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Review Article

Surveillance systems for health care associated infections



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ABSTRACT

HealthCare Associated Infections (HCAIs) are increasingly considered to be preventable adverse events, which require prioritized global attention. In the face of increasing antimicrobial resistance, prevention remains the best method to curb these infections. Surveillance of HCAIs and antimicrobial resistance using standard methods is becoming a model for prevention. Surveillance identifies the rates of HCAIs, the areas for intervention and improvement, as well as the impact of those preventive interventions. Objectivized definitions, algorithmic diagnosis and electronic databases have made surveillance systems more user-friendly and effective over time. The scope of surveillance is ever-widening with increasing need for post-discharge surveillance, day-care and home-based treatment and the technology revolution. This review provides an overview of the global health care associated infection surveillance systems and recent innovations therein.

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1. Introduction

Health Care Associated Infections (HCAIs) are the most common adverse events in medical care, accounting for more than 1,00,000 deaths each year, apart from escalating the cost of treatment and patient morbidity tremendously.^{1–5} The psychosocial consequences of HCAIs and its economic impact on the families is enormous, but can never be accurately quantified. Even the quantifiable measures like the rates of HCAIs are often gross underestimates due to lacunae in our surveillance systems. Prevention of HCAIs is becoming an increasing priority for healthcare providers, medical insures, administrators, quality managers,

legislatures, patient representatives and social media.⁶ This is exemplified by the recent US- White-House release, where the Obama administration made history on September 18, 2014, upon signing an executive order establishing a taskforce to combat Antimicrobial Resistance (AMR) at the Federal Level.⁷ Since disclosure of HAI rates is becoming mandatory, the pressure on healthcare facilities is increasing. The performance-based payment and mandatory reporting of HCAI rates has made accuracy of surveillance results all the more important.^{8,9}

With the onus of responsibility shifting totally towards healthcare providers, we are witnessing a paradigm shift in Hospital Infection Control Practices: Increasing emphasis on Surveillance Systems.

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Again, since reporting of HAI rates is becoming mandatory, it is assumed that hospitals will have an efficient and accurate system for identification of HAIs. However, the actual situation is far from ideal, since surveillance systems are either non-existing in many countries, or plagued by complexity of definitions, lack of trained personnel, highly labor-intensive and time consuming activities and lack of sensitivity, objectivity and efficiency of data analysis or reporting. These limitations, together with the need for inter-hospital comparison has galvanized attempts to develop alternate surveillance strategies. It is in everybody's interest that we adopt preventive policies for HCAs now. All preventive activities begin with a robust surveillance system.

Apart from reduced mortality and improved patient outcomes, the economic benefits of prevention of HAIs are enormous; ranging from \$5.7 to 6.8 billion in USA alone.¹⁰

2. Definition

Surveillance is defined as "The ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health".¹¹

3. Importance of surveillance

Surveillance per-se is often perceived as a tedious, mundane and primarily epidemiological exercise, with little relevance to clinicians. However, it was the path-breaking SENIC (Study on the Efficacy of Nosocomial Infection Control) in the 1970s, that showed that surveillance alone can substantially reduce the burden of HAIs.^{12,13} Since then, the US-Centers for Disease Control and Prevention (CDC) has taken a lead and initiated independent National Surveillance Programs (hitherto called NNIS [National Nosocomial Infection Surveillance]), which are now converged into the single National Health Care Safety Network (NSHN).^{14,15} NHSN has served as a global catalyst for heightening awareness and establishment of other similar Surveillance Networks. Most of the Surveillance systems in other countries are based on the modules developed by NHSN. The free, web-based availability of NHSN modules and methodology has galvanized this "Surveillance Revolution".¹⁶⁻¹⁸ The establishment of NHSN is however not a "mission accomplished", since improvements are continuously being done based on the recommendations and inputs given by HICPAC (Health Care Infection Control Practices Advisory Committee).^{19,20}

4. Features of an efficient surveillance program

The hallmarks of an efficient surveillance system are: maintenance of confidentiality, voluntary participation by a large number of hospitals, use of standard definitions and methods, accurate and efficient detection of site-specific infections, reporting of risk-adjusted rates, facility for inter-hospital comparison, presence of trained infection prevention

professionals, feeding back data to all concerned and provisions to assess the impact of preventive exercises on infection rates.²¹ It should give meaningful information with high sensitivity and specificity. In the long run, a surveillance system should fit into local needs and guide preventive activities. In this regard, single institutional surveillance are always more reliable and valid, since usually the same group of surveyors are applying the same definitions to diagnose cases over a period of time. Difference in case finding techniques and definitions sometimes makes inter-hospital comparison less reliable.

Surveillance systems can be classified based on the methodologies of surveillance or purpose of surveillance. For example, *Manual* and *Automated* surveillance use different methods for data collection, handling and analysis. Another way of classifying the surveillance systems is *Outcome* and *Process* surveillance, their objectives being different. However, whatever the methods of classification, the larger goal of any surveillance system is to curtail the rates of HCAs based on locally generated data and targeted interventions.

5. Manual surveillance

Traditionally, surveillance programs are based on manual review of patients records (either high-risk, or all patients) by trained infection control professionals or prospective in-patient surveillance. This is a mammoth task, considering the load of patient-data that has to be dealt with, to generate reports and provide feedbacks.^{19,20,22} The universal surveillance initiative was also proving costly to sustain. These were the reason that by mid 1990s, the NNIS shifted from an all-patient approach to surveillance of high-risk patient care areas. In manual surveillance, there may be subjective variability in identification of infections due to complex definitions and tedious methodology. Thus, the manual methods depend on the availability of a highly motivated team of surveyors.^{19,20,22-24} Most hospitals are currently using manual surveillance methods. However, this data is usually not pooled into a National network in developing countries.

6. Alternative approaches

Despite its many advantages, standard surveillance methods may not be applicable in many settings for want of trained infection control professionals to identify each HAI, based on specific definitions. Thus, there is a lot of inter- and intra-institutional variability in performance of traditional HAI surveillance.²⁵ To circumvent this, alternative approaches are being looked into. Such approaches will reduce the cost and quantum of work, so that efforts and resources can be focused on preventive measures.^{26,27}

Use of computer databases and data mining to detect clustering, which in turn suggests nosocomial transmission is one such alternative technique. Data acquisition from multiple electronic databases like Microbiology records, pharmacy records and patients records can fill gaps in the existing surveillance systems.^{26,27}

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