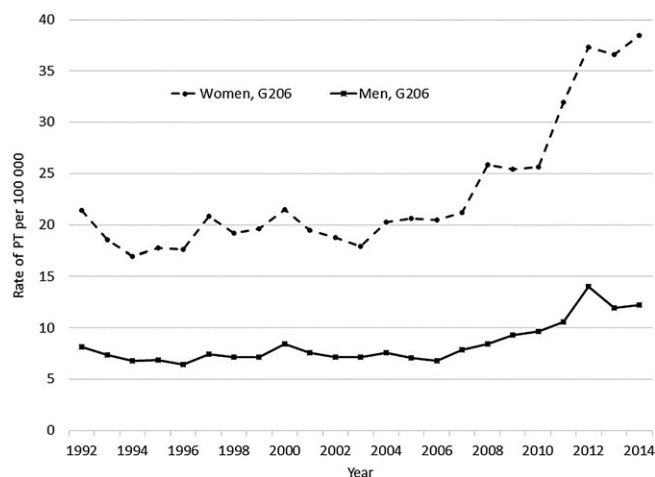


FIGURE 3 Rate of non-work-related (G206) patch testing (PT) per 100 000 people from 1992 to 2014 shown for men and women, limited to adults aged 19 to 64 years in the province of Ontario

explained by the fact that cosmetics and skin care products are the most common sources of positive patch test results according to recent results from the North American Contact Dermatitis Group (NACDG).¹⁴ Specifically, preservatives, including methylisothiazolinone and methylchloroisothiazolinone, which are commonly present in personal care products and cosmetics, show an increasing prevalence of positive patch test reactions over time in the NACDG data.¹⁴

With the increasing number of publications on contact dermatitis, dermatologists and allergists may be more aware of the possibility of allergic contact dermatitis and perform more patch testing, leading to the increasing trend over time in non-work-related patch testing. There also may be an increase in the number of allergists performing patch testing.¹⁵

Most patch testing is performed by dermatologists. However, 10% of patch tests are performed by family physicians and paediatricians, and 19% by other specialties. Allergists and occupational medicine specialists are included in the "other specialty" group. It has been suggested that, over time, allergists may be performing more patch testing, but we were unable to look at this group individually, owing to small cell sizes.¹⁵ Comparison of work-related with non-work-related patch testing shows that there is a substantial difference in the specialty involved. This may be related in part to the inclusion of occupational medicine specialists in the group of other specialties.

One of the authors (D.L.H.) is an occupational medicine specialist who performed patch testing; a substantial number of the reported cases would have come from her clinical practice.

The trend over time is more challenging to interpret for work-related patch testing, as there are relatively small numbers annually (~140 per year across the province). With such a small number of billings each year, individual providers could impact on rates (ie, new graduate, retirements, clinic changes, etc.), but there is no overall marked trend upwards or downwards over time.

An additional consideration when reviewing these results is whether or not patients have equal access to patch testing across the province. The fact that rates of patch testing (either work-related or non-work-related) do not differ substantially by geographical region suggests that access to patch testing does not differ geographically.

There are many limitations of this descriptive study. Although the OHIP data cover the vast majority of the population, some (but not all) individuals patch tested as part of the process of worker compensation claim assessment will not be represented in the OHIP data. The number of patch tests that are suspected to fall into this category is probably small, but cannot be quantified. It is also possible that some patch testing is completed in Ontario but not billed to the OHIP; patch testing that is not medically necessary would fall into this category. Because of the high costs of performing patch testing in the clinic (both staff time and supplies), it is unlikely that medically necessary patch testing is performed but not reported in the billing data.

A further limitation is the use of physician billing data, particularly the billing code assigned to a service. It is not likely that patch testing is being performed but not billed, but it is possible that patch testing performed to investigate a possible work-related problem is coded as general, non-work-related patch testing (G206) rather than work-related patch testing (G198). The accuracy of the use of billing codes for work-related patch testing (G198) and non-work-related patch testing (G206) is difficult to evaluate. In theory, the presence of an occupational billing code specific to patch testing in Ontario offers an opportunity to track or identify occupational cases in the administrative health data. Misclassification may occur because the physician is not aware of a separate code, the physician may not initially suspect a workplace aetiology, or the physician may simply just use G206 to code for all patch testing. There is no way within this study to assess the magnitude of this misclassification. However, the current study suggests that there were ~140 work-related patch tests completed

TABLE 2 Proportion of patch testing (PT) billed by physician specialty shown overall and by 4-year time periods

	Non-work-related PT (G206)			Work-related PT (G198)		
	Other specialties (%)	Dermatology (%)	F&P (%)	Other specialties (%)	Dermatology (%)	F&P (%)
1992-1995	8.5	80.4	11.1	37.0	48.1	14.9
1996-1999	9.2	85.0	5.7	2.8	65.9	31.3
2000-2003	10.0	82.2	7.9	3.2	73.1	23.7
2004-2007	24.2	68.8	7.0	57.9	40.5	1.7
2008-2011	24.9	65.7	9.4	50.1	47.1	2.8
2012-2014	24.4	59.6	16.1	67.3	30.6	2.1
Overall	17.5	72.0	12.3	46.2	45.7	13.7

Abbreviation: F&P, family medicine and paediatrics.

Other specialties: internal medicine, clinical immunology, and rheumatology.

annually in the province of Ontario between 1992 and 2014, but this does not mirror experience with work-related contact dermatitis in the province. From 1997 to 2014, the annual number of accepted lost time workers' compensation claims for skin disorders including dermatitis ranged from 188 to 399 annually.^{16–18} We also know from Ontario experience that many workers do not submit claims. Of workers seen in the 1980s who had a clinical diagnosis of work-related contact dermatitis, only 43% applied for workers' compensation.¹⁹

Apart from the use of billing data, another way to estimate the rate of patch testing is through the use of drug utilization methodology. This has been used in Germany and Denmark to estimate the prevalence of contact allergy, but also provides an estimate of the number of patients who have been patch tested.^{20,21} As utilized to date, it has not explored factors such as patient demographic or geographical features.

5 | CONCLUSIONS

To the best of our knowledge, this is the first study that has used administrative health data to monitor trends in patch testing at the population level. The use of administrative health data provides a more complete understanding of patch test utilization over time, and can enable patch testing practices to be tracked over time. Jurisdictions with universal (or similar) healthcare systems should be encouraged to investigate the data available, in order to undertake comparative analyses.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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