

# 6 Year Trends in Healthcare Personnel Exposures to Respiratory Infectious Hazards

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## Abstract

**Objective:** In order to evaluate the efficacy of respiratory protective interventions for healthcare personnel (HCP), it is necessary to understand the types of hazards endemic to the medical work environment, and the disease outcomes related to those hazards. In this paper, we assess the frequency and outcomes of occupational exposures to respiratory infectious illnesses in a large academic medical center. **Methods:** Vanderbilt University Medical Center HCP Exposure Events to respiratory infectious hazards were analyzed over a six year period for frequency and disease outcomes. **Results:** There were 1844 HCP exposed to tuberculosis, with 9 tuberculosis outcomes; 17 HCP exposed to measles, with 0 disease outcomes; 1434 HCP exposed to varicella, with 0 disease outcomes; and 818 exposed to pertussis, with 2 disease outcomes. **Conclusion:** Tuberculosis remains the most common respiratory infectious hazard for healthcare personnel, and the only hazard with significant risk of disease development secondary to a known patient exposure. The next most common unprotected exposures are to varicella, pertussis, and measles, but the risk of secondary disease development is low.

## Background

Occupational health and safety programs in hospitals must gather knowledge regarding the types of biological hazards present in the workplace, and the modes of transmission for those hazards. This knowledge guides the choice of preventive services offered and the type and frequency of medical surveillance. This study explores how data on exposures, services, and outcomes can be managed using an electronic occupational information system, and, provides the results of 6 years worth of data from the Vanderbilt Occupational Health Clinic (VOHC) regarding respiratory infectious hazards found in the medical work setting. The goals are to describe the value of an integrated, electronic occupational surveillance system to exposure investigation and management, to identify the respiratory infectious diseases to which HCP are exposed in the medical setting, and to quantify the risk of secondary infection.

## Methods

### The Vanderbilt Setting

Vanderbilt University is an internationally recognized institution of higher education with an academic medical center located in Nashville, Tennessee. The campus and medical center combined employ over 3,000 full-time, part-time and clinical faculty and a staff of almost 17,600. It is the largest private employer in Middle Tennessee.

### The VOHIS

The Vanderbilt Occupational Health Information System (VOHIS) was established at Vanderbilt University by occupational health providers for the tracking of information related to health and safety programs. The goals of the VOHIS are to track program compliance, facilitate inter-departmental communications, ease follow-up or process activities, make program information easily available to stakeholders, protect confidentiality of information, minimize the use and routing of paper forms, effectively use technology, and integrate with other Vanderbilt applications.

### Building Exposure Reports

The VOHIS uses Business Objects and its related universe to allow flexibility in reporting not only for compliance but for operational efficiency of the clinic. The query and analysis tools allow end users to interact with the VOHIS information and answer ad hoc questions themselves, without advanced knowledge of the underlying data sources and structures. Reporting allows the user to access, format, and deliver data as meaningful information to business partners both inside and outside the organization.

The respiratory infectious exposure event and outcome data was constructed in Business Objects with the following fields:

- Infectious agent
- Exposure Event date
- Healthcare personnel identifier
- Services (e.g. postexposure prophylaxis, immunization, labs)
- Infectious exposure disease outcome

## Results

1844 HCP were exposed to tuberculosis, with 9 tuberculosis infections; 17 HCP were exposed to measles, with 0 secondary infections; 1434 HCP were exposed to varicella, with 0 secondary infections; and 818 were exposed to pertussis, with 2 secondary infections.



The percent of exposed people with evidence or vaccination was 100% of those exposed to varicella, either by childhood vaccination or lab confirmed immunity. 100% of those exposed to measles were vaccinated, and 34.5% of those exposed to pertussis. For the two secondary pertussis infections, neither had been previously vaccinated.

## Discussion

Tuberculosis remains the most common respiratory infectious hazard for healthcare personnel, and the only hazard with significant risk of disease development secondary to a known patient exposure. HCP with unprotected exposures to varicella, pertussis and measles are the next most common, but the risk of secondary disease development is low. This is likely due to the airborne nature of TB transmission coupled with the lack of a protective vaccine.

Given the numerous hazards and the multiple layers of programming, technology is necessary to facilitate program integration into work practices and provide ongoing monitoring. Electronic systems facilitate management through assignment of program activities, notification and documentation of results, and evaluation of effectiveness. With analytical support stakeholders can make timely changes informed by real time data.

Respiratory Infectious Exposure Events and Outcomes FY 2006 to FY 2011				
Infectious Hazard	Transmission Route	# of Exposure Events	# HCPs in Program Group w/ Unprotected Exposures	HCP Outcomes
Measles	Airborne	2 events	17 employees exposed	No secondary cases
Pertussis	Droplet	89 events	818 employees exposed	2 secondary cases
Tuberculosis	Airborne	62 events	1844 employees exposed	9 employees with TB infection related to TB exposure event
Varicella	Airborne	45 events	1434 employees exposed	No secondary cases

## Conclusion

Electronic surveillance systems can be used to gather data on respiratory infectious disease outcomes in healthcare personnel.

## References

1. Hood, J. and M. Larranaga, *Employee health surveillance in the health care industry*. AAOHN J. 2007. 55(10): p. 423-31.