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# Automated Outbreak Detection of Hospital-Associated Infections

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**Background.** Containment of hospital outbreaks requires timely identification, investigation, and response. Current detection methods rely on empirical rules covering temporal or spatial clustering of a limited number of prespecified pathogens.

**Methods.** We applied a multi-dimensional scan statistic (SaTScan), accessed through WHONET software, to 83 years of historical microbiology data from 44 hospitals using Premier SafetySurveillor. We identified clusters of cultures yielding pathogenic species, where clusters were defined by antimicrobial resistance profiles, locations, and specialty services. We included clusters involving  $\geq 3$  patients and occurring by chance less than once per year. For comparison, a convenience sample of hospitals provided clusters identified using their usual methods. Infection preventionists (IPs) at each hospital rated the value of the information about each statistically based cluster and the automated outbreak detection system.

**Results.** We identified 222 clusters in 44 hospitals. The number of clusters ranged from 0 to 4 per 100 beds/year. The majority were identified based on resistance patterns, others by common ward or service. The organisms causing 135 clusters were not under routine surveillance. Ten hospitals provided data on known clusters, and only 20% (10 of 51) of those clusters were statistically affirmed. The outbreak algorithm detected 69 clusters that were not known to the hospitals. IPs returned surveys on 153 of the 222 clusters. They would have wanted notification about 81% of the clusters and were moderately or highly concerned approximately 35%. Half of the clusters (51%) expanded after detection. If these had been detected in real time, it would have been possible to intervene and possibly curtail the outbreak. Eight of 9 clusters identified by both the software and hospitals were detected earlier by the software (mean difference 5.5 days). All IPs felt that an automated outbreak detection tool would improve their ability to detect outbreaks (80% moderate or large extent) and streamline their work (65% moderate or large extent).

**Conclusion.** Automated outbreak detection can increase the efficiency and scope of identification of nosocomial clusters, including pathogens not under routine surveillance.

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3M: Investigator, Conducting studies in which participating healthcare facilities are receiving product from 3M.

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