Using healthcare-IT to support electronic surveillance of healthcare-associated infections

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Critical data needed for measurement of Hospital Acquired Infections (HAIs) are available in most U.S. hospitals in electronic format. The clinical laboratory can provide culture data including source of the collection, time of the collection, culture results and susceptibility results. The Admission/Transfer & Discharge (ATD) systems contain data on patient location and movement.

In 1998, Dr. Stephen Brossette published a seminal paper that dealt with a data mining methodology known as association rules borrowed from the M.I.T. market basket algorithms. This approach allows identification of patterns in data. While widely used in a variety of retail marketing applications, this was among the first efforts to use such methods with healthcare data. The tools developed allowed discovery of time-dependent changes in the hospital, such as clusters of infections in new physical locations or early changes in antibiograms that had treatment implications. From this, it was a small leap to consider the possibility that it might be possible to use electronic data to objectively and reproducibly measure the hospital-wide HAI burden and the concept of electronic surveillance or e-surveillance was born. From the early literature, there was perhaps more interest in this idea in Europe than in the U.S. In part, this might be due to the heavy reliance on definitions that come from the Centers for Disease Control in America (CDC). The CDC definitions are very carefully considered and vetted but based on cost issues the CDC moved to focused surveillance in 1998. Dr. Brossette and his colleagues, then at MedMined, developed an algorithm known as the Nosocomial Infection Marker or NIM. This algorithmic approach examines source, culture results and timing. It attempts to exclude duplicate specimens and contaminants. One of the first studies to prospectively investigate the performance of e-surveillance came from Dr Lance Peterson’s group in Chicago done collaboratively with MedMined. For detection of HAIs, the NIM was shown to have a sensitivity of 86.0% and a specificity of 98.4%. Furthermore, algorithms such as this can be exploited hospital-wide with little incremental costs. Reliable HAI rates have moved heavily into U.S. healthcare policy arena. Several groups have now developed approaches to electronic detection, with many focused on particular infections such as bloodstream infections. Careful re-examination of the inter-rate reliability of traditional manual methods has led to a very open debate on where and how to target the use of e-surveillance tools.