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Dispelling the Myths:

The True Cost of Healthcare-Associated Infections

AUTHORS
Denise Murphy, RN, BSN, MPH, CIC
Vice President, Chief Safety and Quality Officer
Barnes-Jewish Hospital at Washington University Medical Center, St. Louis, MO

Joseph Whiting, MBA, FACHE
Chief Executive Officer
JKW Consulting, South Elgin, IL

APIC's HAI Cost Calculator Development
Christopher S. Hollenbeak, PhD
Associate Professor of Surgery and Health Evaluation Sciences
Penn State College of Medicine, Hershey, PA

To obtain a copy of the HAI Cost Calculator, visit www.apic.org

APIC
ASSOCIATION FOR PROFESSIONALS IN INFECTION CONTROL & EPIDEMIOLOGY, INC.

APIC's mission is to improve health and patient safety by reducing risks of infection and other adverse outcomes. The Association's more than 11,000 members have primary responsibility for infection prevention, control and hospital epidemiology in health care settings around the globe, and include nurses, epidemiologists, physicians, microbiologists, clinical pathologists, laboratory technologists and public health practitioners. APIC advances its mission through education, research, collaboration, practice guidance and credentialing.

All inquiries about this document or other APIC products and services may be addressed to:

APIC Headquarters
1275 K Street NW,
Suite 1000,
Washington, DC 20005-4006

Phone 202.789.1890
E-mail apicinfo@apic.org
Web www.apic.org

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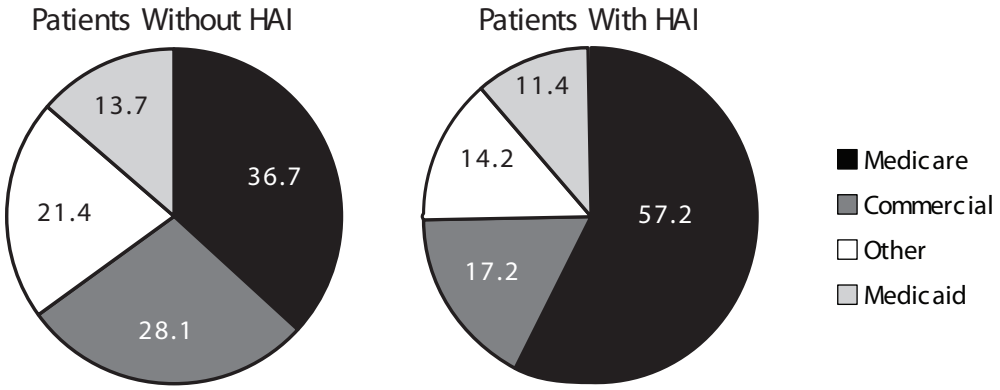
Executive Summary

Hospital leaders are aware that healthcare-associated infections (HAIs) impact patients but many have no idea of the extent of the situation and the degree to which HAIs impact cost and operating margin. For example, some hospital executives believe the number of inpatients that acquire an HAI is far smaller than the actual rate. The purpose of this paper is to present the business case for reducing healthcare-associated infections from the perspective of the healthcare executive. Case studies of significant cost savings are presented along with a methodology for determining the cost of various categories of HAIs.

The large impact these cases have on costs and operating margins is even more significant. A recent study of 1.69 million admissions from 77 hospitals found that patients with a healthcare-acquired infection reduced overall net inpatient margins by $286 million or **$5,018 per infected patient**. The study found that the average additional incremental direct cost for patients with an HAI was $8,832[1].

HAIs erode the bottom line. Therefore in classes where reimbursement is lower, the loss impact is even greater. Figures 1 and 2 demonstrate that the average payer mix for patients without infections is 37% Medicare, 28% commercial payers, 21% other and 14% Medicaid. For patients with healthcare-associated infections, the mix changes to **57% Medicare**, 17% commercial 14% other and 11% Medicaid[2]. Closer examination of payer type for patients with HAIs brings the potential for net loss into greater focus.



Figures 1 and 2.
SOURCE: *MedMined, Inc 1.69 million admission study September 2006*

Healthcare-associated infections have long been considered a byproduct of healthcare, an outcome of treating an increasingly older, sicker patient

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population with an increasingly invasive arsenal of interventions. The costs associated with these infections were thought to be largely offset by reimbursement. But as the methodology of accounting for the costs of HAIs has become more sophisticated, institutions are finding that HAIs are not revenue neutral or positive, that HAIs substantively erode the profit margin of the average hospital. Leading institutions are also finding that significant reductions in many categories of HAIs cannot only be reached but sustained, providing a substantive opportunity for improving patient outcomes and the bottom line as well.

There is emerging evidence that reimbursement for infection does not cover the cost of the required additional care. In fact, HAIs result in considerable operating losses in almost all cases.

This paper seeks to dispel three widely held myths where HAIs are concerned:

1. That HAIs are an expected byproduct of treating an older, sicker patient population with an increasing array of invasive techniques;
2. That the additional cost of an HAI is largely offset by reimbursement, making the infection revenue neutral or positive;
3. That the number of HAIs in most institutions is not significant, making the cost savings associated with reduction of HAIs not worth the investment.

Our goal is to aid healthcare executives in better understanding the true cost of HAIs and engage them in an evaluation of the costs in their particular institution. By clarifying the business case and providing a practical methodology to estimate the value of reducing healthcare-associated infections we are confident that hospital leaders will take a more aggressive approach to infection prevention.

Current Situation

The current system of reimbursement obscures the true cost of HAIs to health care institutions. There is emerging evidence that reimbursement for infection does not cover the cost of the required additional care. In fact, HAIs result in considerable operating losses to hospitals in almost all cases.

It is our position that pursuing perfection[3], setting HAI reduction strategies at the theoretical ideal (zero preventable infections), represents a substantial opportunity for hospital leaders to improve safety, quality and significantly reduce cost.

In 2005, the Top Issues Confronting Hospital CEO's survey conducted by the American College of Healthcare Executives ranked financial challenges as the number one concern of hospital CEOs[4]. Financial challenges had also been ranked number one in the 2003 and 2004 surveys. In addition to traditional financial challenges, the "C-suite" executives must respond to external pressures from regulatory and standard-setting agencies, consumer advocacy groups, and their own community boards to reduce adverse outcomes of hospitalization.

The pressure to keep patients safe and deliver high quality clinical outcomes will further impact reimbursement as pay for performance initiatives become a reality nation-wide. All this said, most executives would agree that keeping patients safe is the right thing to do regardless of financial implications. We hope to provide evidence to demonstrate that infection prevention is not only the right thing to do for patients, but is good business as well.

Healthcare-associated infections cost between five and six billion annually and result in almost one hundred thousand deaths in the United States.

Evidence

In the past decade there has been increasing activity in the measurement of the specific impact infection prevention has had on operating margins and excess costs associated with HAIs. Healthcare-associated infections cost between $5–6 billion annually and result in almost 100,000 deaths in the US[5]. This paper presents two notable examples of healthcare organizations that documented the economic value of eliminating HAIs and did it using validated economic analysis[6].

Allegheny General Hospital

Bloodstream infections are a risk for patients needing vascular access lines, especially if lines are placed in large central veins leading to the heart.

In 2004, the Jewish Health Foundation and Pittsburgh Regional Health Initiative launched an all-out assault on central line associated bloodstream infections (CLABs) through implementation of evidence-based prevention measures. With 40 hospitals working in concert, they set their theoretical goal at zero, meaning their target was no central line infections. With results audited by the Centers for Disease Control and Prevention, they were able to achieve an overall 63% reduction in these serious adverse outcomes of hospitalization.

One participant, Allegheny General Hospital, was able to achieve a 90% reduction in CLABs from fiscal year 2003 to 2004 (from 49 to 3 with an average savings of $14,572 per CLAB[7]. A summary of the Allegheny General's CLAB-related study, as reported in the Nov-Dec 2006 American Journal of Medical Quality Supplement on Hospital-Acquired Infection: Meeting the Challenge (Richard P. Shannon, MD), yielded the following information:

- Average reimbursement per case: $64,894
- Average cost per case with CLAB: $91,733
- Average **Loss** per case: **$(26,839)**
- Total **Loss** from operations associated with CLABs: **$(1,449,306)**
- Percent of total cost of care associated with CLABs: **43%**
-

What price tag can be placed on the lives saved from successful prevention measures deployed by this organization?

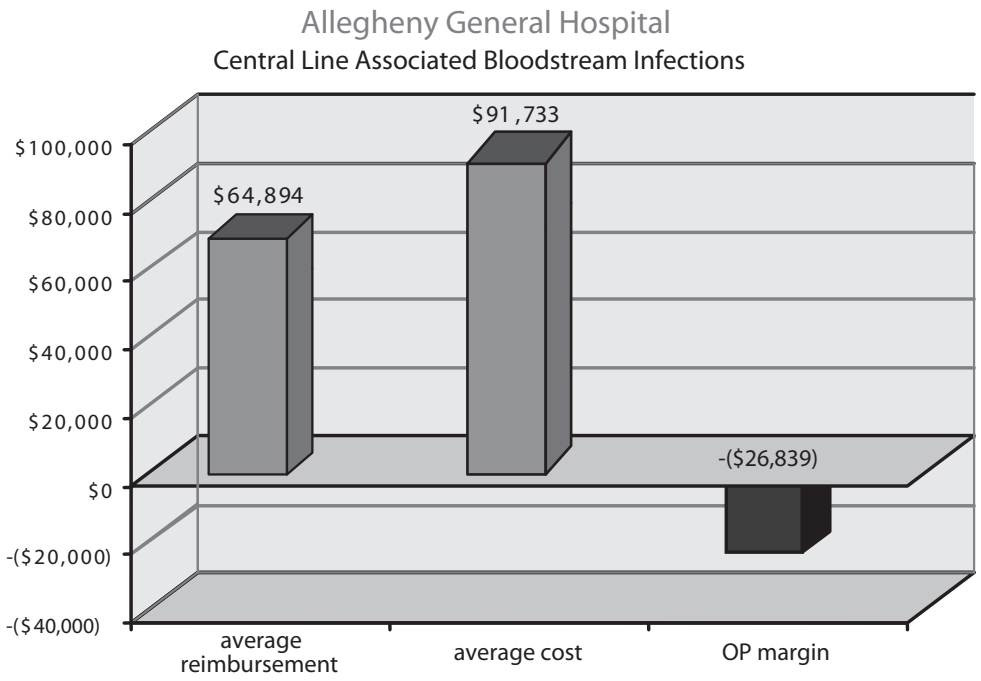

Figure 3.
SOURCE: *Shannon, R.P. (unpublished data)*

In addition to their work on CLABs, AGH also demonstrated significant improvement in reducing ventilator-associated pneumonias (VAPs). Their results showed a reduction from 46 VAPs in FY 2003, and 45 in 2004 to 8 in FY 2005 (82% reduction). Their economic analysis for fiscal years 2003–2005 indicated that cases with a VAP resulted in lost revenue. VAP cases averaged a loss of $(24,435). The average reimbursement for VAP cases totaled $62,883 while the average cost was $87,318; therefore, the average loss for each case was $(24,435).

During the two year effort to eliminate CLAB's and the one year effort targeting VAPs, the total cost savings was $2.2 million. The cost to obtain this level of savings was just under $35,000. The cost per ventilated patient to achieve the targeted improvement was just $17. Note that the mortality associated with ventilator-associated pneumonia and central line associated bloodstream infections is 20–60%. What price tag can be placed on the lives saved from successful prevention measures deployed by this organization?

BJC HealthCare

In 1996, infection control leaders at BJC HealthCare, a 13-hospital, non-profit health care system based in St. Louis, Missouri, presented to their senior management and board of directors a formal business case for increasing

resources to eliminate HAIs. In 2000, they estimated the excess cost generated by just four categories of healthcare-associated infections (CABG surgical site infections (SSI), spinal SSI, bloodstream and ventilator-associated pneumonia infections) at **$8.2 million** across all BJC hospitals. Based on this information, leadership approved an investment of $350,000 to enhance system-wide efforts to eliminate HAIs. Individual hospitals also invested an additional $50,000–$150,000 to increase full time equivalents (FTEs) dedicated to infection prevention and/or medical direction during that same time period. By year end 2001, the same four categories of HAI were associated with excess costs of $6.4 million, an almost $1.8 million dollar reduction in excess costs.

Table 1 contains a summary of the impact of targeted interventions at Barnes Jewish Hospital, BJC's 1300 bed academic medical center, between 2000 and 2004. In a four year period, infection prevention efforts yielded a reduction of excess cost in just four HAI categories of almost $2.5 million. Studies

Table 1

Barnes Jewish Hospital—Impact of Interventions To Decrease Healthcare-Associated Infections

	2000	2004	Intervention Impact
CABG Surgical Site Infections (SSI)			
#SSI	43	18	-25
%SSI	6.8%	5.6%	-18%
Excess Cost	$825,000	$322,610	-$502,390
Spinal Surgical Site Infections (SSI)			
#SSI	20	5	-15
%SSI	2.07%	0.8%	-61%
Excess Cost	$301,327	$44,823	-$256,504
Bloodstream Infections (BSI)			
#BSI	309	87	-222
BSI/1,000 patient days	8.4/1000	1.5/1000	-82%
Excess Cost	$1,446,120	$459,690	-$986,430
Ventilator Associated Pneumonia (VAP)			
#VAP	166	73	-93
VAP/1,000 ventilator days	10.1/1,000	4.8/1,000	-52%
Excess Cost	$1,382,780	$632,180	-$750,600
Total Cost of all HAI tracked	**$3,955,225**	**$1,459,303**	**-$2,495,924**

SOURCE: *Denise Murphy, Marilyn Jones, BJC Infection Control and Healthcare Epidemiology Consortium, St. Louis, MO.*

evaluating "routine" processes such as changing of ventilator circuits every 24-48 hours also resulted in annual savings of $1 million in supply and equipment reductions associated with fewer ventilator circuit changes (with no adverse impact on patients).

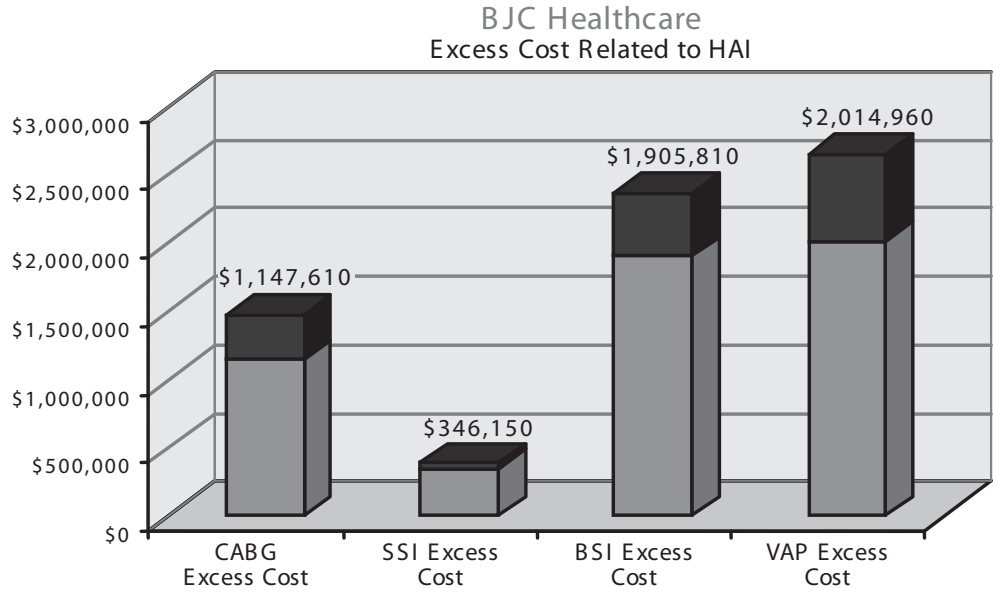

Figure 4.
SOURCE: *Denise Murphy, Marilyn Jones, BJC Infection Control and Healthcare Epidemiology Consortium, St. Louis, MO.*

In addition to the cost of infections, Infection Prevention Specialists also began sharing excess length of hospitalization with executives. In 2000, surgical site infections after coronary artery bypass graft surgeries alone resulted in 1,350 excess days (average of 27 days/SSI) **over** the expected stay for patients who did not acquire an infection. With volumes being the main driver of revenue, this information supported the need for enhanced prevention efforts.

Opportunity Cost

Based on the data submitted for the first nine months of 2005, it is estimated that HAIs added 227,000 extra hospital days in Pennsylvania alone.

As noted above, a largely hidden cost of HAIs is the additional patient days they consume. While many hospitals routinely run near or at capacity, the elimination of HAIs can provide the hospital with additional patient care capacity at little or no cost. A 1985 article estimated that HAIs add a total of **7.5 million excess patient days** nation wide[9]. According to the Pennsylvania Healthcare Cost Containment Council (PHC4), the 1.9 million admissions in their state in 2005 without an HAI had an average length of stay less than 5 days[10]. For the 24,000 admissions that were reported with an HAI, the average length of stay

was **23 days**. Based on the data submitted for the first nine months of 2005, it is estimated that HAIs added **227,000 extra hospital days** in Pennsylvania alone. Pursuing zero tolerance for HAIs can free up a significant number of bed days that can be used for patients potentially bringing in a higher level of reimbursement.

The evidence is compelling that taking action to invest in prevention can have a profound positive impact on the organization's bottom line, patients' safety and satisfaction, and reputation.

The Business Case

The business case for pursuing perfection and eliminating HAIs is designed to identify the reasons for action and the expected benefits. The business case for quality can be defined as "an analysis aimed at determining the economic liabilities of preventable errors to ensure that an investment in quality will bring the greatest value"[11]. The evidence is compelling that taking action to invest in prevention can have a profound positive impact on the organization's bottom line, patients' safety and satisfaction, and reputation. Whenever possible, meaningful measurements should be expressed in operational terms. The importance of forming a partnership with the Finance Department at the outset in the development of the business case, in which the infection prevention and control specialist and a finance partner work together to quantify the economic impact of HAIs to the organization, is key. In this case, the focus is on demonstrating that operating margins can be improved as a result of targeted actions to reduce HAIs to zero.

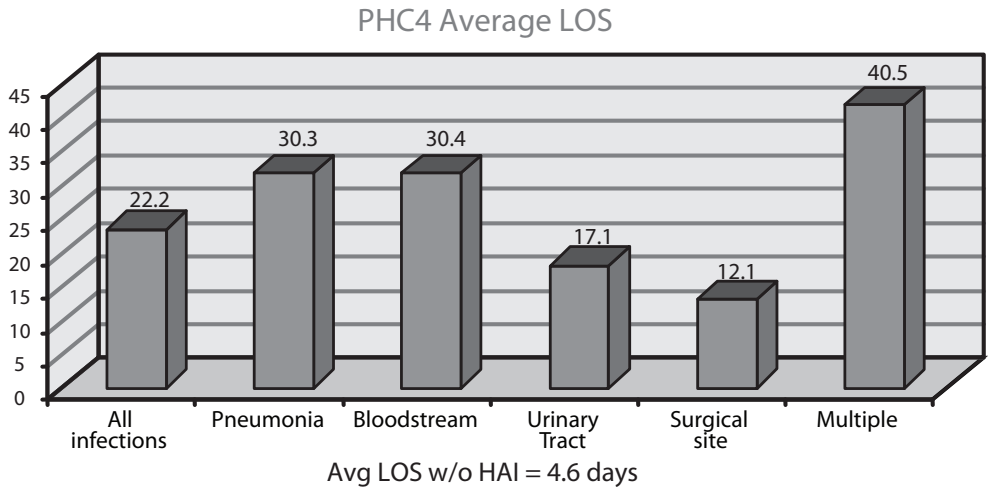

Figure 5.

Methodology

While it may be interesting to read the validated financial results from other organizations, our primary purpose is to provide the reader with practical guidelines to analyze how HAIs are impacting their bottom line. What follows is a simple and practical methodology that can be used to calculate the economic

value of reducing HAIs in your organization. Based on the cases outlined above, we believe that most if not all hospitals have a significant opportunity to improve the bottom line by eliminating HAIs. The following methodology will enable you to identify and quantify that opportunity by using your own organization's data.

To calculate the estimated value (excess cost or impact on margin) of eliminating HAIs in your organization, the following methodologies are suggested:

1. Select one of the following options for the population to be analyzed.
   a. Option 1 – select a number such as 10 patients who acquired a CLAB
   b. Option 2 – select a class of HAIs for the last year. (Include any case where a payer was billed for any service related to a healthcare-associated infection. DO NOT include a case if the primary cause of admission was for an infection; DO INCLUDE readmissions for HAI.)
2. Identify the actual or estimated reimbursement for each case
3. Identify the total costs associated with the case, based upon activity-based cost accounting, if available
4. Identify the costs attributable to the HAI
   a. This step requires clinical and financial expertise to identify which services provided were attributable to the infection AND the cost of these services

Table 2
The Impact of CLAB's on Gross Margin*[12]

	DRG 20 4/2721 (n=3)	DRG 191 (n=3)	DRG 483 (n=2)	
	Acute Pancreatitis	Pancreatitis w/ cc**	Pancreatitis w/ tracheotomy	Case w/ Pancreatitis with CLAB
Revenue ($)	5,907	99,214	125,576	200,031
Expense	5,788	58,905	98,094	241,844
Gross Margin	119	40,309	27,482	(41,813)
Costs attributable to HAI				170,565
LOS	4	38	41	86

**CLAB – central line-associated bloodstream infection*
*** Complication/comorbidity*

SOURCE: *Shannon, R.P., et al. ASMQ Supplement, Vol 21, No. 6, 2006*

5. Calculate the Gross Margin for the case by subtracting the expenses (3) from the reimbursement (2)
6. Compare the gross margin for the case to the gross margin of similar cases without a healthcare-associated infection, matched for age, principal diagnosis, and admission severity
   a. See Table 2

When you have completed the analysis of the HAIs in your organization, use this information to target an area that has significant opportunity for improvement, and then "pursue perfection". Set the target for elimination of this HAI. This approach drives innovation, removes complacency, centers on patients' needs and spurs deep system change.

Continued research and performance improvement efforts must be dedicated to eliminating HAIs and providing a safer environment for patients and providers. These efforts must be supported, if not led, by executive leadership.

Call to Action

In an effort to enhance the attention and resources dedicated to the culture of zero tolerance toward HAIs, it is critical that organizations commit to the following actions:

1. Identify a financial partner to work with Infection Prevention and Control Specialists in your organization.
2. Quantify the economic impact of HAIs in your organization by using the methodology described above.
3. Based on the results of this economic analysis, target a high risk, high volume procedure or patient population and lead efforts to eliminate HAIs using a zero tolerance (or "pursue perfection" mentality).
4. Ensure that Specialists are educating healthcare workers about infection prevention and driving applicable evidence-based best practice recommendations.
5. Identify process defects and institute necessary systems or practice changes where indicated.
6. Measure the results of the efforts and repeat the process.

Conclusion

There is a finite supply of health care dollars in the United States. Regardless of whether health care coverage is managed by employers, insurance companies or the government, consumers fund the system. It is the responsibility of executives and clinicians to protect this investment. To accomplish this task requires an understanding of the risks and liabilities associated with entering the health care system and what it takes to improve health care delivery. Continued research and performance improvement efforts must be dedicated to

eliminating HAIs and providing a safer environment for patients and providers. These efforts must be supported, if not led, by executive leadership.

Because many deserving issues don't get attention unless executives understand their economic implications, APIC is committed to continuing to communicate and clarify the business case for infection prevention. We hope that the practical examples presented in this executive briefing will encourage hospital executives, especially financial executives, to develop a deeper understanding of the economic impact of healthcare-associated infections and, with that understanding, undertake the steps that will lead to healthier bottom lines and improved patient outcomes.

The dollars and infection rates are about people—our family, our friends and our neighbors, who are needlessly harmed every day, and the significant human and economic costs associated with these events.

An Actual Patient Account:

In February 2002, a 37-year old father of four was admitted to the hospital with acute Pancreatitis. Three days into his stay he developed abnormally low blood pressure and respiratory failure. On Day 6, his blood culture tested positive for MRSA (methicillin-resistant *Staphylococcus aureus*) after a femoral vein catheter had been in place for 4 days. The patient had multiple complications related to the infection which required an exploratory laparotomy (a surgical procedure to gain access to the abdominal cavity) and eventually a tracheostomy (a surgical procedure on the neck to provide a direct open airway). On the 86th day of his stay, the patient was discharged to a nursing home. He never returned to work.

The total cost of this patient's care was $241,844, 70% of which ($170,565) was attributable to the central line-associated bloodstream infection (CLAB) he acquired while in the hospital. This patient had commercial insurance which reimbursed the hospital $200,031. Despite this high level of reimbursement, **the hospital lost $41,818 on this case alone**. While this case represents a severe impact of a healthcare associated infection, it is an all too common occurrence.

This story and millions like it occur every year in American hospitals. While our primary objective is to increase hospital leadership attention to the economics of healthcare-associated infections, the dollars and infection rates are about people—our family, our friends and our neighbors, who are needlessly harmed every day, and the significant human and economic costs associated with these events.

SOURCE: *Shannon, R.P., et al. ASMQ Supplement, Vol 21, No. 6, 2006*

APPENDIX

Definitions

Activity-Based Cost Accounting: A powerful tool for measuring performance, Activity-Based Costing (ABC) is used to identify, describe, assign costs to, and report on operations. A more accurate cost management system than traditional cost accounting, ABC identifies opportunity to improve business process effectiveness and efficiency by determining the "true" cost of a product or service.

Attributable Cost: The services provided and billed to a patient that were caused by a healthcare-associated infection.

Business Case: A business case addresses at a high level the business need that the project seeks to resolve. It may include the reasons for the project, the expected business benefits, the options considered (with reasons for rejecting or carrying forward each option), and the expected costs of the project, a gap analysis and the expected risks. The option of doing nothing should be included with the costs and risks of inactivity included along with the differences (costs, risks, outcomes etc) between doing nothing and the proposed project.

Excess Cost/Length of Hospital Stay: The cost/LOS the patient incurred as a result of a healthcare-associated infection over and above usual costs and LOS. The cost/LOS that would be avoided if an HAI did not occur.

Healthcare-associated Infection: A localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that:

1. occurs in a patient in a hospital, and
2. was not found to be present or incubating at the time of admission unless the infection was related to a previous admission to the same setting.

Operating Income: The amount by which total operating revenue exceeds total operating expenses.

Operating Margin: The ratio of operating income to total operating revenue. This measure places operating income in perspective with the volume of business realized by the hospital.

There is a finite supply of health care dollars in the United States. Regardless of whether health care coverage is managed by employers, insurance companies or the government, consumers fund the system.

Executives, especially financial leaders, can have more of an effect on elimination of HAIs simply by talking about zero tolerance, and making small incremental investments in prevention, than all the policies and procedures in the world.

Best-practice Examples

During the Futures Summit on "The Economics of Infection Prevention" sponsored by APIC in April 2006, several best-practices for the elimination of HAIs were shared. These practices significantly contributed to an organization's pursuit of a zero tolerance approach to HAIs. These practices are not absolute guarantees of success, and not all practices may work at every organization. They are, however, worthy of consideration as part of a comprehensive strategy to enhance infection prevention and patient safety.

Champions

A common denominator in achieving a zero tolerance strategy is the commitment of champions to this effort. Often champions become engaged in the fight to eliminate HAIs as a result of their involvement in an incident where a patient was severely injured by an HAI, or when a relative or friend had suffered the effects of an HAI. Successful transformation toward a prevention vs. a reactive culture is generally a result of the extraordinary efforts of a few dedicated people. Organizations should identify, invest in, and empower those people.

Leadership

Organizational leaders set the culture and language shapes it. Executives, especially financial leaders, can have more of an effect on elimination of HAIs simply by talking about zero tolerance, and making small incremental investments in prevention, than all the policies and procedures in the world.

Data and Human Focus

Several of the organizations who have been most successful in the fight to eliminate HAIs have found a way to present data to governing boards, quality committees and other groups that promote a bias toward action. For example, HAIs are often reported using rates. If an organization's rate is 5.1/1000 patient days and our competitor's rate is 5.4/1000 patient days, this may appear acceptable. Also, communicating rates does not define how many people are being injured and possibly killed by HAIs. No infection is acceptable despite the fact that, in hospitals, all infections are not preventable. Key decision makers must know numbers of people affected, rates, action plans and the resources it will take to get to zero.

Language Barrier

HAI-related information is often communicated using terms that are unfamiliar to many non-clinical leaders. To enhance the success of HAI elimination efforts, it is important to create an environment where non-clinical leaders

receive data and information they can understand. It is equally as important for Infection Prevention and Control Specialists to work with financial leaders and learn the language and terms of business and finance, such as payer mix, ROI and operating margin. The sooner we can remove language barriers, the sooner we can create better results together.

Results First

While resources are critical to support the fight, demonstrating success and return on investment makes a great case for enhancing resources. Succeeding first, THEN asking for more resources, is a good strategy. CFOs can help clinicians in Infection Prevention and Control to never assume that adding resources is the only way to improve care. Collaborate to find ways to enhance prevention program efforts even if additional FTEs are not possible. The Specialists, once successful in eliminating infections, may begin bargaining for a percentage of the organizational cost savings to further enhance prevention efforts.

CFOs can help clinicians in Infection Prevention and Control to never assume that adding resources is the only way to improve care.

[1] 1.6 Million Admission Analysis, MedMined, Inc. September 2006

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1275 K Street NW, Suite 1000
Washington, DC 20005

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