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Perceived impact of the Medicare policy to adjust payment for health care-associated infections

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Abstract

Background—In 2008, the Centers for Medicare and Medicaid Services (CMS) ceased additional payment for hospitalizations resulting in complications deemed preventable, including several health care-associated infections. We sought to understand the impact of the CMS payment policy on infection prevention efforts.

Methods—A national survey of infection preventionists from a random sample of US hospitals was conducted in December 2010.

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G.M.L. had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Conflicts of interest: All other authors report no conflicts.

Results—Eighty-one percent reported increased attention to HAIs targeted by the CMS policy, whereas one-third reported spending less time on nontargeted HAIs. Only 15% reported increased funding for infection control as a result of the CMS policy, whereas most reported stable (77%) funding. Respondents reported faster removal of urinary (71%) and central venous (50%) catheters as a result of the CMS policy, whereas routine urine and blood cultures on admission occurred infrequently (27% and 13%, respectively). Resource shifting (ie, less time spent on nontargeted HAIs) occurred more commonly in large hospitals (odds ratio, 2.3; 95% confidence interval: 1.0–5.1; $P = .038$) but less often in hospitals where front-line staff were receptive to changes in clinical processes (odds ratio, 0.5; 95% confidence interval: 0.3–0.8; $P = .005$).

Conclusion—Infection preventionists reported greater hospital attention to preventing targeted HAIs as a result of the CMS nonpayment policy. Whether the increased focus and greater engagement in HAI prevention practices has led to better patient outcomes is unclear.

Keywords

Non-payment for preventable complications; Unintended consequences; Organizational culture; Organizational resources

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As of October 1, 2008, the Centers for Medicare and Medicaid Services (CMS) adopted the use of a new financial mechanism—reduced payment for hospitalizations associated with preventable complications—a policy that has been described as a “stick” (ie, penalty) rather than a “carrot” (ie, bonus).[1–3] Based on this policy, CMS no longer pays hospitals a higher amount for patients who develop preventable complications after admission. These conditions include certain health care-associated infections (HAIs) such as vascular catheter-related bloodstream infections, catheter-associated urinary tract infections (CAUTI), and selected surgical site infections.[4,5] The premise behind the policy is that by removing the perverse incentive of additional reimbursement for these complications, hospitals will work harder to eliminate preventable adverse events.

Prior to this CMS policy, financial incentives to improve care have primarily involved the use of “carrots,” although some demonstration programs included a small potential financial penalty if hospitals did not reach their targets. The impact of these programs on improving quality of care for patients has been mixed, with some studies showing modest gains and others reporting little to no improvement on quality of care measures.[6–9] In contrast, the CMS nonpayment policy functions as a disincentive by reducing payments for certain events with the goal of focusing hospitals on eliminating these preventable complications, yet its impact on how care is delivered in the hospital is largely unknown.

In prior qualitative work with infection prevention specialists, we found early, suggestive evidence of both potential intended and unintended consequences.[10,11] However, the qualitative work necessarily focused on a small number of participants, and data on how the broader health care community has responded to the CMS nonpayment policy remain limited. Therefore, we conducted a national survey of infection preventionists to (1) understand how hospitals are approaching efforts to reduce HAIs, (2) identify the impact of the CMS policy on hospital efforts and resources for infection prevention, and (3) determine

whether certain factors are associated with perceived unintended consequences (eg, resource shifting, unnecessary testing) of the CMS policy change.

METHODS

Study design and population

A random sample of 500 US acute care hospitals subject to the CMS inpatient prospective payment system (IPPS) was selected from the American Hospital Association annual survey. Hospitals not subject to the CMS IPPS, including federal hospitals, Maryland waiver hospitals, pediatric facilities, critical access facilities, and long-term care facilities, were excluded. After the 500 hospitals were identified, 1 hospital was determined ineligible because the lead infection preventionist had already responded to the survey for a different hospital in the same health care system, leaving us with 499 potential respondents. Lead infection preventionists at each hospital were chosen as key informants for the hospital because they have the greatest purview of hospital activities related to infection prevention. These individuals were mailed an initial survey in December 2010. Subsequent mailings were sent to nonresponders during January and February 2011. The study was approved by the Institutional Review Board of the Harvard Pilgrim Health Care Institute.

Survey instrument

The survey instrument was based on findings from earlier qualitative work[10,11] and was developed by an Advisory Board with expertise in infection control to ensure content validity. It was then extensively refined through the use of cognitive interviews with infection preventionists.[10–12] The survey asked a series of questions about the hospital's organizational context (ie, external environment, organizational culture, and infection control program characteristics). It also focused on the perceived impact of the CMS policy on targeted and nontargeted HAIs; activities related to surveillance, education, prevention, and documentation in hospitals; and resources for infection control programs.

Data analysis

Survey responses were linked to the American Hospital Association annual survey, which provided additional key hospital characteristics, including type of ownership (for-profit, not-for-profit, or public), location (metropolitan, micropolitan, or rural), hospital size (ie, small [fewer than 100 beds], medium [between 100 and 400 beds], and large [greater than 400 beds]), nurse staffing levels (nurse full-time equivalents per 1,000 patient-days), and percent of patients admitted with either Medicare and Medicaid.[13,14] The χ^2 test or Wilcoxon rank-sum test was used as appropriate to compare hospital characteristics of respondents versus nonrespondents. Descriptive analyses of survey responses, including percentages, means, and ranges, were performed.

In addition to descriptive analyses, we sought to understand whether potential unintended consequences occurred more commonly in certain types of hospitals. We hypothesized that certain hospital characteristics (ie, hospital ownership, size) or key features of organizational context would be associated with unintended consequences. For example, we postulated that hospitals with limited organizational support by executive leadership, clinical leadership, or

front-line staff might engage in resource shifting or unnecessary diagnostic testing. Similarly, we hypothesized that, in hospitals reporting greater ease of implementing evidence-based recommendations or the existence of mechanisms for sharing best practices, fewer unintended consequences would occur. Bivariate and multivariate logistic regression analyses were used to examine factors associated with resource shifting (ie, less time to prevent nontargeted HAIs) and unnecessary testing (ie, obtaining urine and blood cultures routinely on admission for patients with urinary or central venous catheters [CVC]). A 2-sided *P* value of <.05 was considered statistically significant.

RESULTS

Study population

We received responses from 317 out of the 499 eligible hospitals (response rate, 64%). There were no significant differences in the key characteristics of hospitals that responded compared with the hospitals that did not (Table 1). Respondents varied in their duration of experience, with 45% reporting having worked in the field of infection control for greater than 10 years, and 31% reporting having worked in the field for 5 years or less. A majority of the respondents (55%) was certified in infection control and epidemiology.

Hospital organizational context with regard to infection prevention

Most respondents (85%) reported that their hospital participated in local, regional, or national collaborative efforts to reduce HAIs, although only 19% reported participating in pay-for-performance programs specifically focused on HAIs with private insurers (Table 2). Executive or clinical leadership was infrequently reported to be the primary driver for the hospital to be a safety-centered institution (13% and 20% of hospitals, respectively), although a greater proportion of executive and clinical leaders had reportedly spoken with front-line staff about infection prevention (41% and 67%, respectively). Front-line staff was described as receptive to change and as having a sense of personal responsibility for improving care and outcomes; however, few infection preventionists (3%) reported that front-line staff felt extremely empowered to hold each other responsible for the implementation of prevention practices (Table 2). Although the majority of respondents reported the existence of mechanisms to share best practices in preventing HAIs between hospital units—such as peer-to-peer interaction—only a minority of hospitals did this on a monthly basis (25%) or quarterly (19%). Infection preventionists believed their programs spent less time on prevention than surveillance activities in 41% of hospitals (Table 2).

Impact of the CMS policy on hospital efforts to prevent infections

Attention to targeted and nontargeted HAIs—Most respondents (81%) reported that the CMS policy resulted in their hospitals putting greater focus on targeted HAIs (ie, those infections that are specifically targeted for nonpayment by CMS). In one-third of hospitals, however, infection preventionists noted that the CMS policy had resulted in less time being spent on preventing nontargeted HAIs, suggesting a shift in attention (Table 3).

Surveillance, education, prevention practices, and documentation—A majority of respondents reported spending more time on surveillance of targeted HAIs and education

of staff on best practices, with the greatest amount of effort directed toward catheter-associated urinary tract infections (CAUTIs) (see Table 3). For example, 59% reported spending more time on surveillance for CAUTIs, and 69% reported greater educational efforts for this infection. As a consequence of the CMS policy, infection preventionists reported that front-line staff removed urinary catheters (71%) and CVCs (50%) more quickly than before as a means of preventing infection. Nearly one-third of hospitals reported increased frequency of use of antimicrobial-coated urinary catheters and antiseptic or antimicrobial-impregnated CVCs in their hospitals (Table 3).

A small proportion of hospitals reported the empiric use of diagnostic tests without clinical indication, such as routinely obtaining urine (27%) and blood (13%) cultures on admission to document the presence of infections prior to hospitalization and avoid reductions in payment. Respondents also reported that their hospitals were placing greater emphasis on improving documentation by physicians in medical records (54%) and coding practices by billing staff (49%) in response to the CMS policy (Table 3).

Resources—Most respondents (77%) reported that hospital funding for infection control programs did not change in response to the CMS policy, whereas a small minority reported an increase (15%) or decrease (6%) in funding. Although additional financial resources were not always available, respondents described closer working relationships between infection control and quality improvement programs (57%) and greater collaboration by interdisciplinary teams (65%) as positive effects of the CMS policy.

Potential factors associated with unintended consequences

We examined whether certain hospital characteristics or key features of hospital organizational context were associated with 2 unintended consequences identified by infection preventionists: (1) resource shifting (ie, less time to prevent nontargeted HAIs) (Appendix A) and (2) unnecessary testing (ie, routinely obtains urine or blood cultures on admission) (Appendix B). In multivariate models, being a large hospital (≥400 beds) was associated with a greater odds of resource shifting (odds ratio [OR], 2.3; 95% confidence interval [CI]: 1.0–5.1; $P = .038$), whereas hospitals with front-line staff who were receptive to changes in clinical processes were less likely to shift resources away from nontargeted HAIs (OR, 0.5; 95% CI: 0.3–0.8; $P = .005$). In contrast, being a large hospital was associated with a lower likelihood of unnecessary diagnostic testing on admission (OR, 0.3; 95% CI: 0.1–0.8; $P = .014$).

DISCUSSION

Our study is one of the first national, empirical evaluations focused on the impact of the 2008 CMS payment policy on HAI prevention efforts in US hospitals as reported by infection preventionists. The CMS policy to reduce additional payments for preventable complications is a novel approach—using financial disincentives as a mechanism to improve the safety of health care—that is rapidly being adopted by others.[15,16] Our findings were generally positive, suggesting that the policies have led not only to an enhanced focus on targeted HAIs with greater efforts toward surveillance and education but also to changes in practice by front-line staff as reported by infection preventionists. The impact of the CMS

policy appeared to be greatest for CAUTIs, perhaps because this particular HAI had not previously been a major target of national or regional collaboratives prior to 2008 nor had it been commonly targeted for state mandatory reporting initiatives.[17] Whether the policy will result in fewer infections or will save CMS money is unclear.[2,18–21] What is clear, however, is that, at least in the eyes of the infection preventionists in US hospitals, the policy has increased attention to infection prevention efforts.

Even though a majority of hospitals responded positively to the policy by increasing surveillance, education, and implementation of infection prevention efforts, it is not surprising that some hospitals responded differently. One-third of respondents indicated their hospitals shifted attention away from nontargeted infections, and one-quarter of respondents specified that their hospitals performed routine cultures on admission without clinical indication to avoid financial penalty. Although these practices were reported for a minority of hospitals, overall quality of care may not improve in these types of hospitals. For example, patients who receive care in hospitals that routinely culture on admission may be more likely to receive antibiotics without evidence of a true infection, which in turn may lead to other adverse events in patients (eg, *Clostridium difficile* infections, allergic reactions) and in the broader community (ie, rising prevalence of antibiotic-resistant organisms).[2] As with any far-reaching policy, careful monitoring for both intended and unintended consequences is essential because policies intended to improve quality of care may not always be optimally implemented.[22,23]

The CMS policy is one of many tools used by hospitals, insurers, and state and national policy makers to improve quality of care.[3,24,25] Alhough certainly many improvements were ongoing and apparently augmented by the CMS policy, concerns have been raised about unintended consequences, including resource shifting and unnecessary diagnostic testing.[2] Resource shifting was identified more commonly in large hospitals and less commonly when front-line staff was considered receptive to changes in clinical processes. These findings suggest that aspects of organizational context are likely important in how hospitals respond to national policy efforts, particularly in the context of other ongoing local, state, and national efforts to prevent HAIs.[26,27] With regard to diagnostic testing on admission, smaller hospitals were more likely to perform unnecessary blood or urine cultures. Because routine culturing is specifically not recommended for use in current practice guidelines,[28] targeted educational efforts on the optimal implementation of the CMS policy should be considered to help mitigate potential unintended consequences.

Another important finding, which confirms our earlier qualitative work,[10,11] is the increased resources hospitals have allocated toward improving documentation by physicians in the medical record and the codes being submitted by billing staff (which CMS uses to determine HAI rates). Although improved efforts toward documentation by physicians and coding by billing staff may be considered helpful to payers, the focus on these types of efforts may obscure the importance of using validated, standardized surveillance definitions adopted or endorsed by leading national organizations.[29–31] Because HAIs identified in billing data correlate poorly with HAIs identified using standardized clinical definitions adopted by the Centers for Disease Control and Prevention,[32,33] The CMS has recently asked hospitals to report central line-associated bloodstream infection data using National Healthcare Safety

Network definitions on Hospital Compare beginning January 2011, with other HAIs soon to follow.[34]

Our study has several limitations. First, this survey can only identify the perceived impact on hospitals, and we cannot determine the actual impact of this policy on patient outcomes. Despite this limitation, this is one of the first large-scale, national empiric evaluations focused on the impact of the CMS policy on HAIs to date and serves as a useful first-look to identify areas where closer examination is needed to ensure that unintended consequences are mitigated. Second, our study population focused on infection preventionists, rather than front-line clinicians, who might be better able to directly comment on changing clinical practices at the bedside, or hospital leadership, who may have provided additional information on the financial impact on hospitals. Nevertheless, infection preventionists were selected because they have the greatest organizational knowledge of HAI surveillance, education, prevention, and documentation practices throughout the hospitals and have been used as key informants in previous surveys of hospital-based practices to prevent HAIs.[35,36] In addition, because each hospital unit may also have its own practice patterns and subculture, infection preventionists were chosen as having the broadest overview of the facility as a whole. Third, our study only focused on HAIs that were targeted by the CMS policy and did not examine other preventable complications, such as wrong site surgery and pressure ulcers, which are likely being addressed by other individuals in the hospital.

In summary, the CMS policy of eliminating additional payment for certain HAIs appears to have had a positive impact on hospital infection prevention efforts, yet careful consideration of the potential for unintended consequences is warranted. As CMS expands the list of complications for which it will adjust payment and continues to modify its requirements for reporting, it is critical to ensure that policy changes lead to measureable improvements in patient outcomes while minimizing potential unintended consequences.

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APPENDIX A

FACTORS ASSOCIATED WITH RESOURCE SHIFTING, i.e., LESS TIME TO PREVENT HEALTH CARE-ASSOCIATED INFECTIONS NOT INCLUDED IN THE CMS POLICY

	Bivariate OR (95% CIs)	*P* value	Multivariate OR (95% CI)	*P* value
Hospital characteristics				
Type of hospital ownership				
Public	1.0	-	1.0	-
For-profit	0.9 (0.4–1.8)	.72	0.8 (0.4–1.7)	.57
Not-for-profit	1.0 (0.4–2.3)	.99	1.0 (0.4–2.5)	.95
Hospital size				
Small (<100 beds)	1.0	-	1.0	-
Midsize (100 to <400 beds)	1.5 (0.8–2.7)	.16	1.5 (0.8–2.7)	.18
Large (≥400 beds)	2.2 (1.02–4.8)	.043	2.3 (1.0–5.1)	.038
Hospital organizational culture				
Hospital executive leadership (CEO, COO, and others)				
Has spoken with front-line staff about infection prevention	1.1 (0.7–1.8)	.47	-	-
Is the primary driver for our hospital to be a safety-centered institution	1.0 (0.5–2.0)	.94	-	-
Hospital clinical leadership (CMO, CNO, and others)				
Has spoken with front-line staff about infection prevention	0.6 (0.3–0.9)	.027	-	-
Is the primary driver for our hospital to be a safety-centered institution	0.9 (0.5–1.6)	.66	-	-
Front-line staff				
Are receptive to changes in clinical processes	0.5 (0.3–0.8)	.003	0.5 (0.3–0.8)	.005
Have a sense of personal responsibility for improving patient care &outcomes	0.6 (0.4–0.99)	.046	-	-
Feel extremely empowered to hold each other responsible or infection control practices	0.6 (0.3–1.1)	.11		
Easy to implement evidence-based recommendations to prevent HAIs	0.7 (0.4–1.1)	.09	-	-
Mechanism to share best practices in preventing HAIs between hospital units at least quarterly	0.6 (0.3–1.0)	.050	-	-

CEO, chief executive officer; *CMO*, chief medical officer; *CNO*, chief nursing officer; *COO*, chief operating officer; *HAIs*, health care-associated infections; *OR*, odds ratio.

APPENDIX B

FACTORS ASSOCIATED WITH UNNECESSARY TESTING, i.e., ROUTINE URINE OR BLOOD CULTURES ON ADMISSION

	Bivariate OR (95% CIs)	*P* value	Multivariate OR (95% CI)	*P* value
Hospital characteristics				
Type of hospital ownership				

	Bivariate OR (95% CIs)	*P* value	Multivariate OR (95% CI)	*P* value
Public	1.0	-	1.0	-
For-profit	0.5 (0.2, 0.99)	.048	0.5 (0.2–1.1)	.08
Not-for-profit	1.4 (0.6, 3.2)	.40	1.4 (0.6–3.2)	.45
Hospital size				
Small (<100 beds)	1.0	-	1.0	-
Midsize (100 to <400 beds)	0.5 (0.3, 0.8)	.009	0.6 (0.3–1.1)	.08
Large (≥400 beds)	0.2 (0.7, 0.5)	.001	0.3 (0.1–0.8)	.014
Hospital organizational culture				
Hospital executive leadership (CEO, COO, and others)				
Has spoken with front-line staff about infection prevention	0.2 (0.8–2.0)	.40	-	-
Is the primary driver for our hospital to be a safety-centered institution	1.4 (0.7–2.8)	.35	-	-
Hospital clinical leadership (CMO, CNO, and others)				
Has spoken with front-line staff about infection prevention	1.1 (0.6–1.9)	.73	-	-
Is the primary driver for our hospital to be a safety-centered institution	0.9 (0.5–1.6)	.67	-	-
Front-line staff				
Are receptive to changes in clinical processes	1.0 (0.6–1.6)	.96	-	-
Have a sense of personal responsibility for improving patient care and outcomes	0.9 (0.6–1.5)	.79	-	-
Feel extremely empowered to hold each other responsible for infection control practices	1.7 (0.9–3.1)	.09	-	-
Easy to implement evidence-based recommendations to prevent HAIs	1.3 (0.8–2.2)	.25	-	-
Mechanism to share best practices in preventing HAIs between hospital units at least quarterly	0.9 (0.5–1.6)	.80	-	-

CEO, chief executive officer; *CMO*, chief medical officer; *CNO*, chief nursing officer; *COO*, chief operating officer; *HAIs*, health care-associated infections; *OR*, odds ratio.

Table 1

Hospital characteristics for respondents and nonrespondents

	Respondents n = 317	Nonrespondents n = 182	*P* value*
Hospital region, n (%)			
Midwest	88 (28%)	39 (21)	.39
Northeast	48 (15)	34 (19)	
South	122 (38)	76 (42)	
West	59 (19)	33 (18)	
Hospital location, n (%)			
Metropolitan	226 (71)	136 (75)	.81
Micropolitan	63 (20)	31 (17)	
Rural	28 (9)	15 (8)	
Type of hospital ownership, n (%)			
Public	41 (13)	26 (14)	.26
For-profit	217 (68)	112 (62)	
Not-for-profit	59 (19)	44 (24)	
Hospital size, n (%)			
Small (<100 beds)	86 (27)	55 (30)	.70
Midsize (100 to <400 beds)	186 (59)	100 (55)	
Large (≥400 beds)	45 (14)	27 (15)	
Number of ICU beds, n (%)			
≤15 ICU beds	164 (52)	101 (55)	.42
>15 ICU beds	153 (48)	81 (45)	
Teaching hospital type, n (%)			
Graduate	46 (15)	30 (17)	.77
Major teaching	30 (9)	14 (8)	
Minor teaching	28 (9)	13 (7)	
Nonteaching	213 (67)	125 (69)	
% Medicare admissions, median (range)	45% (0%–77%)	46% (11%–77%)	.65
% Medicaid admissions, median (range)	17% (0.3%–76%)	17% (2%–77%)	.35
RN FTE per 1,000 patient-days, median (range)	6.8 (0.4–34.7)	6.8 (0.2–17.2)	.82

FTE, full-time equivalents; *ICU*, intensive care unit; *RN*, registered nurse.

*Wilcoxon rank-sum test or χ^2 test.

Table 2

Key characteristics of hospital organizational context with regard to infection prevention

	%
External environment	
Hospital participates in	
Collaborative efforts to reduce HAIs	85
Pay-for-performance programs to reduce HAIs	19
State mandates public reporting of HAI data	66
Organizational culture	
I feel safe being treated here as a patient	77
Hospital executive leadership (CEO, COO, and others)	
Is the primary driver for our hospital to be a safety-centered institution	13
Has spoken with front-line staff about infection prevention	41
Hospital clinical leadership (CMO, CNO, and others)	
Is the primary driver for our hospital to be a safety-centered institution	20
Has spoken with front-line staff about infection prevention	67
I feel extremely comfortable sharing concerns about barriers faced in preventing HAIs with	
Hospital executive leadership	32
Hospital clinical leadership	44
Front-line staff	
Are receptive to changes in clinical processes	54
Have a sense of personal responsibility for improving patient care and outcomes	62
Feel extremely empowered to hold each other responsible for infection control practices	3
Easy to implement evidence based recommendations to prevent HAIs	41
Mechanism to share best practices in preventing HAIs between hospital units	64
Monthly or more*	25
Quarterly*	19
Semiannually*	3
Annually or less*	53
Infection control program characteristics	
My infection control program spends more time on infection prevention efforts than on surveillance*	
Disagree/strongly disagree	41
Neither agree nor disagree	31
Agree/strongly agree	26

CEO, chief executive officer; *CMO*, chief medical officer; *CNO*, chief nursing officer; *COO*, chief operating officer; *HAIs*, health care-associated infections.

NOTE. Includes 317 respondents.

*Among 204 hospitals that reporting having a mechanism to share best practices.

Table 3

Perceived impact of the CMS policy on attention to HAIs, available resources, and activities related to surveillance, education, prevention, and documentation in hospitals: n = 317

	%
Attention to HAIs	
Greater focus on HAIs targeted by the CMS policy	81
Less time to prevent HAIs that are NOT targeted by the CMS policy	32
Surveillance and education	
More time spent on surveillance for	
CAUTIs	59
CLABSIs	50
SSIs	40
More time spent monitoring infection prevention practices in hospital units	53
More time spent educating staff on best practices to reduce	
CAUTIs	69
CLABSIs	68
Mediastinitis post-CABG*	35
More face-to-face time with front line staff to improve infection prevention practices	57
Infection prevention practices	
Front-line staff removes	
Urinary catheters more quickly than before	71
Central venous catheters more quickly than before	50
Front-line staff increasingly use	
Antimicrobial-coated urinary catheters	29
Antiseptic-containing dressing for CVCs	56
Antiseptic or antimicrobial-impregnated CVCs	36
Antimicrobial locks for CVCs	15
Routine bathing of all ICU patients with a chlorhexidine preparation on a daily basis	23
Routinely obtains on hospital admission	
Urine cultures from all patients with urinary catheters	27
Blood cultures on admission from all patients with CVCs	13
Documentation	
More time working with physicians to improve HAI documentation in medical records	54
More time working with billing staff to improve HAI coding practices	49
Resources	
Funding for our infection control program is now†	
Substantially less than before	2
Less than before	4
Same as before	77
More than before	13
Substantially more than before	2
Closer working relationships between infection control and quality improvement to reduce HAIs	57

	%
Greater collaboration by interdisciplinary teams to prevent HAIs	65

CABG, coronary artery bypass graft; *CAUTIs*, catheter-associated urinary tract infections; *CLABSIs*, central line-associated bloodstream infection; *CMS*, Centers for Medicare and Medicaid Services; *CVC*, central venous catheter; *HAIs*, health care-associated infections; *ICU*, intensive care unit; *SSI*, surgical site infection.

*Among the 153 hospitals that performed CABG procedures.

†Seven missing responses.