

# Looking for Anthrax: Feasibility Study of Free Text Analytics for Emergency Department Syndromic Surveillance

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## OBJECTIVE

The primary objective of this study is to assess the capability of an advanced text analytics tool that uses natural language processing techniques to extract important medical information collected as part of routine emergency room care (history, symptoms, vital signs, test results, initial diagnosis, etc.). This information will be automatically, accurately, and efficiently converted from unstructured text into useable information, which can then be used to identify cases that are the result of a naturally occurring outbreak or bioterrorism event. This information would then be available to (1) communicate to the treating physician, and (2) message back to organizations aggregating data at a higher level, such as the Centers for Disease Control and Prevention (CDC) and the Department of Homeland Security (DHS).

## BACKGROUND

The use of syndromic surveillance as a means for evaluating large populations of patients for the presence of specific disease syndromes is becoming increasingly important in the creation of near real-time situational awareness for the threats of bioterrorism and emerging infectious disease. Syndromic surveillance uses health associated information (i.e., symptoms) that precede diagnosis as a signal of a case or an outbreak to warrant further public health response. Currently, most developed tools are based on a coding schema (i.e., International Classification of Diseases (ICD-9) codes) and are unable to accurately extract more detailed unstructured data from a patient's medical chart. Such information may increase the sensitivity and specificity of syndromic surveillance efforts. Booz Allen Hamilton's Health Care and Analytical teams have designed a proof-of-concept capability that monitors medical records of anonymous emergency room patient encounters and other data for possible early detection and situational awareness of disease outbreaks.

## METHODS

This study will be conducted utilizing patient records from the Emergency Department at Inova Fairfax Hospital. These are patients who were evaluated in the emergency department between 20 October 2001 through 7 November 2001, which was the time period immediately after the distribution of anthrax-

contaminated letters through the US Postal Service and the diagnosis of inhalational anthrax in 5 patients who worked and resided in the Washington, D.C., metropolitan area [1]. Our study cohort includes a representative sample of patients who presented in that period of time with chief complaints matching ICD-9 codes consistent with the symptoms found with inhalational anthrax. To these charts, we add the first 10 inhalational anthrax cases as described in the literature (Jernigan, et al), abstracted in the same format as the cases which presented to the Inova Fairfax Emergency Department [2].

The specific portions of the charts that will be analyzed include the triage note, vital signs, patient history and physical examination results, social or occupational history, nursing notes, laboratory results (complete blood count, chemistries) and chest radiograph findings. Data contained within these fields will be processed using advanced analytic techniques to identify and extract information related to the diagnosis/occurrence of specific syndromes of interest.

## RESULTS

Preliminary results show that the tool successfully identifies a variety of symptoms and vital signs represented in a variety of different formats, using acronyms and other medical terminology. Future results will include a determination of probable diagnosis based on the information learned about symptoms, vital signs, and lab results.

## CONCLUSIONS

Utilizing advanced text analysis capabilities, we are implementing a proof of concept application that we expect will harvest valuable information related to the accurate detection of specific syndromes of interest.

## REFERENCES

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- [2]. Jernigan JA, Stephens DS, Ashford DA et. al., Bioterrorism-Related Inhalational Anthrax: The First 10 Cases Reported in the United States, *Emerging Infectious Disease*. 2001 Nov-Dec;7(6).

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