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ABSTRACT

Population-based, pathogen-specific surveillance in Utah

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Objective

The objective of this study is to describe a system—Germ Watch—that provides information about the regional activity of common communicable infectious diseases.

Introduction

Epidemiological information realized by modern disease-surveillance systems offers great potential for supporting clinical decision-making. Providing health practitioners with population-based, pathogen-specific information about regional communicable infectious disease epidemiology can engender enhanced knowledge about specific pathogens, which may, in turn, lead to improved clinical performance. To enhance the pathogen-specificity of Utah's surveillance system, which includes tracking syndromes[1] and notifiable diseases, we developed a system that tracks microbiologic testing in Utah's largest health care delivery system.

Methods

Setting

Intermountain Healthcare operates 21 hospitals and >100 outpatient clinics. The Intermountain Healthcare Data Warehouse is a seven terabyte (TB) database containing clinical (lab, radiology, meds, vitals) and administrative data from inpatient and outpatient settings.

Data source

Microbiological testing, including molecular diagnostic testing (DFA, PCR, EIA), and cultures ordered during routine clinical care and performed in one of Intermountain Healthcare's microbiology laboratories.

Pathogens currently tracked

Nine respiratory pathogens and seven enteric pathogens for which testing is available and routinely performed (Table 1).

Data warehousing

Lab results are uploaded daily into a dimensional (star) schema in the Intermountain Healthcare Data Warehouse to support *ad-hoc* multidimensional online analytical processing analysis of daily surveillance data. Additional normalized tables are utilized to enable fast web-query performance of the web applications. Data is available at patient, region and organism granularity.

Table 1 Pathogens tracked by Germ Watch and current count of encounters in the database (2002 through Sept. 2010)

Pathogen	*Encounters*
Respiratory	
Influenza A[a]	13,958
Influenza B[a]	2108
Respiratory Syncytial Virus (RSV)	16,072
Human Metapneumovirus (hMPV)	3025
Adenovirus	2517
Parainfluenza (types 1, 2 and 3)	4130
Rhinovirus	7031
Enterovirus	914
Bordetella pertussis[a]	712
Enteric	
Rotavirus	2898
E. Coli 0157H7[a]	973
Giardia lamblia[a]	1503
Cryptosporidium[a]	1286
Salmonella[a]	1160
Shigella[a]	210
Campylobacter[a]	1563

[a]Reportable disease in Utah.

Reporting

We use the IBM COGNOS (International Business Machines Corp. Armonk, New York, USA; http://www-01.ibm.com/software/data/cognos/) platform to automatically generate and disseminate dashboard-style summary reports, and NetCharts (Visual Mining, Inc., Rockville, MD, USA; http://www.visualmining.com/) to provide interactive, web-based graphing. GIS visualizations are made available using Google Maps (Google Inc. 2011. Map data—Europa Technologies, INEGI).

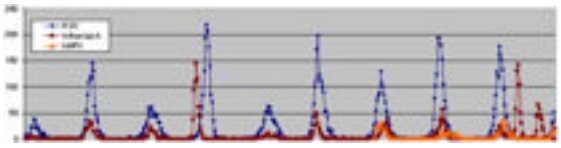

Figure 1 Time-series graph of Germ-Watch data showing yearly epidemics of RSV (blue), Influenza (dark red) and hMPV (orange).

Results

Presently, the Germ-Watch schema contains over 60,000 encounters associated with a lab-detected infection (Table 1). Time-series graphs of these data provide meaningful information about epidemic and endemic activity of various pathogens (Figure 1).[2] Summary reports, along with a bulleted text summary of the week's activity, are e-mailed weekly to >300 physicians and made available on the web. The system has proven sustainable and has been well-received by Utah providers who believe that it helps their clinical performance.[3]

Conclusions

Pathogen-specific information derived from routine diagnostic testing can provide an important signal to population health, when data are available at a population level. Systems that generate and disseminate this information to health practitioners can, and will have an important role in supporting public health practice and clinical decision-making.

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