Published in final edited form as:

Med Care. 2010 May ; 48(5): 433–439. doi:10.1097/MLR.0b013e3181d5fb3f.

CMS Changes in Reimbursement for HAIs:

Setting A Research Agenda

Patricia W. Stone, PhD, FAAN^{*,||}, Sherry A. Glied, PhD[†], Peter D. McNair, BN, MPH, MHS^{‡,§},
Nikolas Matthes, MD, PhD, MPH, MSc[¶], Bevin Cohen, MPH^{||}, Timothy F. Landers, CNP,
PhD^{||}, and Elaine L. Larson, RN, PhD, FAAN, CIC^{*,||}

^{*} Center for Health Policy, Columbia University School of Nursing, New York, NY

[†] Department of Health Policy and Management, Mailman School of Public Health, Columbia University, New York, NY

[‡] Palo Alto Medical Foundation Research Institute, Palo Alto, CA

[§] Philip R. Lee Institute for Health Policy Studies, University of California, San Francisco, San Francisco, CA

[¶] Research and Development Quality Indicator Project, Maryland Hospital Association, Elkridge, MD

^{||} Center for Interdisciplinary Research to Reduce Antimicrobial Resistance, Columbia University School of Nursing, New York, NY

Abstract

Background—The Centers for Medicare and Medicaid Services (CMS) promulgated regulations commencing October 1, 2008, which deny payment for selected conditions occurring during the hospital stay and are not present on admission. Three of the 10 hospital-acquired conditions covered by the new CMS policy involve healthcare-associated infections, which are a common, expensive, and often preventable cause of inpatient morbidity and mortality.

Objective—To outline a research agenda on the impact of CMS's payment policy on the healthcare system and the prevention of healthcare-associated infections.

Methods—An invitational daylong conference was convened in April 2009. Including the planning committee and speakers there were 41 conference participants who were national experts and senior researchers.

Results—Building upon a behavioral model and organizational theory and management research a conceptual framework was applied to organize the wide range of issues that arose. A broad array of research topics was identified. Thirty-two research agenda items were organized in the areas of incentives, environmental factors, organizational factors, clinical outcomes, staff outcomes, and financial outcomes. Methodological challenges are also discussed.

Conclusions—This policy is a first significant step to move output-based inpatient funding to outcome-based funding, and this agenda is applicable to all hospital-acquired conditions. Studies beginning soon will have the best hope of capturing data for the years preceding the policy change, a key element in nonexperimental research. The CMS payment policy offers an excellent opportunity to understand and influence the use of financial incentives for improving patient safety.

Keywords

pay-for-performance; healthcare-associated infections; quality; health policy

The Deficit Reduction Act of 2005 required the Secretary of Health and Human Services to identify high cost and high volume preventable conditions that result in higher payments. Following this directive, the Centers for Medicare and Medicaid Services (CMS) promulgated regulations denying payment for claims occurring after October 1, 2008, in which selected conditions occurred during the hospital stay and were not present on admission (POA). In preparation, starting October 1, 2007, CMS required POA indicators on all secondary diagnoses for admissions. Furthermore, CMS prohibits the hospital from billing the beneficiary for the difference between the lower and higher payment rates. The intended net effect of this change is that claims would be paid as though the secondary diagnosis were not present, effectively transferring financial responsibility to the hospital. The goal of this policy change is to decrease costs while encouraging the prevention of adverse events.¹ While the intent is desirable from a societal perspective, little is known about the true impact of this policy.

Three of the 10 hospital-acquired conditions covered by the new CMS policy involve healthcare-associated infections (HAIs), which are a common, expensive, and often preventable cause of inpatient morbidity and mortality. Approximately 2 million patients per year develop HAIs, or about 5% of acute hospital admissions. The last decade alone has seen an estimated 36% increase in HAIs.² The estimated 100,000 deaths per year associated with HAIs rank this as the sixth leading cause of death in the United States.^{3–5} In a recent study capturing additional underlying expenses, the excess hospital cost of HAIs across the nation was estimated to be between 28 and 45 billion dollars annually.⁶

Many HAIs are preventable and effective strategies to reduce HAIs are available. For example, a coalition of 66 intensive care units (ICUs) in southwestern Pennsylvania reduced central line-associated bloodstream infection rates by 68% over a 5-year period.⁷ One hundred three ICUs in Michigan achieved a similar reduction.⁸ Both efforts were based on collaboratives and used a multifaceted approach to the prevention of HAIs including improved measurement, standardized case finding, and interventions to focus organizational culture more specifically toward patient safety.^{9–11} Given that by their very nature many HAIs are considered preventable, it is hardly surprising that the CMS policy covers 3 types of common infection sites: (1) selected surgical site infections, (2) vascular catheter-associated infections, and, (3) catheter-associated urinary tract infections.

In other contexts—including both hospital and outpatient settings—limited research has shown that financial incentives for quality, often known as pay-for-performance, can result in modest improvement in quality of care measures.¹² The literature, however, is sparse. A recent systematic review of the literature on pay-for-performance in the hospital setting identified only 8 published studies, most of which suffered from methodological flaws.¹³ In addition, the question of whether any of the ascribed improvements are sustainable remains open.¹⁴ Because Medicare funding policies have previously set important precedents for other insurance providers in the United States and other jurisdictions, a broad application of the CMS policy could result both in far-reaching positive and negative consequences, prescribing the need for a careful and rigorous policy evaluation. The purpose of this article is to outline a research agenda on the impact of CMS's payment policy on the healthcare system, to encourage initiating such research sooner rather than later.

An invitational daylong conference funded by the Agency for Healthcare Research and Quality (RHS018099) was convened in April 2009 to address HAI reimbursement. The conference

sought to build on the experience of, and questions arising from, the current CMS healthcare-acquired condition policy with a view to generating a consensus-derived research agenda to evaluate the current policy and develop funding policies that lead to HAI reduction.

METHODS

A total of 65 invitations for participation were sent out to selected national experts and senior researchers with the goal of recruiting 32 participants with expertise in HAIs, patient safety, funding systems, and CMS policy making. Potential participants were selected by a planning committee for their influence in setting national policy, development of practice guidelines, key roles in the direction of infection prevention and control as exemplified by leadership in relevant professional organizations, publications and recognition as a thought leader. Thirty-three individuals accepted our invitation. Including the planning committee and speakers there were 41 conference participants. All participants were provided with background reading before the conference.^{15–23}

The conference was organized into 5 sessions. Each session began with a short 20 to 30 minute presentation given by an expert. Table 1 outlines the topics covered by each session and the speaker who presented the topic. After each presentation, participants broke into small, preassigned groups each comprising a variety of disciplines and viewpoints, including 1 or 2 doctoral students who were assigned to take notes. Participants were assigned to the same group for the day and discussions were guided by a session specific list of questions. Each small group discussion was followed by a plenary session in which each small group reported back. General sessions and plenary sessions were audio-recorded and transcribed. Transcripts from the general sessions, plenary sessions, and notes from the small group sessions were analyzed by 2 reviewers using a thematic content analysis approach (NVivo; http://www.qsrinternational.com/products_nvivo.aspx) to identify both gaps in current knowledge and specific research questions regarding the impact of HAI reimbursement. Results of the thematic analysis were discussed and summarized by the study authors to identify common themes and priorities for research.

RESULTS

Conceptual Issues

There was agreement among participants that all research should be theory driven. A behavioral model of clinician responses to incentives to improve quality was presented, which builds upon an adaption of Andersen's Behavioral Model.^{24,25} In this adapted behavioral model of clinician responses to incentives to improve quality, the incentive serves as the stimulus while the environmental, organizational, provider and patient characteristics present mediating variables, which affect the outcomes.²⁵ Another theory that was presented came from organizational theory and management research; in this theory, leader behavior, organizational culture and staff behavior were acknowledged as important antecedents that affect outcomes.¹⁷

These theories were combined to develop an organizing conceptual framework (Fig. 1). The new CMS policy creates direct incentives for senior managers (ie, chief financial officers and chief executive officers) as a minimum. The environmental variables include overall payment environment as well as regulatory and market factors. From organizational theory, it is postulated that leader behaviors and management styles influence the organizational culture, which in turn influences staff behaviors. Ultimately, it is these changes in staff behaviors that will influence outcomes. Predisposing/enabling patient factors (such as risk for infection) also influence the outcomes. The outcomes that may be affected include the clinical outcome of

interest, which in this case is HAIs, along with others such as those related to the staff (eg, satisfaction) and the financial results.

This conceptual framework was applied to organize the wide range of issues that arose during the discussions. Of course, in designing a single study to address a specific identified research gap, investigators may find a more specific theory useful. Indeed, while other models were not presented at the conference, it was acknowledged by participants that models, such as Young et al, may be useful to study the use of incentives in promoting quality.²⁶

The Research Agenda

Table 2 lists some of the important research questions that were raised. The areas of research are organized by the conceptual framework and discussed more fully below. Except where noted, no priorities were assigned to specific research questions.

Incentives

Many participants expressed concern as to whether the policy provides sufficient incentive to influence clinical practice.²⁷ Medicare payments to hospitals will only be reduced in instances where the HAI codes are the only factor causing a case to be reclassified into a more expensive payment.²⁸ That is, if a patient has many complications, the exclusion of the HAI from the payment formula will have zero consequence. Thus, in most cases, it is expected that the policy change will affect only a small portion of hospital reimbursement, and the magnitude of the financial incentive remains relatively small for most hospitals. Identifying the relative and absolute magnitude of an effective financial incentive is important. Therefore, this policy may be an opportunity to identify the effects of different levels of incentives across and within settings. The diffusion of the incentives to other payers—whether other payers follow the CMS lead and institute similar payment practices—will also affect the magnitude of the incentive per provider. Last, with mandatory public reporting of these same infections in many states, it will be important to understand the relative impact of reputational versus financial incentives (see below).

Environmental Factors

As of June 1, 2009, all but 14 states have instituted some type of legislation or regulation regarding public reporting. Conference participants acknowledged that researchers would need to understand these contextual factors to tease out the impact of the CMS change given existing reporting initiatives. For example, while many states now have mandatory reporting requirements, these requirements vary widely in what is required and whether or not these data are made public. Developing research designs that control for these contextual factors would be important. Additionally, understanding if and how hospitals in states with public reporting behave differently from those without it would provide evidence on the impact of the policy change. Another important environmental factor is related to the overall reimbursement environment of an individual hospital. It is possible that the impact of this payment reform varies based on the percentage of Medicare patients in the hospital.

Organizational Factors

The aim of the CMS hospital-acquired condition reimbursement policy is to drive changes in organizational structures that may facilitate process change including the development of care pathways and ultimately clinician behavior change, such as adherence to hand hygiene. This is in contrast to other pay-for-performance initiatives where individuals are directly paid to consciously modify their behavior.

Management research suggests that leadership processes that transform individual goals to collective organizational goals are likely to affect the organizational culture.¹⁷ Participants agreed that involving the workforce in the development of processes related to improving performance, shared decision-making, and fostering communication were important for developing high-performing organizations. Indeed, these factors had been identified in the collaborative demonstration projects where central line-associated bloodstream infections were reduced in ICU settings.^{18,19}

Understanding how best to engage the workforce was thought to be an important item in the research agenda. For example, is this best done through managers or engaging professional societies? Furthermore, research designed to examine the effectiveness of incentives at the physician level, hospital management level (eg, quality division, infection control division, and/or nursing unit manager) and even healthcare worker level (bedside providers such as nurses) would be of great value. Organizational theory suggests that the level of implementation of the incentive within the hospital will be significant.

The goal of this reimbursement change is prevention of HAIs through altering staff behavior. Behaviors, or process measures, that are thought to be important include antibiotic prescribing, cultures to establish POA, and adherence to guidelines. For example, the policy may encourage active culturing of patients on admission to identify symptomless infections that are POA or the policy may encourage the use of antibiotics in the absence of clinical indication. Qualitative research at high-performing hospitals to understand these and other processes that may affect the outcomes of interest was identified as a high-priority agenda item.

Outcomes

The most obvious research item relating to outcomes is to assess and understand the impact of the policy on infection rates across the nation. The best measures of HAIs have not been clearly articulated. Over many decades the Centers for Disease Control and Prevention (CDC) has developed standardized surveillance protocols and definitions for HAI identification conducted by trained clinicians using traditional laboratory and clinical criteria.^{10,11} These widely used protocols are recognized as valid and reliable measures for HAI surveillance.^{29,30} As part of the CMS payment reform initiative, HAIs will be identified using routinely collected patient-level and administrative billing data. These data are limited by the range, definition and number of diagnosis, and procedure codes that can be recorded. Previously, researchers have found that the routinely collected data did not capture all instances of central vascular catheter insertion.³¹ Additionally, researchers have found poor concordance between infections identified using CDC definitions and those identified using administrative data.^{32,33} This previous research was conducted before the POA indicators were mandated across all jurisdictions. Validation of HAI definitions using administrative data against standard CDC clinical definitions is a priority for researchers. Differing characteristics of ideal HAI definitions for clinical decision making, surveillance activities, and reimbursement policies is an important component of the research agenda. The relationship and reliability among existing HAI measures, including those developed by the CDC, CMS, and state agencies should be explored. These definitions should include quality metrics easily interpretable by consumers. To advance the goal of eliminating preventable HAIs, it is important that consumers, clinicians, administrators, and policy makers agree on which HAI measures can most efficiently serve multiple purposes.

Not all infections are preventable.³⁴ Participants agreed that another contribution to the field would be defining “reasonably preventable” infections. Similarly, determining the levels of risk adjustment needed for the cross-hospital comparisons is important.

Based on agency theory, another potential unintended consequence is that hospitals may avoid patients perceived to be at highest risk for HAIs. There is evidence that individual physicians subject to external incentives try to avoid minority patients whom they perceive as more likely to have poor treatment outcomes.³⁵ After New York State initiated its report card measuring death rates from coronary artery bypass graft surgery for individual surgeons and hospitals, the gap between coronary artery bypass graft rates for whites and blacks increased. The report card may have made surgeons more reluctant to operate on black patients.^{36,37} Similarly, hospitals may be less likely to admit high-risk patients, such as those from long-term care settings.

Another potential unintended consequence is “up-coding” to improve hospital reimbursement. Up-coding involves the identification of additional diagnoses to attract a higher payment as well as ordering codes to get maximum payment. This practice is widespread and legal. There is little research on hospitals optimizing reimbursement through up-coding, although it is occasionally suggested as a strategy in the literature and has been identified as a problem for over 30 years.^{38,39} With audits by CMS and the introduction of electronic medical records, coding practices may over time become more uniform between states and providers. In the short run, however, up-coding could even result in increased costs to CMS. All participants agreed that understanding the policy’s impact on hospital coding behaviors and their financial impact are important research items.

A potential synergistic positive outcome is that the policy would incentivize hospitals to become learning organizations that perform well, and that this engagement of the staff to decrease HAIs would spill over to other quality metrics. It could also increase staff satisfaction and reduce turnover. Many participants noted that more research is needed to determine whether these hypothetical outcomes are in fact being realized.

Determining the ideal research design—or types of designs—that would be most useful to address the impact of the policy changes was identified as another area of uncertainty. While it is clear that randomized controlled trials are no longer possible because the change in policy has already been implemented without them, there was agreement that uniform study designs will permit more accurate comparison of the impact of the policy in different settings and different geographic regions. This requires that researchers clearly outline the specific definitions and techniques used to identify HAIs. For example, ICD-9 codes, computer programming languages and analytic methods should be made available for published studies either as part of the published paper or as supplemental material. Where possible, researchers should report findings obtained using several different analytic approaches on a single dataset, even when results appear contradictory or uninformative.

Expanding the methodologic approaches currently used was also recommended. Methods that should be explored include the use of ecologic studies, group randomized trials, and innovative methods to control for different payer mix, patient risk adjustment, and community-level factors. There was consensus that researchers should articulate study designs and assumptions in detail to allow replication of the results. Clearly reporting the limitations of individual study designs encountered by researchers will allow replication, refinement of methods, and comparison of results.

Participants agreed that because of the complexity of issues surrounding payment for HAIs, a mixed approach that applies both quantitative and qualitative components is preferable. These techniques should be adopted to address the specific research questions, and methods of design and analysis should be developed in collaboration with individuals who possess specific methodologic expertise. Interdisciplinary teams are essential to adequately examine the impact of incentives throughout the healthcare system.

DISCUSSION

This policy is a first significant step to move output-based inpatient funding to outcome-based funding. The policy is one of the most large-scale and visible pay-for-performance initiatives ever attempted in the US healthcare system. It is also the most important effort yet made to address the growing problem of HAIs. The list of preventable infections affected by the CMS hospital-acquired condition policy is likely to grow in the future. CMS is already considering adding ventilator-associated pneumonia, bloodstream infections due to *Staphylococcus aureus*, *Clostridium difficile*-associated disease, and methicillin-resistant *Staphylococcus aureus* to the new reimbursement policy. Understanding the ramifications of this policy, both for HAIs and for safety improvement in general, is critical to future quality improvement.

CMS has estimated that the total nationwide payment impact of the new policy amounts \$20 million in the first year and \$50 million in subsequent years, signifying an average impact of approximately \$12,500 per hospital. An independent study, however, has indicated that the payment impact may be as low as \$2.4 million nationwide (~\$600 per hospital). Anecdotally, the policy appears to have engaged hospital communities and received extensive and protracted media coverage asserting significant financial impact for individual hospitals prior to implementation. To date, the preimplementation impact of the policy has not been evaluated and therefore it may never be possible to estimate its full impact.

As with many new policies, although a number of potential outcomes can be hypothesized, the actual consequences may be surprisingly different. Under the most positive scenarios the financial incentive provides motivation for hospitals to improve processes, implement evidence-based practice recommendations and reduce the rate of HAIs.¹⁴ Under a less optimistic scenario, hospitals will recognize that the reduction in revenue is limited and modify administrative and billing practices sufficiently to “work around” and limit the impact of the CMS policy, without implementing initiatives that will reduce the infection rate.⁴⁰ An even more pessimistic scenario is that the policy results in perverse incentives for hospitals to provide care below present standards of quality while adopting defensive measures to protect themselves from potential revenue losses by shunning patients who are likely to develop HAIs.

Because of the diversity of these potential outcomes, and their important implications for healthcare quality and costs, all participants in the conference agreed that research to evaluate the consequences of the policy change should begin immediately. A broad array of research topics was identified. Studies beginning soon will have the best hope of capturing data for the years preceding the policy change, a key element in nonexperimental research. Indeed, for many of the research agenda items, specific data (such as clinician behavior and compliance with guidelines) needs to be collected prospectively. Moreover, early results of research are likely to help CMS modify the payment regulations in the coming years. The CMS payment policy offers an excellent opportunity to understand and influence the use of financial incentives for improving patient safety.

While the research agenda developed is specific to HAIs, many of the items are also appropriate to the other hospital-acquired conditions. For example, there are similar definitional issues with pressure ulcers. With healthcare reform likely, there are many other important policy changes on the horizon (eg, bundled payments, disease management, and medical homes). Developing research agendas around these changes would also be worthwhile activities.

Acknowledgments

Supported by the Agency for Healthcare Research and Quality (RHS018099); National Institute of Nursing Research (5T90NR010824-02) as a fellow in the Center for Interdisciplinary Research to Reduce Antimicrobial Resistance (to T.L.).

The authors thank all participants for their input, in addition to Pamela de Cordova, Ann-Margaret Navarra, and Roberta Salveson, who assisted with data collation and analysis.

References

1. Department of Health and Human Services. HHS Action Plan to Prevent Healthcare-Associated Infections. [Accessed September 25, 2009]. Available at: <http://www.hhs.gov/ophs/initiatives/hai/infection.html>
2. Institute of Medicine. To Err is Human: Building A Safer Health System. Washington, DC: National Academy Press; 2000.
3. Haley RW, Culver DH, White JW, et al. The nationwide nosocomial infection rate. A new need for vital statistics. *Am J Epidemiol* 1985;121:159–167. [PubMed: 4014113]
4. Klevens RM, Edwards JR, Richards C Jr, et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep* 2007;122:160–166. [PubMed: 17357358]
5. Centers for Disease Control and Prevention. Public health focus: surveillance, prevention, and control of nosocomial infections. *MMWR Morb Mortal Wkly Rep* 1992;41:783–787. [PubMed: 1406572]
6. Scott, R, II. Division of Healthcare Quality Promotion National Center for Preparedness, Detection, and Control of Infectious Diseases, Coordinating Center for Infectious Diseases, Centers for Disease Control and Prevention. The Direct Medical Costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention. 2009 [Accessed September 25, 2009]. Available at: http://www.cdc.gov/ncidod/dhqp/pdf/Scott_CostPaper.pdf
7. Centers for Disease Control and Prevention. Reduction in central line-associated bloodstream infections among patients in intensive care units-Pennsylvania, April 2001–March 2005. *MMWR Morb Mortal Wkly Rep* 2005;54:1013–1016. [PubMed: 16224448]
8. Pronovost P, Needham D, Berenholtz S, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *N Engl J Med* 2006;355:2725–2732. [PubMed: 17192537]
9. Pronovost PJ, Berenholtz SM, Goeschel C, et al. Improving patient safety in intensive care units in Michigan. *J Crit Care* 2008;23:207–221. [PubMed: 18538214]
10. Horan TC, Lee TB. Surveillance: into the next millennium [editorial]. *Am J Infect Control* 1997;25:73–76. [PubMed: 9113281]
11. Horan TC, Emori TG. Definitions of key terms used in the NNIS system. *Am J Infect Control* 1997;25:112–116. [PubMed: 9113287]
12. Rosenthal MB, Frank RG, Li Z, et al. Early experience with pay-for-performance: from concept to practice. *JAMA* 2005;294:1788–1793. [PubMed: 16219882]
13. Mehrotra A, Damberg CL, Sorbero ME, et al. Pay for performance in the hospital setting: what is the state of the evidence? *Am J Med Qual* 2009;24:19–28. [PubMed: 19073941]
14. Campbell SM, Reeves D, Kontopantelis E, et al. Effects of pay for performance on the quality of primary care in England. *N Engl J Med* 2009;361:368–378. [PubMed: 19625717]
15. Dudley RA. Pay-for-performance research: how to learn what clinicians and policy makers need to know. *JAMA* 2005;294:1821–1823. [PubMed: 16219887]
16. Rosenthal MB, Dudley RA. Pay-for-performance: will the latest payment trend improve care? *JAMA* 2007;297:740–744. [PubMed: 17312294]
17. Nembhard IM, Alexander JA, Hoff TJ, et al. Why does the quality of health care continue to lag? Insights from management research. *Acad Manag Perspect* 2009;24–42.
18. Pronovost PJ, Berenholtz SM, Goeschel CA, et al. Creating high reliability in health care organizations. *Health Serv Res* 2006;41:1599–1617. [PubMed: 16898981]
19. Pronovost PJ, Goeschel CA, Marsteller JA, et al. Framework for patient safety research and improvement. *Circulation* 2009;119:330–337. [PubMed: 19153284]
20. Tucker AL, Edmondson AC. Why hospitals don't learn from failures: organizational and psychological dynamics that inhibit system change. *Calif Manag Rev* 2003;45:55–72.
21. Besser, RE. Statement before the Subcommittee on Labor, Health and Human Services, Education, and related agencies of the House Committee on Committee on Appropriations. Washington, DC: Department of Human Health and Services; 2009. CDC's role in preventing healthcare associated infections.

22. Wright, D. Statement before the Subcommittee on Labor, Health and Human Services, Education, and Related Agencies of the House Committee on Appropriations. Washington, DC: Department of Human Health and Services; 2009. Pathway to health reform: HHS action plan to prevent healthcare-associated infections.
23. Toward a research agenda on quality-payment alignment: findings from an invitational colloquium. [Accessed September 25, 2009]. Available at: <http://www.ahrq.gov/QUAL/qpayment.htm>
24. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav* 1995;36:1–10. [PubMed: 7738325]
25. Frolich A, Talavera JA, Broadhead P, et al. A behavioral model of clinician responses to incentives to improve quality. *Health Policy* 2007;80:179–193. [PubMed: 16624440]
26. Young GJ, White B, Burgess JF Jr, et al. Conceptual issues in the design and implementation of pay-for-quality programs. *Am J Med Qual* 2005;20:144–150. [PubMed: 15951520]
27. McNair PD, Luft HS, Bindman AB. Medicare's policy not to pay for treating hospital-acquired conditions: the impact. *Health Aff (Millwood)* 2009;28:1485–1493. [PubMed: 19738267]
28. Rosenthal MB. Nonpayment for performance? Medicare's new reimbursement rule. *N Engl J Med* 2007;357:1573–1575. [PubMed: 17942869]
29. Thongpiyapoom S, Narong MN, Suwalak N, et al. Device-associated infections and patterns of antimicrobial resistance in a medical-surgical intensive care unit in a university hospital in Thailand. *J Med Assoc Thai* 2004;87:819–824. [PubMed: 15521239]
30. Sticca G, Nardi G, Franchi C, et al. Hospital infection prevention in an intensive care unit. *Ann Ig* 2004;16:187–197. [PubMed: 15554525]
31. Wright SB, Huskins WC, Dokholyan RS, et al. Administrative databases provide inaccurate data for surveillance of long-term central venous catheter-associated infections. *Infect Control Hosp Epidemiol* 2003;24:946–949. [PubMed: 14700411]
32. Stone P, Horan T, Huai-Che S, et al. Comparisons of healthcare associated infections using two different mechanisms for public reporting. *Am J Infect Control* 2007;35:145–149. [PubMed: 17433936]
33. Stevenson KB, Khan Y, Dickman J, et al. Administrative coding data, compared with CDC/NHSN criteria, are poor indicators of health care-associated infections. *Am J Infect Control* 2008;36:155–164. [PubMed: 18371510]
34. Brown J, Doloresco IF, Mylotte JM. "Never events": not every hospital-acquired infection is preventable. *Clin Infect Dis* 2009;49:743–746. [PubMed: 19624274]
35. Casalino LP, Elster A, Eisenberg A, et al. Will pay-for-performance and quality reporting affect health care disparities? *Health Aff (Millwood)* 2007;26:w405–w414. [PubMed: 17426053]
36. Werner RM, Asch DA, Polsky D. Racial profiling: the unintended consequences of coronary artery bypass graft report cards. *Circulation* 2005;111:1257–1263. [PubMed: 15769766]
37. Werner RM, Asch DA. The unintended consequences of publicly reporting quality information. *JAMA* 2005;293:1239–1244. [PubMed: 15755946]
38. Simborg DW. DRG creep: a new hospital-acquired disease. *N Engl J Med* 1981;304:1602–1604. [PubMed: 7015136]
39. Fillit H, Geldmacher DS, Welter RT, et al. Optimizing coding and reimbursement to improve management of Alzheimer's disease and related dementias. *J Am Geriatr Soc* 2002;50:1871–1878. [PubMed: 12410910]
40. Rosenthal MB, Fernandopulle R, Song HR, et al. Paying for quality: providers' incentives for quality improvement. *Health Aff (Millwood)* 2004;23:127–141. [PubMed: 15046137]

FIGURE 1.
Conceptual Framework for CMS Change in Reimbursement.

TABLE 1

Speakers and Presentation Topics

Speaker	Presentation Title	Discussion Topics
Thomas B. Valuck, MD, MHA, JD Medical Officer and Senior Advisor, Center for Medicare Management, CMS	CMS's progress toward implementing value-based purchasing	Goals of CMS's value-based purchasing principles Overview of hospital-acquired conditions payment provision and present on admission indicator reporting initiatives
Teresa Horan, MPH NHSN Team Leader, Division of Healthcare Quality Promotion, CDC	Measuring healthcare-associated infections	Traditional and electronic methods of healthcare-associated infections detection Challenges associated with standardizing healthcare-associated infections definitions Current and proposed metrics for quantifying healthcare-associated infections
R. Adams Dudley, MD, MBA Associate Professor of Medicine and Health Policy, University of California, San Francisco	Using incentives to reduce the rate of healthcare-associated infections	Overview of financial and reputational incentives being used to reduce healthcare-associated infections External factors affecting the effectiveness of incentives
Ingrid Nembhard, PhD, MS Assistant Professor of Public Health and Management, Yale University	Creating an environment for learning, innovation and successful implementation in organizations	Overview of challenges associated with organizational learning Strategies for successful organizational learning
Sherry Glied, PhD Professor and Chair, Department of Health Policy and Management, Mailman School of Public Health, Columbia University	Other payer and provider responses to CMS healthcare-associated infections rule	Anticipated reactions by Medicaid and private payers Potential for hospitals to alter coding practices, patient populations, and discharge patterns Possible financial effects on hospitals

CMS indicates Centers for Medicare and Medicaid Services; NHSN, National Healthcare Safety Network; CDC, Centers for Disease Control and Prevention.

TABLE 2

Research Issues and Gaps Identified by Workshop Participants

Component of Conceptual Framework	Topic
Incentives	<p>Level of incentives which are effective (hospital, provider).</p> <p>Variability of impact of incentives by type/size/patient mix in hospitals.</p> <p>Diffusion of incentives (ie, will payers other than CMS offer incentives?).</p> <p>Impact of incentives on disparities in healthcare.</p> <p>Impact of financial vs. reputational incentives.</p> <p>Assess and compare hospital responses to past reimbursement strategies and incentives.</p>
Environmental factors	<p>Differential role of environmental factors on effectiveness of new regulations.</p> <p>Description of overall reimbursement environments across hospitals.</p> <p>Impact of reimbursement policies and surveillance on public reporting.</p> <p>Appropriate/meaningful metrics for consumer and public reporting.</p> <p>Impact of reporting metrics on public knowledge, attitudes and selection of hospitals.</p>
Organizational factors	<p>Impact of reimbursement on antimicrobial prescribing patterns.</p> <p>Role of institutional leadership on implementation and outcomes of reimbursement policies.</p> <p>Role of organizational culture and climate on level of implementation of reimbursement policies.</p> <p>Characteristics/predictors of organizations with successful implementation of reimbursement policies and positive outcomes.</p>
Clinical outcomes	<p>Validation of the HAIs using administrative data against standard CDC clinical definitions.</p> <p>Understanding variations in HAI measurement across governmental agencies.</p> <p>Defining “reasonably preventable” infections.</p> <p>Validity and reliability of various case finding methods and definitions of HAIs.</p> <p>Extent of under-reporting of HAIs.</p> <p>Impact of reimbursement policies on rates of clinical cultures, screening cultures, and prophylactic antibiotic prescribing.</p> <p>Evaluation of computer algorithms for screening and detection of HAIs.</p> <p>Evaluation of various metrics (eg, incidence, processes of care) to assess impact of reimbursement policies.</p> <p>Determine levels of risk adjustment needed.</p> <p>Assess various risk adjustment methods.</p> <p>Correlation of coder, state auditor, and infection prevention definitions and rates.</p> <p>Impact of reimbursement policies on HAI rates.</p>
Staff outcomes	<p>Impact of reimbursement policies on compliance with practice guidelines.</p> <p>Changes in staff behavior and processes of care associated with new reimbursement policies.</p> <p>Impact of “present on admission” policies on prescribing practices, screening and diagnostic tests at admission.</p>
Financial outcomes	<p>Economic modeling of the differential impact of reimbursement policies across provider types (eg, metropolitan vs. rural hospitals).</p> <p>Impact of reimbursement policies on other payers and providers (eg, satisfaction).</p>

CMS indicates Centers for Medicare and Medicaid Management; HAIs, healthcare-associated infections; CDC, Centers for Disease Control and Prevention.