

## Demonstrating Return on Investment for Infection Prevention and Control

### ABSTRACT

*Healthcare-associated infections (HAIs) represent 4.5 infections for every 100 hospital admissions and account for an estimated 99,000 deaths in the United States each year. In 2007, the Pennsylvania Health Care Cost Containment Council reported hospital charges of \$35,168 in cases without an HAI to \$191,872 in cases with an HAI, with a difference of 15.3 days in the average length of stay. Effective infection prevention and control programs demonstrate a valuable return on investment by releasing hospital resources for alternative uses and beds for new admissions. The Centers for Disease Control and Prevention estimates that the \$45 billion annual direct cost of HAIs could be significantly reduced by as much as \$31.5 billion with well resourced, quality infection prevention and control programs. Organizations may have inadequate methods to investigate the true cost of HAIs or the cost-effectiveness of infection prevention and control program. This article provides practical methods to engage healthcare executives in evaluating the cost of HAIs in their organization and to dispel common misperceptions about the significance of HAIs, reimbursement, and cost savings associated with effective HAI reduction programs. Using these methods will assist hospital epidemiologists to develop a compelling business case for infection prevention and control programs. (Pa Patient Saf Advis 2010 Sep;7[3]:102-7.)*

### Introduction

Healthcare-associated infections (HAIs) account for about 1.7 million infections and 99,000 deaths in the United States each year. This number represents 4.5 infections for every 100 hospital admissions.<sup>1</sup> The Centers for Disease Control and Prevention (CDC) March 2009 report on the direct medical costs of HAIs estimates that \$35.7 to \$45 billion in 2007 dollars is added to the nation's annual healthcare costs to treat these infections. These estimates reinforce the need for a renewed focus on sustainable HAI prevention and surveillance processes.<sup>2</sup> Resources are needed to sustain the momentum of infection prevention. Increasing resources requires establishing a business case for infection prevention and control programs.

An important function of the hospital epidemiologist and the infection preventionist (IP) is to demonstrate the value of infection prevention and control programs to healthcare executives. The most important aspect of a business case for prevention is reduction of harm and loss of life. But from a financial health perspective, boards, executives, and healthcare managers are interested in cutting costs and getting maximum value for expenditures. They may not see the benefit

of new infection prevention and control programs if the return on investment is not realized within a certain time frame.<sup>3</sup> An infection control business case analysis of the excess cost of HAIs and of the excessive length of stay can help gain needed resources and physician support.<sup>4</sup> Practical methods are needed to engage healthcare executives in evaluating the true cost of HAIs in their organizations. Hospital leaders' awareness that HAIs impact their patients may not always lead to understanding the extent of the financial burden of HAIs or the cost-effectiveness of infection prevention and control programs. Organizations may have inadequate methods to investigate the true cost of HAI in their institutions. Executives and clinicians in hospitals with HAI rates at or below nationally published rates may become complacent, accepting that a certain degree of patient harm from infections is an unavoidable price of caring for older, sicker patients. Common misconceptions about HAIs need to be dispelled. These misperceptions include (1) the fallacy that the incidence of HAI in most institutions is insignificant; (2) the erroneous belief that additional cost of HAIs is largely offset by reimbursement, making cost savings associated with reduction of HAIs not worth the investment, and (3) the misperception that HAIs are an expected outcome of treating an older, sicker patient population with escalating use of invasive procedures.<sup>5</sup>

### Economic Burden of HAI

HAIs consume resources, prolong patients' hospital stays, and are only partially reimbursed at best.

An economic analysis of central line-associated bloodstream infections (CLABSIs) at Allegheny General Hospital in Pennsylvania from 2002 to 2005 examined hospital revenues and expenses in 54 cases of patients with CLABSIs in two intensive care units (ICUs). The average payment for a case complicated by CLABSI was \$64,894, and the average expense was \$91,733 with a gross margin of minus \$26,839 per case and a total operating loss of nearly \$1.5 million from the 54 cases.<sup>6</sup>

In addition to revenue loss, there are hidden costs and lost financial opportunities associated with HAIs. For example, when patients are brought back to the operating room (OR) for an incision and drainage of a postsurgical site infection, both the surgical suite and the OR team are tied up, and new cases cannot be scheduled. Primary procedures are often reimbursed at a higher rate than follow-up procedures.<sup>4</sup>

The 2007 Pennsylvania Health Care Cost Containment Council (PHC4) report on HAIs in Pennsylvania hospitals shows that the average charge for care grew from \$35,168, with an average length of stay of 4.4 days, for cases without an HAI to \$191,872 for

those cases with an HAI, with an average length of stay of 19.7 days. PHC4 reported that in almost all cases, hospitals do not receive full reimbursement of charges; on average, in 2006 and 2007, hospitals statewide were paid approximately 27% of established charges (see Table).<sup>7</sup>

The misconceptions regarding the financial significance of HAIs are dispelled by the CDC in its 2009 report on the direct medical costs of care related to secondary infection diagnosis, increased length of stay, and expensive HAI outbreaks. The report also describes additional cost components, which reflect the socioeconomic consequences of HAIs such as indirect and intangible costs of HAIs related to diminished quality of life (e.g., permanent disability, lost wages).<sup>2</sup>

CDC reports that the cost of HAIs per patient (based on the 2007 consumer price index) ranges from approximately \$20,000 to \$25,000.<sup>8</sup> Diagnosis-related group (DRG) based reimbursement is not increased when a patient develops an HAI, as there are no specific DRG codes available for HAIs. Hospitalized patients may be covered by Medicare and Medicaid, which in most cases reimburse fixed amounts based on diagnosis. The hospital then has to absorb the additional costs associated with HAIs, while the HAIs simultaneously prevent the hospital from taking new admissions with reimbursable conditions.<sup>5,9</sup> The Centers for Medicare and Medicaid Services (CMS) regulations, effective in 2008, now refuse reimbursement to hospitals for the excess costs of certain types of infections. (See “The Department of Health and Human Services Action Plan to Prevent Healthcare-Associated Infections.”)

The current legal and regulatory landscape has changed in a large part due to the success of hospitals across the country with HAI prevention programs. HAIs that were previously thought of as defensible are now considered to be preventable adverse events. IPs will play a larger role in protecting their hospitals against liability in the future.<sup>10</sup>

Based on recent guidelines from the Society for Healthcare Epidemiology of America (SHEA)<sup>3</sup> and

the Association for Professionals in Infection Control and Epidemiology (APIC),<sup>5</sup> a business case exists if the intervention realizes a financial return on investment through hospital profit, loss reduction, or cost avoidance in a reasonable time frame. Comparing the cost of an infection prevention and control program or intervention to the benefits—lowering rates of HAI and preventing harm and death—is the best method for justifying the investment in prevention efforts.

**Return on Investment**

Possibly the greatest opportunity to demonstrate a positive return on investment in infection prevention and control is by decreasing patients’ hospital length of stay and releasing those beds to new patients, consequently increasing volume, revenue, and reimbursement.<sup>11</sup> This opportunity reinforces the evidence that financial investments in infection prevention and control programs offer good value and that resources to implement best practice strategies at the bedside should be made available.<sup>8</sup> In assessing the extent to which HAIs are preventable, CDC estimates that effective infection control programs could prevent up to 70% of infections. This can translate into potential savings nationwide of up to \$31.5 billion of the \$45 billion expenditures attributed to HAIs.<sup>2</sup>

The components of a high-quality infection prevention and control program include sufficient staff with time to conduct risk-adjusted surveillance; staff education; isolation and outbreak management; report review and development; employee health activities; tasks intended to meet regulatory requirements, including public reporting tasks; clinical implementation of evidence-based best practices; and process improvement activities. Program resource needs include trained IPs, clerical support, at least a part-time epidemiologist, physician champion and clinical nurse liaison hours, supplies, data mining support, and education.<sup>11,12</sup> Successful infection control programs are supported by clinicians, physicians, and executives in an organizationwide culture of safety.

The average cost for staffing that includes two IPs, one member of clerical support staff, and a part-time medical director is estimated at \$300,000.<sup>13</sup>

**Table. Pennsylvania Healthcare Cost Containment Council Hospital-Acquired Infections, 2007 Report Highlights**

2007 CASES	NUMBER OF CASES*	INFECTION RATE PER 1,000 CASES	MORTALITY		AVERAGE LENGTH OF STAY (IN DAYS)		AVERAGE CHARGE	
			Number	Percent	Mean	Median	Mean	Median
Statewide	1,578,600	17.7	35,120	2.2%	4.7	3.0	\$37,943	\$20,111
Cases with a hospital-acquired infection	27,949	N/A	3,416	12.2	19.7	15.0	\$191,872	\$87,655
Cases without a hospital-acquired infection	1,550,651	N/A	31,704	2.0	4.4	3.0	\$35,168	\$19,748

\* The number of cases with infections represents the number of hospitalizations in which the patient contracted a hospital-acquired infection as identified and reported by the hospital.

Source: Pennsylvania Health Care Cost Containment Council (PHC4). Hospital-acquired infections in Pennsylvania in 2007 [online]. 2009 Jan [cited 2010 Apr 21]. Available from Internet: <http://www.phc4.org/reports/hai/07/default.htm>.

## The Department of Health and Human Services Action Plan to Prevent Healthcare-Associated Infections

The U.S. Department of Health and Human Services (HHS) released an action plan in January 2009, which estimates that 80% of all healthcare-associated infections (HAIs) in hospitals in the United States fall into one of four categories of infections: (1) catheter-associated urinary tract infections (CAUTI), (2) surgical-site infections (SSI), (3) intravascular catheter-related bloodstream infections (CLABSI), or (4) ventilator-associated pneumonia (VAP). The plan further states that hospital length of stay for patients infected with methicillin-resistant *Staphylococcus aureus* (MRSA) has tripled since 2000.<sup>1</sup> HHS has developed targets and metrics in a five-year plan aimed at eliminating infections, including *Clostridium difficile* infections and MRSA.

HHS prioritized recommendations for prevention of these infections based on evidence-based best practices outlined in related Healthcare Infection Control Practices Advisory Committee (HICPAC) recommendations. HAIs will be identified through the Centers for Disease Control and Prevention's National Healthcare Safety Network (NHSN) reporting modules and from administrative and discharge data. As of October 1, 2008, the Centers for Medicare and Medicaid Services no longer provides additional payment for hospital cases with secondary diagnoses of CAUTI, CLABSI, and selected SSI when the condition was not present on admission. These conditions were selected by three criteria: (1) high cost, high volume, or both; (2) assignment to a diagnosis-related group that has a higher payment when present as a secondary diagnosis; and (3) could reasonably have been prevented through the application of evidence-based guidelines.<sup>2</sup>

### Notes

1. U.S. Department of Health and Human Services (U.S. HHS). HHS action plan to prevent healthcare-associated infections [online]. [cited 2010 Feb 1]. Available from Internet: <http://www.hhs.gov/oph/initiatives/hai/infection.html>.
2. Centers for Medicare and Medicaid Services. Hospital-acquired conditions (HAC) [online]. 2008 Oct [cited 2010 Apr 21]. Available from Internet: <http://www.cms.hhs.gov/HospitalAcqCond/>.

This cost could be financed by avoiding fewer than nine surgical-site infections (SSI), based on the CDC 2009 direct cost estimates of \$34,670 per SSI.<sup>2</sup> Another study of 28 U.S. hospitals estimated that the hospitals' financial loss due to HAIs was 4.3 times greater than the amount the hospitals invested in prevention in 2005.<sup>9</sup>

Examples of cost savings associated with a well-resourced, quality infection control program include the expertise of an IP to eliminate supply waste

through the appropriate selection of products and expensive technology, avoidance of regulatory citations<sup>14</sup> and fines for lack of progress in decreasing infection rates,<sup>15</sup> and enhancement of the organization's image by minimizing the threat of outbreaks, resistant pathogens, employee injuries from blood-borne pathogens, HAI disclosures, sentinel events, and malpractice claims.<sup>10,16</sup> Many infection prevention practices can improve quality without much of a financial investment. These include nurse-driven catheter removal protocols, proper equipment disinfection, hand hygiene, process and outcome measurement, and accountability standards for compliance.

### Success Models

Hospitals across the country are taking an aggressive stance against HAIs, demonstrating that infections are not an expected outcome of treating older, sicker patients and that hospitals have a significant opportunity to improve their bottom line by eliminating HAIs.<sup>5</sup>

A 2004 Johns Hopkins Hospital study on the effects of a multifaceted infection control intervention program on CLABSI found that implementation of simple, inexpensive interventions prevented 43 CLABSIs and eight deaths and saved nearly \$2 million in additional costs to the hospital.<sup>17</sup>

Pennsylvania's public reporting mandate necessitates support for hospitalwide surveillance of HAIs in acute care hospitals. Across the state, HAIs dropped nearly 7.8% from 2006 to 2007. According to PHC4's latest study, 27,949 patients contracted an infection during their hospitalization in 2007—a decrease from 30,237 patients in 2006. This represents a drop in the infection rate of 7.8%, from 19.2 infections per 1,000 cases in 2006 to 17.7 per 1,000 cases in 2007.<sup>7</sup>

St. Christopher's Hospital for Children in Philadelphia implemented a modified neonatal ventilator care bundle, decreasing the ventilator-associated pneumonia (VAP) rate in the neonatal ICU from 3.9 (10 cases) per 1,000 ventilator days in 2006 to 0.3 (1 case) per 1,000 ventilator days in 2008.<sup>18</sup> CDC estimates the cost of one case of VAP to be \$28,508.<sup>2</sup>

### Making the Business Case for Infection Prevention

#### An Administrator's Perspective

Administrators see infection prevention and control programs as cost centers because the costs cannot be passed onto anyone else. Infection prevention's value to the organization is based on how well HAIs are prevented and controlled. There are a number of ways in which that value is added; for example, reducing HAI damage to the hospitals' operating budget can also reduce legal liability. The public's demand for accountability for public safety has increased, giving IPs the advantage of more leverage as they represent best practices. The primary cost of HAIs to the hospital is the loss of bed days due to prolonged length of stay. The loss of higher paying, new admissions represents the gross costs of HAIs and the value of

prevention. For example, an intervention that shortens a patient's stay in intensive care or lessens the need for surgery is a plus because the hospital gets more productivity out of the existing facility. Administrators want to know what comprises an effective infection prevention and control program, the costs and savings to the hospital, how much to invest, and what else could be done with the resources released through HAI prevention. They want the information in a timely fashion for budget consideration—at that time, there will be competition with every other department in the hospital. Administrators can be greatly influenced by a physician champion—physicians control 85% of healthcare spending in the United States, and they control the number of patients coming into the institution.<sup>4</sup>

A January 2010 survey of 203 senior hospital executives across the United States found that, despite current severe financial constraints, hospitals of all sizes are employing sophisticated budget strategies in a commitment to reduce infection rates. Surveyed hospital executives anticipate that focus on patient safety is a key component of an organization's strategy to enhance its reputation in select specialties. Infection prevention and control was identified as one of the top five categories with the highest budget growth potential. However, the report also found that just one-third of respondents are willing to increase spending to reduce errors and infection rates.<sup>19</sup>

### From an IP Standpoint

When making the business case for increased infection prevention and control resources, data gathered for the infection prevention and control committee should be shared with people who decide how resources are allocated. Be prepared to discuss which interventions require *minimal* or no financial investment (e.g., standardization of work processes, compliance with checklists, teamwork, communication, collaborative efforts) and which are cost-effective. Any information about the excess number of days and costs attributable to HAIs is likely to be favorably received, as administrators are often receptive to information on the number of beds occupied by patients with HAIs.<sup>4</sup>

In a 2008 survey of IP challenges to maintaining a quality infection prevention and control program, 30% of the 930 respondents suggested that executives and physicians are their most important resources to meet HAI challenges; of those looking for leadership, only half indicated that these executives and physicians are leading the charge against infections in their facilities. Fifty-seven percent cited regular infection prevention and control agenda discussion at board meetings, but only 15% said leadership provided feedback and recommendations. Survey respondents also indicated challenges in the areas of engaging information technology support, measuring compliance, providing adequate staffing, removing indwelling urinary catheters, ensuring appropriate physician

medical record documentation, and having sufficient time for surveillance investigation.<sup>20</sup>

### Steps to Completing an Infection Control Business Case Analysis

Before asking for more support and presenting infection control programs to management, it is important to accurately and comprehensively identify the key issues in the organization and where best to direct efforts. For example, focus on which types of infections are more prevalent, locations where endemic infection rates are particularly high, or locations where surveillance and prevention efforts have been sporadic or lacking.<sup>4</sup>

Focus the hospital executive team's attention on the number of infections avoided and the dollars saved by infection control interventions that have been successful in the past. Identify a patient group (e.g., intensive care patients), the infection prevented, and all reasonable strategies that might prevent that type of infection.<sup>8</sup> Develop clinical practice priorities based on the Department of Health and Human Services (HHS) action plan, which have the potential to decrease HAIs based on: (1) supporting scientific evidence that the recommended practice is effective, practical, and urgent; (2) recognized gaps in current implementation of the practice (full versus partial implementation); and (3) the "bundling" or implementation of several practices at the same time to ensure the effectiveness of the action plan.<sup>21</sup> Assessment of adequate resources for an infection prevention and control program includes identification of the scope of patient populations being served, the number of trained and certified IPs in the facility, the types of programs in which the IP is involved, and a practice analysis. This analysis describes the frequency and estimated hours required each week for infection prevention and control activities and identifies areas of the program that may be underresourced.<sup>11</sup>

The process of completing a business case can be divided into practical steps to analyze how HAIs are impacting the organization's bottom line, calculate the economic value of reducing HAIs using the facility's internal data, and assist the hospital epidemiologists and IPs in justifying and expanding the infection prevention and control programs.

In an effort to enhance the attention and resources dedicated to the zero-tolerance culture regarding HAIs and to calculate the estimated value (i.e., excess cost) of eliminating HAIs in the organization, APIC and SHEA recommend the following methods:<sup>3,5</sup>

**Prepare an executive summary.** Start with a statement of purpose. Describe the intervention requested, explain why it should be pursued, and review the financial implications of not pursuing it.

**Identify a financial partner.** Infection prevention and control specialists need to work with the financial specialists in the organization to identify which services provided were attributable to the infection and the cost of that service.

**Frame the problem.** Select an HAI or a population within the last year to be analyzed. Select a number of cases (e.g., 10) of patients who acquired a CLABSI or select a class of HAI for the last year. Develop potential solutions based on these cases.

**Meet with key administrators or physician leaders.** Before the start of the analysis, obtain agreement that the issue is of institutional concern and has the support of leadership. Administrators can help to identify individuals or departments that may be affected by the proposal and also help identify the critical costs and factors that should be included.

**Determine the costs associated with the infection of interest.** Emphasize the complications that would not have occurred during a hospital stay without the HAI. With the financial advisor, identify actual or estimated costs and reimbursement, and calculate the difference between profits with and without an HAI. Use available hospital administrative data for the amount of costs that are reimbursed, or use estimates from literature. An alternative method of calculating the attributed cost of an HAI is to multiply the mean increase in length of stay for HAI cases by the mean daily cost for a hospital stay. For example, if the average daily cost for a patient intubated in ICU was \$3,000 a day and the average increase in the length of stay was seven days due to a VAP, the increased cost would be \$21,000. Estimate additional revenue gained by filling the additional bed days available.

**Determine which costs can be avoided through reduced infection rates.** Use proposed or actual past reduced infection rates or published data. Calculate the gross margin for the case by subtracting the expenses from the reimbursement. Compare the gross margin for the case to the gross margin of similar cases without an HAI. Analysis of your organization's costs is more credible than general estimates from studies. (An example of this calculation can be found at <http://www.premierinc.com/safety/topics/guidelines/downloads/09-hai-whitepaper.pdf>.)

**Calculate the financial impact.** Subtract the upfront and future outlay costs from the estimated cost savings. Determine the annual cost of an infection prevention and control program, as well as the salary and benefits of the IP. When looking at a specific project or intervention, estimate the percent of IP time needed to support the project based on his or her hourly rate. Include the additional reduced costs and benefits expected from impact of the infection control intervention on other processes or other types of preventable infections

**Make the business case.** Once the analysis of the HAIs in the organization is completed, use this information to target an area that has significant opportunity for improvement and then set the target for elimination of this HAI. Develop an implementation plan, determine current support for the initiative, and answer anticipated questions before presenting the initial findings to critical stakeholders.

**Identify process defects and institute changes.**

Institute necessary systems or practice strategies where indicated.

**Measure results.** Collecting outcomes, costs, and implementation data allows comparison with units where the intervention has not yet been implemented. Prospectively collecting cost and outcome data once programs are in effect can illustrate stable outcome rates or continued improvement associated with the intervention.

A sample business plan is available at <http://www.ih.org/NR/rdonlyres/EEC35DF1-03244C69-A401-05BD178E555E/2735/YumaBusinessPlanTemplate.pdf>.

**Conclusion**

CDC estimates that as much as \$31.5 billion of the \$45 billion annual direct cost of HAIs could be saved with an effective infection program, which would significantly reduce the economic burden. Reimbursement is currently affected by the determination that some infections can reasonably be prevented through application of evidence-based practices. The evidence is compelling that taking action to invest in an effective infection control program can have a profound positive impact on the organization's bottom line and reputation, prevent the catastrophic effects of HAI, and improve patient safety and satisfaction. Hospital success stories highlight the opportunities for all organizations to make zero HAIs a target, and many protocols can be implemented without much of an investment. Application of practical guidelines to develop an infection prevention and control business case will assist hospital IPs and epidemiologists to justify and expand much-needed programs. The true investment is the organizational commitment from healthcare leaders and clinicians to engage in a fresh approach to providing patient care in a culture of safety and to set the goal number of HAIs at zero. This requires acknowledging the high-risk nature of the organization's activities, as well as investing in infection prevention programs, allocating resources needed for optimal programs, and making infection prevention an institutionwide priority.

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# PENNSYLVANIA PATIENT SAFETY ADVISORY

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## THE PENNSYLVANIA PATIENT SAFETY AUTHORITY AND ITS CONTRACTORS



The Pennsylvania Patient Safety Authority is an independent state agency created by Act 13 of 2002, the Medical Care Availability and Reduction of Error ("Mcare") Act. Consistent with Act 13, ECRI Institute, as contractor for the Authority, is issuing this publication to advise medical facilities of immediate changes that can be instituted to reduce Serious Events and Incidents. For more information about the Pennsylvania Patient Safety Authority, see the Authority's Web site at <http://www.patientsafetyauthority.org>.



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