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A Timeliness Study of Disease Surveillance Data Post ELR Implementation in Houston

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Objective

Review 5 years of surveillance data post electronic lab reporting (ELR) implementation and 8 years of data prior to ELR, to evaluate timeliness and completeness of disease surveillance.

Introduction

Since 2009, Houston Health Department (HHD) uses an electronic disease surveillance system (Maven) to receive ELRs from reporting facilities in the Houston jurisdiction. Currently, two large hospital systems, a blood bank, two large commercial labs, and two public health labs are sending ELRs to Maven. The overall percentage of disease reports received via ELR was over 50%. We hypothesize that the implementation of ELR has improved the timeliness and completeness of disease surveillance.

Methods

The data are from two sources, Maven and Casefile, Maven's predecessor. Nearly half of disease reports in Maven are manually entered, and thus we group reports in three groups: Casefile (all manually entered cases 2000-2008), Interactive (manually entered cases in Maven 2009-2014) and Batch (cases in Maven automatically populated by ELRs 2009-2014). We select campylobacter infection, Hepatitis A infection, legionellosis, bacterial meningitis and salmonellosis to represent reportable conditions with different reporting priorities. Variables were selected to evaluate the timeliness and completeness of case reporting and investigation. Variables were selected for patient demographics.

For case reporting, the timeliness is evaluated using the difference between onset date and reporting date, whereas case investigation is evaluated only for reportable (confirmed or probable) cases by the difference between reporting date and investigation close date. For each selected variable, the completeness is evaluated by the percentage of cases without missing observations.

Results

The annual case volume increased substantially post the ELR implementation. Prior to ELR, on average the HHD received 1167 cases per year, and the number increased to 2797 cases per year post-ELR. After ELR implementation, the percentage of disease reports received via ELR increased rapidly by year, and in 2014 the percentage of ELR was around 70% (chart1):

Post ELR, the number of reportable cases conditions also substantially increased. Pre ELR, on average 400 reportable cases per year were reported to HHD, whereas post-ELR approximately 700 reportable cases per year were reported to HHD (chart1).

In terms of timeliness of case reporting, on average, Batch showed improvement over Interactive cases (Kruskal-Wallis chi-squared= 357.7, p-value < 0.01) and over cases in Casefile (24.4,,$p<0.01$) (Table1). By comparing Interactive cases with cases in Casefile, Interactive cases were more complete on reporting variables, and reported in more timely manner than the cases in Casefile (76.0,$p<0.01$). Moreover, the overall differences were also statistically significant (405.9,$p<0.01$):

The timeliness of case investigation is only evaluated for reportable cases in Houston. Cases prior to ELR were more complete with case investigation information. In Maven, it took longer to close a case investigation ($p<0.01$ for both Casefile vs.Batch, and Casefile vs. Interactive). The Interactive cases were closed faster than cases populated by ELRs (10.9,1,$p<0.01$) (tab2):

Variable level completeness is evaluated for case reporting variables and variables of patient information (detailed in method) (see table3). The overall completeness is obtained by averaging completeness over case reporting variables and over patient information variables.

The overall completeness shows that cases prior ELR were more complete in terms of reporting. In Maven, Interactive cases had more complete information on disease reporting. In regards with patient information, Interactive cases were as complete as cases prior to ELR implementation, and Batch cases in Maven were slightly less complete than Interactive cases (table3).

Conclusions

Post the ELR implementation the annual number of cases (including reportable cases) in Houston jurisdiction increased substantially (chart1); prior to the ELR it took longer to receive a case report, and the use of electronic disease surveillance system and the implementation of ELR improved the Houston disease surveillance system capacity of early case detection (table1); however, post ELR implementation, probably due to the increase in case volume, it took longer to complete a case investigation (table2); moreover, for patient information, no substantial differences were found between cases pre and post ELR implementation, but cases populated by ELRs were less complete with case reporting information (table3).

Keywords

Disease surveillance; electronic lab reporting; timeliness; Completeness

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