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APIC Position Paper: The Importance of Surveillance Technologies in the Prevention of Healthcare-Associated Infections (HAIs)

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Surveillance of healthcare-associated infections (HAI) is the cornerstone of an effective infection prevention program. By definition, surveillance is a comprehensive method of measuring outcomes and related processes of care, analyzing the data, and providing information to members of the healthcare team to assist in improving those outcomes and processes.[1]

Continuous monitoring of HAI rates can be used to implement improvement initiatives, assess effectiveness of interventions and provide information which may be used for interfacility comparisons. Surveillance can also be used to quickly identify outbreaks and provide epidemiological profiles for clinical and research studies.[2]

Most organizations utilize a targeted surveillance methodology based upon an annual risk assessment. A manual review of computerized microbiology reports, coupled with other laboratory and patient care information extracted from a variety of sources has historically been the primary method of case finding. This approach to surveillance can be both limited in scope and labor intensive.

As infection prevention programs are faced with competing priorities -- including expectations for expanded surveillance from internal, regulatory, or public sectors -- the demands on the infection preventionist's time may divert efforts away from prevention activities such as education, observation and behavior modification. To enhance the role of the infection preventionist to one in which the primary objective is that of prevention, surveillance must absorb fewer human resources.[3]

The Association for Professionals in Infection Control and Epidemiology (APIC) supports the use of automated surveillance technologies as an essential part of infection prevention and control activities .* "Automated surveillance is the process of obtaining useful information from infection control data through the systematic application of medical informatics and computer science technologies."[4] Automated surveillance includes, but is not limited to, either data mining (discovering patterns and relationships which can be used to classify and predict) or query-based data management (requires user input, but does not seek patterns independently). A variety of automated systems exist and include both commercial and independently designed systems which, at a minimum, integrate portions of the medical record with laboratory, admission, discharge, transfer (ADT) and treatment information.

Rationale:

Benefits of automated surveillance:

Streamline and facilitate efficient review of relevant data, promoting rapid identification of sentinel events and detection of outbreaks [5]

Discussion: Manual methods to identify potential HAIs by laboratory results, chart reviews, data entry and looking for associations can be inefficient, labor intensive and error prone.[6] A retrospective review comparing automated surveillance with standard infection control practices for outbreak detection concluded that automated surveillance was more efficient and operated with high specificity and positive predictive value.[7]

Expand and better define the scope of infection prevention activities [8]

Discussion: Although targeted surveillance based upon a comprehensive risk assessment forms the basis for a facility's surveillance plan, opportunities exist to enhance surveillance beyond the typical high risk intensive care unit (ICU) population where many larger facilities focus their efforts.[9] For example, central venous catheters (CVCs) may be prevalent on medical and surgical floors in some facilities. The burden of infection in these areas is less clear and the opportunities for prevention are inferred but generally untested. Several studies have reported that the use of CVCs and central line-associated bloodstream infection (CLABSI) rates outside ICUs is equivalent to or higher than rates in ICUs.[10, 11, 12] Surveillance for catheter-associated urinary tract infections (CAUTI) has been largely focused in ICU populations as well. Reports from users of automated surveillance systems indicate that expanding surveillance to target the non-ICU population has resulted in improved practices, cost avoidance and a reduction in overall rates of CAUTI. [13] By understanding the data as a whole, it is possible to direct attention and efforts to where they are most needed and has the largest impact to improve patient care.

Reduce infection prevention department time spent on surveillance and clerical tasks

Discussion: Several studies have reported a time savings benefit. One early report indicated that time spent on surveillance activities decreased as much as 65%.[14] More recent publications report similar results.[15] There has been discussion regarding the value-added benefit of additional time coupled with the fear that it may result in reduced full time equivalents (FTEs) for many already understaffed infection prevention programs. However, experts believe that as greater gains in efficiency are achieved and more time is spent in prevention and intervention, healthcare administrators will see the added value of effective infection prevention programs, resulting in the need for more, not fewer, infection preventionists.[16]

Improve response to public health issues

Discussion: Electronic applications at public health agencies at the national and local level have proven to be effective tools during outbreak investigations.[17] At the local level, automated surveillance provides a useful tool to identify communicable diseases, unusual clusters and to detect and manage outbreaks of community-acquired illnesses.

Regulatory compliance

Discussion: Electronic tools enable the program to rapidly demonstrate to the Centers for Medicare and Medicaid Services (CMS), The Joint Commission (TJC), and other regulatory surveyors that programs carrying out targeted surveillance can immediately demonstrate that the infection prevention and control program has a pulse on the *entire* facility. For example, the tools can provide profiles of organisms, antibiotic-resistance trends, and reports used to address the elements of the CMS Infection Control standards (e.g. the surveillance log).

Financial performance

Discussion: Cost-savings obtained by avoiding infections can be estimated using attributable costs of HAIs from the medical literature.[18] This logic can be applied to an enhanced surveillance approach which potentially identifies and reduces numbers of infections. Although the peer review literature is still limited on the cost-effectiveness associated with electronic surveillance systems, there are at least two studies demonstrating substantial cost-effectiveness.[19] Case reports from facilities or groups utilizing electronic tools have reported significant reductions in infections and subsequent significant cost savings.[20]

Potential to enhance antibiotic stewardship programs

Discussion: A number of commercial and facility programs interface with a pharmacy data base. Given the association between antimicrobial use and the selection of resistant pathogens, the frequency of inappropriate antimicrobial use is often used as a surrogate marker for the avoidable impact on antimicrobial resistance. The combination of effective antimicrobial stewardship with a comprehensive infection control program has been shown to limit the emergence and transmission of antimicrobial-resistant bacteria. Computer-based surveillance can facilitate good stewardship by facilitating more efficient targeting of antimicrobial interventions, tracking of antimicrobial resistance patterns, and identification of nosocomial infections and adverse drug events. Such programs have been shown to be cost-effective.[21]

<u>Essentials of an Electronic Surveillance System</u>

- Ability to pull essential clinical information for individual patients from hospital data sources throughout the facility.

- Ability to take data from various clinical and/or diagnostic systems (i.e. laboratory, pharmacy, radiology) and translate that data into information and/or alerts that can be acted upon.

- Ability to retrieve data that is in real time and actionable.

- Ability to send standard electronic messages (e.g., electronic laboratory reports, ADT data), and/or clinical documents using Clinical Document Architecture (CDA) to public health departments for notifiable disease reporting and to the National Healthcare Safety Network [NHSN]).

System Assessment:[22]

The following steps are helpful in choosing appropriate electronic surveillance systems:

- Identify and investigate system options.

- Come up with a list of absolute requirements ("must haves") and a list of "nice to have" features.

- Interview vendors or individuals responsible for developing facility specific systems.

- Have some standard scenarios of what you would like the system to do and ask different vendors to demonstrate the ability of their system to perform such tasks on a test system (e.g. ability to retrieve all positive cultures for Acinetobacter in a certain time period for a specific unit [requires patient location at time of specimen collection]).

- Talk to other users -- persons who are happy and unhappy with the system.

- Create side-by-side vendor comparisons.

  Examples:

  Automated data collection
  Event alerts
  Rate and trending analysis
  Threshold notification
  Antibiograms
  Interfaces
  Clinical Support
  Service
  Education
  Messaging to public health
  Messaging/data transfer to NHSN

- Assess time and resources needed to implement and maintain the system.
- Assess flexibility of system to adapt to changing needs.
- Assess ability to keep data secure and confidential.
- Involve key stakeholders.
- Assess the business case.
- Make a decision and work through administrative processes.

In addition, the "Infection Prevention and Control Surveillance Technology Assessment Tool" found on the APIC website may be of assistance when comparing and evaluating surveillance products.[23]

Limitations of electronic surveillance:

Learning curves, user involvement and administrative support are key variables in the success or failure of automated surveillance. There is a concern that technology, if not properly utilized, can lead to information overload and overdependence on technology itself.[24] It is important to recognize that data obtained from electronic surveillance obviates the need for manual abstraction, but does not necessarily meet surveillance definitions without further analysis (i.e. NHSN definitions). The threshold for detection of patterns and clusters is usually low. It is important to recognize that data must be evaluated to determine its significance. Central to this theme is that technology is not a substitute for critical thinking, but is an important tool to assist the infection preventionist in obtaining and utilizing information to drive improvements

Conclusion:

The implications surrounding the need to recognize and reduce HAIs have never been greater. Prevention of infections, as well as controlling antibiotic-resistant organisms, have been targeted by organizations promoting patient safety, regulatory and accrediting agencies, and policymakers in response to public concerns. Although surveillance is an essential part of an effective infection prevention and control program, all too often it consumes too much of an infection preventionist's time, limiting time spent in education and performance improvement activities. As the infection preventionist allows technology to alter the manner in which surveillance is done, it may ease the burden of data management and allow them to "go forth and accomplish the profession's highest calling: prevention."[25]

*Information in this position paper is based mainly on reports from acute care hospitals or systems. However, case reports from integrated systems have reported benefit in the long term care and ambulatory setting. Smaller hospitals or critical access hospitals need to assess needs

and benefits carefully. However, even in smaller organizations with limited infection prevention resources, robust surveillance may not be feasible without some computerized assistance.

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