Disease Surveillance Systems
CREOD Research Summary
MARCH 2023

BACKGROUND

What is health surveillance?

Health surveillance includes the ongoing, systematic collection, analysis and interpretation of data to track disease or exposure over time.[1] This includes being able to detect, measure, and characterize disease or exposure to various infectious, occupational and/or environmental agents. Surveillance allows for assessment of the magnitude of the disease/exposure, identification of high-risk groups and targeting prevention efforts. The ongoing collection of data also allows for the detection of trends over time. Information gathered during surveillance can be used to inform the design and implementation of preventions strategies including for various worker-groups and contexts.

Surveillance in and of itself does not prove causation. Instead, surveillance may be able to identify associations between different exposures and outcomes. Data from other study types (randomized controlled trials) are necessary to prove causation.

Disease surveillance

Disease surveillance has been defined by the World Health Organization (WHO) as "the continuous, systematic collection, analysis and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice."[2]

Occupational disease surveillance can inform early identification and prevention efforts. Several types of data/evidence can be used for surveillance including:

a) Population-based administrative and/or exposure databases
b) Reporting systems and/or registries (laboratory-based, physician based)
c) Clinical databases and case reports

a) Population-based administrative and/or exposure databases

Using population-based administrative and/or exposure databases offers multiple advantages. First, administrative data are often routinely collected and updated and thus are readily available/accessible. Given the nature of the publicly funded health care system in Canada, these data often tend to be comprehensive and can easily be linked. Administrative data can be prone to coding errors, though this may not materially skew results if sample size is large. Another limitation of using population-based administrative data includes the fact that these data are collected for other reasons and specific information/data needed for occupational disease and exposure surveillance may not be captured. One example of this approach is the Occupational Disease Surveillance System (ODSS) in Ontario. ODSS links data from workers' compensation claims (WSIB) to tumour registry and other health administrative data (hospital, ambulatory care, physician billing).[3,4]

b) Reporting systems and/or registries

Reporting systems and/or exposed worker registries for hazardous or emerging exposures could also be used for occupational disease and exposure surveillance. One disadvantage of using reporting systems and/or registries is the incompleteness of the data, especially if reporting is not mandated. This type of

passive surveillance may therefore be prone to under-reporting though it may be less time-consuming. However, if mandated, this type of data can be very powerful. For example, in the UK, employers are required to report cases of certain diagnosed reportable diseases which have been linked with occupational exposure to specific hazards.[5] These include carpal tunnel syndrome, occupational dermatitis, hand-arm vibration syndrome, occupational asthma, and tendonitis/tenosynovitis. In the UK there are also physician reporting systems for several occupational diseases. These include The Health and Occupation Research (THOR) Network and SWORD (chest physicians) EPIDERM (dermatologists) and OPRA (occupational physicians).[5,6]

c) Clinical databases and case reports

Clinical records can also be utilized for occupational disease and exposure surveillance. For example, death certificates, patient registries and physician clinical records and/or case reports may provide information on who is diagnosed with occupational disease or who may be exposed to various hazards. One example includes patch test databases that contain information about agents causing allergic contact dermatitis. In many instances individual clinic databases are merged into national or international databases. Examples include the European Surveillance System for Contact Allergy (ESSCA) and the North American Contact Dermatitis Group (NACDG).[6]

CREOD RESEARCH

CREOD researchers have been involved in a number of aspects of disease surveillance. Some of this research is CREOD-led and some is through collaborative working groups with other researchers in Ontario. These include an attempt to create an Ontario reporting system for occupational asthma, patch test databases and case reports. Topics summarized include –

1. Voluntary Ontario reporting system for work-related asthma
2. Comparing WSIB claims diagnosis with provincial administrative data
3. Patch test databases

EXECUTIVE SUMMARY

- A reporting system for occupational asthma was established but did not receive ongoing support.
- Not all individuals with work-related asthma may have an asthma diagnosis in provincial administrative databases.
- Occupational asthma is under-reported to the WSIB.
- Patch test databases provide current information on exposures in the workplace causing allergic contact dermatitis.
- The results can be used in a surveillance system to track trends in disease and causative exposures over time.

VOLUNTARY ONTARIO REPORTING SYSTEM FOR WORK-RELATED ASTHMA

TAKE AWAYS

- **While it was possible to set up a voluntary reporting system for work-related asthma, participation was low.**
- **Sustainability in the long term is unknown.**

Is it feasible to implement a reporting system for occupational asthma in Ontario?

Led by Dr T To, a group of researchers developed and implemented a voluntary reporting system for work-related asthma in Ontario.[7] The Ontario Work-Related Asthma Surveillance System: Physician Reporting Network (OWRAS) was established in 2007. Invitations to participate were sent to 205 respirologists, 36 allergists, 45 occupational medicine physicians and a further 45 physicians with an interest in occupational disease. Standardized information was collected. In total, forty nine of the 331 registered with the Network. Between January 2007 and March 2010 34 cases of occupational asthma, 49 cases of work exacerbated asthma, 3 cases of work-related bronchitis, 4 cases of work-related skin changes and 18 cases of work-related rhinitis were reported (total 108). Of the 83 cases of work-related asthma, 8 had claims submitted to the WSIB. Issues identified by others as challenges include lack of uniform definitions, incomplete case ascertainment and low participation rates. It was noted that two similar efforts in Canada (British Columbia and Quebec) did not progress past the pilot as in this case.

COMPARING WSIB CLAIMS DIAGNOSIS WITH PROVINCIAL ADMINISTRATIVE DATA

TAKE AWAYS

- **Workers with WSIB claims may not be identified when using provincial administrative data for asthma.**
- **Occupational asthma is under-reported to the WSIB.**

How do results from WSIB claims and provincial administrative databases compare?

Led by Dr D Lougheed, a group of researchers utilized data abstraction done for studies of occupational asthma using WSIB claims data.[8] These studies had both WSIB diagnosis and also expert diagnosis by the research team led by Dr Tarlo following detailed review of the claims files from 1998-2002. This work has been described in the CREOD Research Summary related to medical screening. This information was compared to provincial administrative data. Researchers have developed a definition for asthma that is used to identify asthma cases in the Institute of Clinical Evaluative Sciences (ICES). These were compared with the records in the WSIB claim files and the researcher expert diagnosis files. The estimate of prevalence of work-related asthma was less than 1% (expected prevalence 15%-20%). Approximately 11% to 15% of the compensated claims were not captured in the ICES asthma database.

PATCH TEST DATABASES

TAKE AWAYS

- **The St Michael's Hospital Patch Test Database provides ongoing information about work-related allergens in Ontario**
- **The St Michael's Hospital Patch Test Database also provides ongoing information about workplace prevention activities, work status and claim submission**
- **The NADCG database provides ongoing information about work-related allergens in North America and because of its larger size, may identify trends faster**
- **These databases provide current information on exposures in workplaces that cause allergic contact dermatitis that can be used in surveillance systems.**

How can clinical data be collected and analysed to inform surveillance systems?

a) St Michael's Hospital Patch Test Database

CREOD researchers have maintained a database patch test results over many years. An initial database was used for a variety of analyses in the 1980's and 1990's.
The current database was started in 2012 and continues to add patch test results for patients assessed in the Occupational Medicine clinic at St Michael's Hospital in Toronto. Not only are demographic, clinical and patch test information collected, but information about the workplace and prevention activities and some key exposures is also included. This database has been used to examine trends in patch test results including allergens causing occupational allergic contact dermatitis and has also been used to track information about the workplace.
The most recent publication presented this workplace information by industry sector.[9] The results relate to 853 workers with work-related contact dermatitis. From a diagnostic perspective, overall 50% had a diagnosis of allergic contact dermatitis and 76% had a diagnosis of irritant contact dermatitis. Forty six percent reported lost time from work with an average of 52 days and 52% reported filing a worker's compensation claim. Overall, 78% reported both general occupational health and safety and WHMIS. Workers in the automotive, health care and manufacturing sectors were most likely to report this training. Skin specific training was reported less frequently with an overall rate of 53%. The results in 308 health care workers were examined.[10] Overall, 90% had a diagnosis of irritant contact dermatitis and 34% had allergic contact dermatitis. Dental workers had very different results than those in other healthcare occupations (nurses, PSWs, cleaners). The dental workers had the highest rate of allergic contact dermatitis and higher percentages of occupationally relevant rubber and acrylate allergies. They also worked in smaller, non-unionized workplace and were less likely to report workplace training, taking time off work for their dermatitis or filing a worker's compensation claim.

b) NACDG database

In addition, CREOD researchers have examined the NACDG database related to occupational exposures.[11] Analysis of data from 2001 to 2016 identified 4,471 workers with occupationally related skin disease. Allergic contact dermatitis was diagnosed in 70.5%. The most common occupational allergens included rubber accelerators, preservatives and bisphenol A epoxy resin. The most common occupations affected were service workers and machine operators. The most common locations for an occupationally related dermatitis were the hands (76%) arms (30%) and face (16%). Trends over time

were also examined. The percentage of occupationally relevant positives for carba mix (rubber accelerator) and methylchloroisothiazolinone/ methylisothiazolinone (preservative) increased over the time period from 2001 to 2016 while that for 2-mercaptobenzothiazole decreased. In addition, the common sources of exposure to the identified allergens were reported.[12] The most common sources of exposure for NACDG screening allergens were gloves, then hair dyes, cement/concrete/mortar, adhesives/glues/bonding agents and coatings. For non-NACDG screening allergens were adhesives/glues/bonding agents, hair dyes, gloves, coatings, moisturizers/lotions/creams and metalworking fluids/cutting oils.

c) Case reports

Case reports are often the first description of an association between a particular exposure and disease. CREOD researchers have reported a number of cases of occupational asthma and contact dermatitis. In addition, the occurrence of vibration related problems in the feet were described.

Examples of occupational lung disease

- Turcotte SE, Chee A, Walsh R, Grant FC, Liss GM, Boag A, Forkert L, Munt PW, Lougheed MD. Flock worker's lung disease: natural history of cases and exposed workers in Kingston, Ontario. Chest 2013;143:1642-1648.
- House R, Rajaram N, Tarlo SM. Case report of asthma associated with 3D printing. Occup Med 2017;67:652-654.
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Examples of occupational dermatitis

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Example of HAVS in the feet

- Thompson A, Eger T, Krajnak K, House R. Vibration white foot in a worker with direct vibration exposure to the feet. Canadian Acoustics 2011;39(2):28-29.

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