Epidemiologic Survey of Legionella Urine Antigen Tests Within a Large Wisconsin Integrated Health Care System

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Background

Legionella pneumophila is an aerobic, pathogenic, gram-negative bacterium.

Human infection presents as potentially life-threatening pneumonia otherwise known as Legionnaires’ disease.

Legionella organisms exist in biofilms and survive and multiply within free-living amoebas.

Outbreaks have been associated with contaminated cooling towers and other fresh water sources.

Objective

Our study aimed to identify unrecognized outbreaks and geodemographic associations of Legionella, given limited literature regarding the epidemiology of infections in Wisconsin and recent outbreak reports.

Methods

Retrospective chart review on:

- All patients who underwent Legionella urine antigen testing (LUAT)
- Within a single Eastern Wisconsin health system
- Between January 2013 and December 2017
- Random sample inclusive of all positive tests was reviewed.
  - If a patient was ever identified as positive, only the encounter in which they had their first positive test was included in the analyses.

- For all other patients, only their first negative test was included.
- Ultimately, the above rules let us get down to the individual patient level.

Demographics – Statistical Methods:

- Chi-squared, 2-sample t-tests, and stepwise regression for univariable analysis as appropriate
- Binary logistic regression for multivariable analysis
- To explore generalizability, health system demographics compared to Census data for the catchment area (412 total ZIP codes)

Geographic Patterns – Mapping Methods:

- SAS, Tableau, and other GIS mapping software
- Positive tests results with ZIP codes within Wisconsin were mapped to locate hotspots
  - Specifically looked at ZIP codes within Milwaukee County
- Negative cases were used to investigate significant geodemographic differences in patients testing positive versus negative
- Additionally, geographic information for positive tests were mapped to locate hotspots.

Results

- Of all LUAT results in the original data set (N=21,599), 146 (0.68%) were positive.
- Tables 1,2 compare health system and Census data
- After review of the random sample inclusive of all positives, 138 positive cases remained in the final data set, 135 with ZIPs in WI (Figure 1) Differences in demographics are described in (Table 3)
- Within Milwaukee County, of the 5,507 tests done, 82 patients tested positive for Legionella (Figure 2).

Conclusions

The prevalence of positive LUAT tests was low and generally followed known geodemographic patterns. This methodology, if done real-time, may complement public health detection of Legionella outbreaks. Further study on built environments near clustered cases may reveal additional sources of infection.

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References

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