

Electronic medical record Support for Public Health (ESP)

Automated detection and reporting of acute hepatitis C, syphilis, and other notifiable diseases from electronic medical records

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Introduction

- Notifiable disease surveillance is a cornerstone of public health but is typically incomplete, delayed, and sparse in detail
- Electronic laboratory reporting increases number and timeliness of reports but does not distinguish between acute and chronic disease (e.g. hepatitis C) nor report purely clinical diagnoses (e.g. primary syphilis with absent or negative lab results)
- Manual and electronic lab reports often have incomplete data on patient demographics, clinician contact numbers, patient symptoms, pregnancy status, and treatment.
- Electronic medical record (EMR) systems are a promising means to improve reporting by combining the timeliness and efficiency of electronic reporting with the clinical detail available in EMR systems.
- Novel algorithms are needed to accurately detect notifiable diseases from EMR data.
- We report on development and performance of algorithms for acute hepatitis C and syphilis.

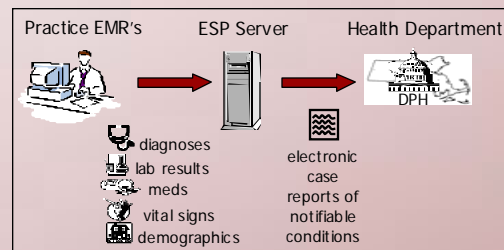


Figure 1 – The Electronic medical record Support for Public Health System (ESP). EMR encounter data is extracted daily and analyzed for notifiable conditions on an ESP server. Cases are electronically transmitted to the state health department.

Methods

- Algorithms were developed and tested within the Electronic medical record Support for Public Health (ESP) system.
- ESP is model architecture and software that scans structured EMR data to detect notifiable diseases and automatically send an electronic case report to the health department (Figure 1 and MMWR 2008;57:353). ESP currently reports tuberculosis, chlamydia, gonorrhea, pelvic inflammatory disease, acute hepatitis A, and acute hepatitis B cases.
- Patient population: 600,000 Atrius Health ambulatory patients, June 2006-May 2008.
- Available data elements: ICD9-CM diagnosis codes, laboratory orders, laboratory results, medication prescriptions, vital signs
- Candidate algorithms were developed using combinations of the above data elements.
- Positive predictive value of each candidate algorithm was determined by chart review using CDC case definitions as reference standard.
- Sensitivity was calculated relative to a master list of all Atrius patients with incident disease during the study period. The master list included all confirmed cases identified by the candidate algorithms and Atrius health's independent infection control records.
- Final algorithm performance was validated by comparison to the state health department's records of all independently reported Atrius health patients with either target disease.

Results – Acute Hepatitis C

Acute Hepatitis C Algorithms (partial list)	Sensitivity	Positive Predictive Value
A. ICD9 for acute hepatitis C	10/16 (63%)	12/54 (22%)
B. (ALT>400 or ICD9 for jaundice) and (HCV ELISA positive) and RIBA positive (if done) and HCV RNA positive (if done) and Hep A IgM negative and (Hep B core IgM or IgG) negative within 28 days and No prior positive (HCV ELISA or RIBA or RNA or ICD9 code)	12/16 (75%)	12/12 (100%)
C. HCV RNA positive and record of negative HCV ELISA within the past 12 months	7/16 (44%)	7/7 (100%)
D. HCV ELISA positive and record of negative HCV ELISA within the past 12 months	7/16 (44%)	7/8 (88%)
FINAL ALGORITHM: Equation B or C or D	15/16 (94%)	15/15 (100%)

Results – Syphilis

Syphilis Algorithms (partial list)	Sensitivity	Positive Predictive Value
A. ICD9 for syphilis	57/61 (93%)	57/123 (47%)
B. ICD9 for syphilis and order for (penicillin G or doxycycline or ceftriaxone)	42/61 (69%)	42/42 (100%)
C. RPR ≥ 1:8 and (TPPA positive OR FTA-ABS positive)	43/61 (70%)	43/43 (100%)
FINAL ALGORITHM: Equation B or C	59/61 (97%)	59/59 (100%)

Results continued

- The performance of selected candidate algorithms and the final algorithm for detection of acute hepatitis C and syphilis are shown in the tables.
- 16 true cases of acute hepatitis C were found.
- Evaluation of state health department records showed that none of these cases had been independently reported as acute infections by either labs or clinicians.
- There were no Atrius Health cases of acute hepatitis C known to the health department that were missed by the final algorithm.
- 61 true cases of syphilis were found.
- Evaluation of state health department records showed that 60 of these cases had been independently reported by either labs or clinicians.
- There were no Atrius Health cases of syphilis known to the health department that were missed by the final algorithm.

Conclusions

- Structured data from electronic medical record systems can be used to identify syphilis and acute hepatitis C with high accuracy
- Application of these algorithms to electronic health data has high potential to improve the completeness, timeliness, and accuracy of public health surveillance
- Standardized electronic case definitions and systems for extracting, analyzing, and transmitting electronic health data are needed.

