## APIC Position Paper: The Use of Administrative (Coding/Billing) Data for Identification of Healthcare-Associated Infections (HAIs) in US Hospitals

Patricia Gray, RN, CIC, Co-Lead Author, Vice Chair, APIC Public Policy Committee
Stephen Streed, MS, CIC, Co-Lead Author, Member of APIC Board of Directors, and Board Representative to the Public Policy Committee
Susan Dolan, RN, MS, CIC, Chair, APIC Public Policy Committee
Raed Khoury, MA, MPH, MT(ASCP), CIC ARM, CHSP, CPHQ, CSHA, Member, APIC Public Policy Committee
Patricia Kulich, RN, CIC, Member, APIC Public Policy Committee
Russell N. Olmsted, MPH, CIC, APIC, 2010 APIC President-elect
**Reviewers:**
Tracy Cox, RN, CIC, Member, APIC Public Policy Committee
Charlene Ludlow, RN, MHA, CIC, Member, APIC Public Policy Committee

## Introduction

Following the release of the Institute of Medicine's To Err Is Human report in 1999, medical errors were identified as the cause of almost 100,000 deaths annually.  Healthcare-associated infections (HAIs) comprise a significant proportion of these errors, and account for an estimated 1.7 million infections[1] and $28.4 to $45 billion in direct medical costs[2] per year.  Additionally, the Centers for Disease Control and Prevention (CDC) lists HAIs as one of the top ten causes of death in the United States.

Meaningful reporting of HAIs has become a crucial issue for two reasons.  First, it is important to know the accurate number and type of infections. Second, this information is useful only when it is actionable and can be used to decrease the number of infections.  Public reporting, pay-for-performance, and reduced payment for hospital-acquired conditions by the Centers for Medicare and Medicaid Services (CMS) and private payers have given these objectives a heightened focus of attention.  The impact of public reporting of HAIs may not be realized for some time, as it is in its infancy in terms of data selection, standardization, and analysis.

Collection of accurate data is essential.  As the accelerated quest for readily available HAI data unfolds, the challenge is to identify accurate data retrieval methodologies.  To date some believe that existing data retrieved from administrative coding and billing systems (claims data) can be used to collect HAI data; however, this concept has been challenged by the concern that the sole use of administrative data cannot precisely, reliably, and accurately determine HAIs.  The issue is not trivial.  Many lives and billions of dollars are at stake.

The diverse and growing number of reporting requirements impacts HAI data collection, as well.  As the number of reporting requirements grows, increasing resources will be needed just to satisfy these requirements.  Facilities spend a great deal of time and money reporting the same information to multiple organizations.  Agencies may use different definitions for a particular infection.  This requires separate reporting functions and can result in differences in the reported number of infections for the same facility.

In most cases, the reports need to be entered into the agencies' systems manually, a practice that can take time and resources away from other important initiatives intended to improve patient safety and outcomes.  Standardized reporting definitions for HAIs from the CDC's National Healthcare Safety Network (NHSN) exist but there remains a need for more robust electronic surveillance technologies to enhance the efficiency of HAI detection and reporting.

Spreading knowledge. Preventing infection.™

To date, while most of the work identifying patients with HAIs and reporting the results has been done using a manual, labor-intensive methodology, we look to the near future when electronic medical records coupled with electronic surveillance technology (ST) will provide infection preventionists (IPs) with greater efficacy and efficiency within the Infection Prevention and Control (IPC) programs they oversee. The attributes and benefits of ST have been described in the APIC Position Paper entitled, *The Importance of Surveillance Technologies in the Prevention of Healthcare-Associated Infections (HAIs)*. [3]

## APIC Positions

The Association for Professionals in Infection Control and Epidemiology (APIC) supports the following positions:

- The exclusive use of Administrative data is not a precise measure for identifying healthcare-associated infections and should not be used as a sole source for HAI identification.
- Administrative data collection does not facilitate the real-time implementation of targeted prevention strategies.
- The CDC/NHSN standardized definitions should be used to identify and report HAIs.
- The CDC/NHSN comparative database should be used to promote the reduction and assess progress towards elimination of HAIs.
- Electronic surveillance technology development and implementation is necessary to enhance infection prevention strategies and effectiveness.
- Validation of findings from surveillance for HAIs is an essential process that facilitates meaningful comparison of HAI findings in a standardized, unbiased manner.

## Overview

Proponents for the use of administrative coding and billing data in identifying HAIs make a compelling argument. First, administrative systems that collate claims data are already in place. They maintain that minimal programming changes can deliver diagnosis codes to identify infections. In 2008, Present on Admission (POA) coding was applied to the administrative data with the intent to improve the risk-adjustment methodology. This is helpful but there are remaining gaps in the application of POA coding and the precision of claims data to capture/classify infections caused by *Clostridium difficile* and methicillin-resistant *Staphylococcus aureus*.[4,5] In addition, the utilization of current administrative codes for select sites of HAIs, e.g. catheter-associated urinary tract infections, has been studied and found to be used infrequently and imprecisely when compared to epidemiologic surveillance methods.[6] These same proponents also assert that purchasing new hardware and software systems and developing new coding systems to deliver essentially the same information that administrative systems already deliver will cost billions of dollars when adequate funding for such projects is non-existent.

Proponents for the use of epidemiologically-based, standardized definitions and accurate HAI identification disagree. Infection prevention and control literature provides a solid scientific profile of the various strategies used in HAI identification. APIC's 2005 position paper on Mandatory Public Reporting of Healthcare-Associated Infections noted that administrative data cannot be used as a single source of information to detect HAIs because these data do not utilize needed medical information to determine if an HAI occurred.[7] The same position paper further supports the need for the use of risk-adjusted infection rate data to allow for comparative analysis. The "gold standard" for identification of HAIs is for the IP and/or healthcare epidemiologist to review a patient's medical record for indicators of infection and apply the standardized, validated NHSN definitions. By performing reviews and making visits to the patient care units to identify high risk patients, this approach, used in the 1970s, was able to predict infections with 75 to 94 percent accuracy.[8] The goal was to detect HAIs as they occurred and to

ensure that appropriate controls were implemented in a timely manner and to avoid over or under identifying HAIs.

In 1998, an analysis of HAI detection in intensive care unit patients using the CDC National Nosocomial Infections Surveillance (NNIS) System, predecessor of the NHSN, reported that the predictive value for different infections ranged from 80 to 92 percent.[9] Comparison of these values with the predictive values for administrative data shows the NNIS strategies to be superior.[10]

More recently, electronic surveillance technology (ST) and growing adoption of electronic health records offer potential opportunities to enhance the efficiency of surveillance. Data mining, one example of ST, searches large databases, e.g. laboratory information system (LIS), admission/discharge/transfer, and medication utilization, in real time using predictive regression models to look for a constellation of signs, symptoms, and therapies that identify a possible HAI.[11] A growing body of research indicates a relatively high specificity and sensitivity when ST is applied to surveillance of certain HAIs.[12] In addition, these systems are capable of accessing diagnostic testing, which further enriches their reliability and demonstrates the scope and efficacy of automated detection.[13]

In contrast, studies investigating the accuracy of administrative coding and billing data to identify HAIs found that administrative data systems could not be used without "extensive modification or validation,"[14] and that only 20% of the infections predicted by targeted active surveillance would have been identified using administrative data.[15] Another investigation concluded, "3 out of 4 HAIs as detected by coding data, on average, would not meet standard CDC/NHSN definitions and criteria."[10] This is not surprising, since the original purpose of administrative data is not surveillance, but rather reimbursement based on claims for care.[16] In addition, much administrative data is recorded and verified after a patient's discharge. This argues against using administrative data to assist physicians and IPs in developing a plan to contain and prevent infections in real time.

In addition to standardized definitions, a single national database that can be used for data submission is essential to store and collate meaningful, comparative outcome data, as well as to monitor for epidemic, pandemic, or bioterrorism events. The NHSN database, an expansion and renovation of the previous NNIS database, provides such a repository. Recently NHSN was improved to meet the needs of states with mandatory reporting of HAIs. Refinement of NHSN HAI definitions occurs as needed to address changes in the understanding of HAI manifestations and to incorporate evolving diagnostic capabilities. Recently, NHSN released the first comparative report on central line-associated blood stream infections (CLABSIs).[17] This process will continue to be refined as more hospitals and states participate.

To date, most IPs have relied on manual review of medical records, laboratory reports, and other information to identify HAIs. Many facilities still extract data manually from a combination of paper and electronic records. Submission of data for mandatory reports requires data elements to be entered either manually or electronically. These methods used to collect and report HAI data are labor intensive and complex. Manual submissions can be overwhelming for both small and large facilities. Because data entry diverts IPs from other essential infection prevention and control tasks, data entry and submission needs to be performed electronically.

Commercial surveillance technology software can work with electronic health records to automate the identification of key data elements for positive predictive HAI identification. Several ST vendors have collaborated with CDC to automatically capture and deliver these elements via the NHSN Internet access.

While purchase and support of surveillance technology may require significant capital investments and customization, these systems will provide for expansion of HAI surveillance facility-wide and allow

IPs to focus on prevention activities, ultimately resulting in total decreased HAIs, improved patient outcome, and concomitant costs.

## Analysis

Effective infection prevention and control programs depend heavily upon sound surveillance strategies and accurate data analysis.[18]   It is imperative that HAIs are properly identified to promote appropriate treatment and prevention strategies.  Over-identification of HAIs and inappropriate treatment patterns must also be avoided.  While cost considerations must be taken into account, programs that provide sound, accurate surveillance and reporting of HAIs will ultimately promote improved patient outcome, and fairly administered pay-for-performance plans.

In the final analysis, the exclusive use of administrative data does not provide precise identification of HAIs, nor does it provide information in a timely manner to provide effective treatment and prevention. More research is needed to identify more meaningful uses of administrative data as it may provide useful signals to a possible HAI in combination with epidemiologic methods.

The determination of an HAI must be performed using standardized definitions for infection.[19]  The use of multiple definitions for a single HAI is confusing and compromises the ability to use the data.  For more than 30 years the CDC database, now known as NHSN, has been recognized as the gold standard for tracking healthcare-associated infections.  In 2007, the NHSN secure, web-based reporting network was made available to all healthcare facilities in the United States without charge. One system of reporting, with one repository of information, will enhance surveillance and comparison nationwide.

Currently, detecting and reporting HAIs is performed manually by most IPs.  While this was the standard in the past, there are limitations of traditional surveillance methodologies.  As ST continues to be developed and refined, the capability of searching electronic medical information will become more efficient in determining whether a pattern indicates the probability or the existence of an HAI.  This capability provides facility-wide surveillance information in real time to IPs for their proactive use.  This technology has the ability to relieve IPs of the traditional labor-intensive surveillance approach and allow them to spend time on clinical prevention strategies, rather than paperwork.

Infection prevention software, along with electronic medical records and automated electronic reporting, will also enhance the ability to validate surveillance findings, both in terms of methodology and data. Through this validation will come meaningful comparisons of HAI findings in a standardized, unbiased process.

## Recommendations

APIC believes that the exclusive use of administrative data is not accurate in identifying HAIs.  Effective surveillance requires the use of the full range of clinical data available to identify current or predicted HAIs.  Effective and efficient surveillance and reporting require the use of standardized, validated definitions for any given HAI.  APIC believes the logical choice for this is the NHSN HAI definitions. APIC also believes that NHSN should serve as the single repository for HAI information to be used for facility, local, regional, and national comparison and surveillance.  Because the burden of surveillance and reporting will only grow in the future, electronic medical records and automated electronic surveillance and reporting systems need to be supported if the effort to reduce or eliminate HAIs is to succeed.  These systems will also permit greater data and methodology validation, which is necessary to provide efficient methods to identify, retrieve, and report accurate HAI data.

# References

1. Klevins RM, Edwards JR, Richards CL Jr, Horan TC, Gaynes RP, Pollock DA, et al. Estimating Health Care -Associated Infections and Deaths in U.S. Hospitals, 2002. Public Health Reports March-April 2007.

2. Scott RD, II. The Direct Medical Costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention. Centers for Disease Control and Prevention, March 2009. Available at: http://www.cdc.gov/ncidod/dhqp/pdf/Scott_CostPaper.pdf   accessed: 10/04/2010.

3. Greene LR, Cain TA, Khoury R, Krystofiak SP, Patrick M, Streed S. APIC Position Paper: The Importance of Surveillance Technologies in the Prevention of Healthcare-Associated Infections (HAIs).  Available at: http://www.apic.org/Content/NavigationMenu/GovernmentAdvocacy/PublicPolicyLibrary/Surveillance_Technologies_position_paper_2009-5_29_09.pdf accessed 10/04/2010.

4. Dubberke ER, Butler AM, Yokoe DS, Mayer J, Hota B, Mangino JE, et al. Multicenter study of surveillance for hospital-onset *Clostridium difficile* infection by the use of ICD-9-CM diagnosis codes. Infect Control Hosp Epidemiol 2010;31:262-8.

5. Schaefer MK, Ellingson K, Conover C, Genisca AE, Currie D, Esposito T, et al. Evaluation of International Classification of Diseases, Ninth Revision, Clinical Modification Codes for reporting methicillin-resistant *Staphylococcus aureus* infections at a hospital in Illinois. Infect Control Hosp Epidemiol 2010;31:463-8.

6. Meddings J,  Saint S, McMahon LF Jr. Hospital-acquired catheter-associated urinary tract infection: documentation and coding issues may reduce financial impact of Medicare's new payment policy. Infect Control Hosp Epidemiol 2010;31:627-33.

7. APIC Position on Mandatory Public Reporting of Healthcare-Associated Infections. March 14, 2005. Available at: http://www.apic.org/AM/Template.cfm?Section=Position_Papers1&Template=/CM/ContentDisplay.cfm&ContentFileID=2240  accessed 10/04/2010.

8. Wenzel RP, Osterman CA, Hunting KJ, Gwaltney JM. Hospital acquired infections: Surveillance in a university hospital. Am J Epidemiol 1976;103:251-260.

9. Emori T, Edward J, Culver D, Sartor C, Stroud LA, Gaunt EE, et al. Accuracy of reporting nosocomial infections in intensive-care-unit patients to the National Nosocomial Infections Surveillance System. Infect Control Hosp Epidemiol 1998;19:308-316.

10. Stevenson KB, Khan Y, Dickman J, Gillenwater T, Kulich P, Myers C, et al. Administrative coding data, compared with CDC/NHSN criteria, are poor indicators of health care–associated infections. Am J Infect Control 2008;36:155-64.

11. Broderick A, Motomi M, Nettleman M, Streed S, Wenzel R. Nosocomial Infections: Validation of Surveillance and Computer Modeling to Identify Patients at Risk. Am J Epidemiol 1990;131(4):734-742.

12. Chalfine A, Cauet D, Lin WC, Gonot J, Calvo-Verjat N, Dazza F, et al. Highly Sensitive and Efficient Computer-Assisted System for Routine Surveillance for Surgical Site Infection. Infect Control Hosp Epidemiol 2006; 27:794-801.

13. Hota B, Lin M, Doherty JA, Borlawsky T, Woeltje K, Stevenson K, et al. Formulation of a model for automating infection surveillance: algorithmic detection of central-line associated bloodstream infection.  J Am Med Inform Assoc 2010;17:42-8.

14. Wright SB, Huskins WC, Dokholyan RS, Goldmann DA, Platt R. Administrative Databases Provide Inaccurate Data For Surveillance Of Long-Term Central Venous Catheter–Associated Infections. Infect Control Hosp Epidemiol 2003;24:946-949.

15. Sherman ER, Heydon KH, St. John KH, Teszner E, Rettig SL, Alexander SK, et al. Administrative Data Fail to Accurately Identify Cases of Healthcare-Associated Infection. Infect Control Hosp Epidemiol 2006;27:332-337.

16. Jhung MA, Banerjee SN. Administrative Coding Data and Health Care-Associated Infections. Clin Infect Dis 2009;49(6):949-55.

17. Centers for Disease Control and Prevention (CDC). First State-Specific Healthcare-Associated Infections Summary Data Report. CDC's National Healthcare Safety Network (NHSN). 05/25/2010. Available at: http://www.cdc.gov/hai/pdfs/stateplans/SIR_05_25_2010.pdf Accessed 10/04/2010.

18. Lee TB, Montgomery OG, Marx J, Olmsted RN, Scheckler WE. Recommended practices for surveillance: Association for Professionals in Infection Control and Epidemiology, Inc. Am J Infect Control;2007;35:427-40.

19. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care–associated infection and criteria for specific types of infections in the acute care setting. Am J Infect Control 2008;36:309-32.

*October 12, 2010*