

ORIGINAL RESEARCH

Changes in Hospitals' Credentialing Requirements for Board Certification From 2005 to 2010

Gary L. Freed, MD, MPH^{1,2,3*}, Kelly M. Dunham, MPP^{1,2}, Acham Gebremariam, MS^{1,2}

¹Division of General Pediatrics, Department of Pediatrics and Communicable Diseases, University of Michigan Health System, Ann Arbor, Michigan;

²Child Health Evaluation and Research (CHEAR) Unit, University of Michigan, Ann Arbor, Michigan; ³Department of Health Management and Policy, School of Public Health, University of Michigan, Ann Arbor, Michigan.

OBJECTIVE: In 2005, we conducted a study of the prevalence of board certification requirements for hospital privileging and found that one-third of hospitals did not require pediatricians to be board certified. In 2010, the American Board of Pediatrics implemented the Maintenance of Certification (MOC) program. To examine changes in the policies of hospitals regarding requirements for board certification, we surveyed privileging personnel at hospitals across the country.

STUDY DESIGN: Telephone survey between April 2010 and June 2010 of privileging personnel at a random sample of 220 hospitals.

RESULTS: Of the 220 hospitals, 23 were ineligible because they had no pediatricians on staff, and 26 hospitals refused to participate. The remaining 154 hospitals completed the survey, resulting in a 78% participation rate. Compared with

our findings in 2005, in 2010 a greater proportion of hospitals now require board certification for general pediatricians (80% vs 67%, $P = 0.141$) and pediatric subspecialists (86% vs 71%, $P = 0.048$). Among these hospitals, a larger proportion (24% vs 4%) now requires board certification for all pediatricians at the point of initial privileging. However, a greater proportion of hospitals reported that they make exceptions to their board certification policies (99% vs 41%).

CONCLUSION: In the 5 years since our previous study, a larger proportion of hospitals now require pediatricians to be board certified, although the proportion of hospitals that make exceptions to this policy has increased twofold. Hospitals appear to be incorporating the MOC program into their privileging policies. *Journal of Hospital Medicine* 2013;8:298–303. © 2013 Society of Hospital Medicine

In 2005, we conducted a study of the prevalence of board certification requirements for hospital privileging of pediatricians.¹ Since that time, there have been many changes in the landscape of both physician and healthcare-system quality assessment. New developments include greater utilization of physician quality-of-care assessment tools, a change from recertification for time-limited board certification to Maintenance of Certification (MOC) in 2010, and an increasing commitment on the part of hospitals and state licensing officials to patient safety and quality-of-care issues, due in part to the continued interest by governmental and private payors and the public on external measurement of healthcare quality.^{2–6}

MOC is an ongoing process of lifelong learning and self-assessment to continuously improve knowledge and clinical performance. It has been adopted by all 24 member boards of the American Boards of Medical Specialties. MOC is focused on the 6 core competencies of quality medical care as outlined by the

Accreditation Council for Graduate Medical Education (ACGME): (1) patient care, (2) medical knowledge, (3) practice-based learning, (4) systems-based practice, (5) professionalism, and (6) interpersonal and communication skills. To address, these competencies, MOC involves a 4-part process for continuous learning that is required to keep certification current: (1) licensure and professional standing, (2) lifelong learning and self-assessment, (3) cognitive expertise, and (4) practice performance assessment.^{7,8}

Our previous study found that many hospitals utilize specialty certification as a marker of quality for privileging.¹ To explore changes in the policies of hospitals regarding requirements for board certification and the incorporation of MOC into those requirements, we conducted a 5-year follow-up study of a national random sample of hospitals in 2010.

METHODS

Sample

All hospitals identified in the American Hospital Association's 2009 Annual Survey of Hospitals as providing care to pediatric patients were included in the sampling frame ($N = 2136$). We then selected a stratified random sample of 10% of the total ($N = 220$) hospitals weighted to provide nationally representative estimates. The sample was stratified by Council of Teaching Hospitals (COTH) designation (teaching vs nonteaching) and National Association of Children's Hospitals and Related Institutions (NACHRI)

*Address for correspondence and reprint requests: Gary L. Freed, MD, MPH, University of Michigan, 300 North Ingalls Building 6E08, Ann Arbor, MI 48109-0456; Telephone: 734-615-0616; Fax: 734-764-2599; E-mail: gfreed@med.umich.edu

Additional Supporting Information may be found in the online version of this article.

Received: December 5, 2012; Revised: January 25, 2013; Accepted: February 1, 2013

2013 Society of Hospital Medicine DOI 10.1002/jhm.2033

Published online in Wiley Online Library (Wileyonlinelibrary.com).

membership. In contrast to our previous study, in this study we did not stratify according to the designation of freestanding children's hospital (vs part of a hospital system) or metropolitan statistical area size (urban vs rural), as comparisons across these designations were not found to be significant in 2005.

Hospitals were sampled with varying probabilities from each stratum. Weights were applied to create a representative sample of the overall hospital population. The total sampling weight (TSW) calculated for each hospital was based on the probability of selection into the study (P) and the response rate (RR). The following formula was used: $TSW: (1/P) \times (1/RR)$.

Survey Instrument

In collaboration with the American Board of Pediatrics Research Advisory Committee, we developed a 24-item, fixed-choice, structured questionnaire to be administered by phone. The survey was designed to be completed in 15 minutes or less and focused on board certification requirements at initial privileging, recertification, and MOC requirements.

The survey focused on the following descriptive research questions: Do hospitals require board certification for pediatricians at the time of initial privileging? Do they ever require board certification for privileging? Are there different certification requirements for generalists vs subspecialists? Are pediatricians with permanent certificates required to enroll in MOC?

Other questions focused on such issues such as whether the hospital was familiar with the requirements of MOC, whether MOC was required of all pediatricians, and whether the institution of MOC changed certification requirements at the hospital.

The instrument was pilot tested for clarity and ease of use with representatives from a convenience sample of hospitals within the state of Michigan and revised to clarify potentially ambiguous questions. Pilot surveys were not included in the analyses.

Questionnaire Administration

Data collection took place between April 2010 and June 2010. Interviewers requested to speak with the department responsible for credentialing or privileging at the hospital, typically the Medical Staff Office, the Office of Clinical Affairs, or the Credentialing or Privileging Department. When the appropriate person was identified and located, interviewers explained the purpose of the study and obtained verbal consent to participate.

Data Analysis

Initially, frequency distributions were calculated for all survey items to create descriptive statistics. Next, we performed a cross-tabulation of responses by the specific hospital classifications listed above (COTH and NACHRI status) and computed the χ^2 statistics.

Finally, we conducted bivariate analyses on the 2005 and 2010 results. SAS version 9.1 (SAS Institute Inc., Cary, NC) was used for all statistical analyses. $P < 0.05$ was considered statistically significant.

Although this study is similar to the study that was completed in 2005,¹ we have reanalyzed those data to more specifically assess certification policy. All results are now weighted in contrast to the 2005 study, which only weighted the results by hospital classification. Thus, the numbers in some cases may be slightly different from those reported in 2006. We believe that this has resulted in a more robust analysis of hospital use of board certification in privileging.

Comparisons

Where possible, results were compared with those found in a 2005 study of hospital privileging.¹ The sampling frame for that study was identical to the current study, but the specific hospitals may or may not be included in the current study.

The study was approved by the University of Michigan Medical School Institutional Review Board.

RESULTS

Response Rate and Respondent Demographics

Of the 220 hospitals surveyed, 23 were ineligible because they did not have at least 1 pediatrician on staff. Of the remaining 197 hospitals, 154 completed the survey, resulting in a 78% participation rate.

Response rates did not differ significantly by NACHRI or COTH hospital status; therefore, there was no impact on the analytic power of the weighting. Approximately half (54%, $n = 82$) of the respondents were NACHRI member hospitals, and 49% ($n = 75$) were COTH hospitals.

Because not every hospital responded to every question, the total number for each question response may differ slightly.

2005 VS 2010 COMPARISONS

Board Certification Requirements

Compared with our findings in 2005, in 2010 a greater proportion of hospitals now require board certification for general pediatricians (80% vs 67%, $P = 0.141$). Among these hospitals, a much larger proportion (24% vs 4%) now require board certification for all pediatricians at the point of initial privileging (Table 1). Similarly, a greater proportion of hospitals now require board certification for pediatric subspecialists (86% vs 71%, $P = 0.048$). The percentage of hospitals that require subspecialists to be board certified at the point of initial privileging also increased from 10% in 2005 to 34% in 2010.

The proportion of teaching (COTH) hospitals that require general pediatricians to be board certified at some point in time increased from 63% in 2005 to 89% in 2010 ($P = 0.001$), and the percentage that require board certification for all pediatricians at

TABLE 1. 2005 vs 2010 Hospitals: Board Certification Requirements for Pediatricians

	General Pediatricians		Pediatric Subspecialists	
	2005 (N = 159)	2010 (N = 154)	2005 (N = 153)	2010 (N = 147)
Certification never required	33%*	20%*	29% [†]	14% [†]
Certification ever required	67%*	80%*	71% [†]	86% [†]
At time of initial privileging for all pediatricians	4%	24%	10%	34%
Within a specified time frame of initial privileging	50%	29%	41%	32%
At time of initial privileging but only for some pediatricians	11%	24%	16%	17%
Only recertification required	2%	3%	4%	3%

NOTE:

* $P = 0.141$.[†] $P = 0.048$.

initial privileging increased from 2% in 2005 to 25% in 2010. Similarly, the proportion of teaching hospitals that require pediatric subspecialists to be board certified increased from 66% in 2005 to 89% in 2010 ($P = 0.003$).

There were small changes between 2005 and 2010 in the proportion of nonteaching (68% vs 79%, $P = 0.231$), NACHRI-member (76% vs 82%, $P = 0.366$), and non-NACHRI member (67% vs 80%, $P = 0.156$) hospitals that require pediatricians to be board certified at some point in time. The proportion of nonteaching (4% vs 24%), NACHRI-member (5% vs 32%), and non-NACHRI (4% vs 23%) hospitals that require board certification at the point of initial privileging also increased between 2005 and 2010.

Certification Policies at Initial Privileging

Although in 2010, a greater proportion of hospitals reported that they require board certification for general pediatricians and pediatric subspecialists at the point of initial privileging, a much larger proportion of hospitals reported that they make exceptions to their board certification policies for both general pediatricians (99% vs 41%) (Table 2) and pediatric subspecialists (98% vs 14%) (Table 3). Among hospitals that do not require board certification at the point of initial privileging, only small differences were seen in requirements around completion of residency or fellowship training and time frame after which certification must be achieved (Tables 2 and 3).

There were no meaningful differences between board certification policies for general pediatricians and pediatric subspecialists in 2010.

Comparing Recertification and MOC Policies

Few hospitals required permanent certificate holders to recertify (2005) or enroll in MOC (2010) in 2005

TABLE 2. 2005 vs 2010 Hospitals: Board Certification Requirements for General Pediatricians at Initial Privileging

	2005 (N = 159)	2010 (N = 154)
Certification required at initial privileging		
Yes	4%	24%
Mixed policy	11%	24%
No	85%	52%
If hospital required certification at initial privileging:		
Allowed exceptions to policy at initial privileging	41%	99%
Required certification to be current	99%	99%
If hospital did not require certification at initial privileging:		
Required to complete residency	85%	84%
Established time frame after which certification must be achieved	48%	51%

TABLE 3. 2005 vs 2010 Hospitals: Board Certification Requirements for Pediatric Subspecialists at Initial Privileging

	2005 (N = 153)	2010 (N = 147)
Certification required at initial privileging		
Yes	10%	34%
Mixed policy	5%	17%
No	85%	49%
If hospital required certification at initial privileging:		
Allowed exceptions to policy at initial privileging	14%	98%
Required certification to be current	83%	100%
If hospital did not require certification at initial privileging:		
Required to complete fellowship	86%	86%
Established time frame after which certification must be achieved	47%	52%

(5%) or 2010 (6%). The proportion of hospitals that required recertification or MOC enrollment for general pediatricians increased from 33% in 2005 to 42% in 2010. Similarly, the percentage of hospitals that required recertification or MOC enrollment for pediatric subspecialists increased from 25% in 2005 to 35% in 2010.

Between 2005 and 2010, there was no significant change in the proportion of hospitals that reported revoking or denying privileges to a pediatrician due to failure to recertify or enroll in MOC (3% vs 6%).

SPECIFIC MAINTENANCE OF CERTIFICATION POLICIES IN 2010

Board Certification Requirements

Respondents from 29% of hospitals reported that they were not at all familiar with the American Board of Pediatrics' (ABP) MOC program. Most respondents (58%) were familiar with MOC, with 37% reporting that they were somewhat familiar, and 12% reporting that they were very familiar with the program.

Three-fourths of hospitals (76%) reported that their MOC requirements do not differ from their

recertification requirements held prior to the institution of MOC, and 14% reported that their hospital had not yet established specific MOC requirements.

The majority of respondents (62%) had verified the board certification of some physicians since the institution of the ABP's MOC program on January 1, 2010. A majority (53%) of hospitals track MOC data for all pediatricians, whereas 3% of respondents track MOC data only for those pediatricians whose initial certification was time limited.

Of those hospitals that require pediatricians with permanent certificates to enroll in MOC, 9% allow them to retain their privileges for a period of time if they are not meeting the requirements for MOC. Among hospitals that require pediatricians with time-limited certificates to enroll in MOC, fewer than half allow general pediatricians (37%) and pediatric subspecialists (40%) to retain their privileges if they are not meeting the requirements for MOC.

The majority of respondents (89%) reported that the initiation of MOC had not changed board certification requirements at their hospital. However, respondents from over one-quarter of hospitals (27%) reported that they expect changes in their hospital's certification or MOC requirements in the next 2 years. Those hospitals that reported changes moved to more stringent requirements for certification at initial privileging and requirements for permanent certificate holders to meet MOC requirements.

DISCUSSION

In the 5 years since our previous study, a larger proportion of hospitals now require pediatricians to become board certified to obtain hospital privileges. Of note is that a larger proportion of hospitals also now require board certification at the time of initial privileging for both generalist and subspecialist pediatricians.

Hospitals face increasing pressure to differentiate themselves from their peers through better patient outcomes.^{9,10} The increase from 67% to 80% of hospitals requiring board certification may be a result of hospitals utilizing certification as a proxy for assessment of physician quality or as a way to engage physicians in quality improvement through the MOC program.¹¹ Hospitals may also be responding to greater interest in MOC from regulatory agencies such as the Centers for Medicare and Medicaid Services Maintenance of Certification Program Incentive, which rewards physicians with an additional incentive payment beyond the Physician Quality Reporting System incentive for their participation in the MOC program.¹²

Interestingly, although a greater proportion of hospitals reported that they require certification, a much larger proportion of hospitals make exceptions to the policy. The exceptions could include grandfathering physicians who had hospital privileges prior to the policy change, or giving recent graduates additional time to obtain board certification. It is unknown

whether or not all of these physicians would be required to obtain board certification or participate in MOC after some provisional time frame.

Hospitals in our study appear to be incorporating the MOC program into their policies. However, fewer than half of the hospitals studied require pediatricians with time-limited certificates to enroll in MOC if their certificates have expired. In addition, some hospitals are still establishing their MOC requirements for those pediatricians with time-limited and permanent certificates. It is likely that the majority of hospitals retained their previous board certification requirements, and that the current flux in hospital requirements is not unique to pediatrics, as all American Board of Medical Specialties' specialties have recently implemented MOC requirements.¹³ Hospitals will likely adjust their credentialing policies as their familiarity and experience with MOC grows.

The primary purpose of the specialty certification process is to provide to the public, which includes both individual consumers and regulatory agencies, an assessment of the competency of individual physicians. Self-regulation through certification is a privilege of trust granted to the medical profession by the public. This is an essential concept that underlies the concept of specialty certification.¹⁴ As the public has continued to adopt a greater focus, and additional demands, on safety and quality assessment in healthcare, the medical profession must in turn be responsive.^{13,15-17} Failure in this regard would run the risk of losing that trust with the public, with the resultant loss of the ability to self-regulate.

Studies have indicated a positive relationship between board certification and quality of care, yet this area remains hampered by a paucity of data.¹⁸⁻²² Pham et al. found that board certified physicians were more likely to provide preventative care services to Medicare patients.²² In 2008, Turchin et al. showed that recertification made a small, yet meaningful, difference in physician treatment of hypertension.¹⁸ This area of research is especially important, as the MOC program is more comprehensive and utilizes an ongoing system of assessment and physician engagement. As such, it has been criticized by some for being complicated, burdensome, and irrelevant to the manner in which physicians actually practice.^{23,24} However, previous methods of certification were limited to assessing physicians at 1 point in time during their entire careers (eg, permanent certification) or at specific intervals (eg, time-limited certification). With recent increased attention to improving the quality of patient care, these methods were unable to assure the public that physicians maintained their knowledge and skills over time in an environment of increasing rapid incorporation of new knowledge into clinical practice. Recent reports have also shown that (years of) "practice does not make perfect" with regard to physician performance. In fact, there may be

deterioration of performance over long periods of practice.²⁵ Furthermore, although physicians commonly believe they are able to assess their own performance, available evidence does not support that contention.^{26,27} Thus, there is a need for an objective ongoing assessment of physician performance that also has the capacity to continuously improve the quality of care provided.

The comprehensive nature of the MOC program is a result of efforts to meaningfully incorporate the 6 competencies defined by the ACGME into the certification process. Although MOC is still relatively new and maturing, a growing body of evidence is demonstrating effectiveness of specific components of the program.^{28–31} In the field of pediatrics, several programs approved for MOC credit have already demonstrated their effectiveness in improving the quality of care in clinical practice.^{32–36} However, additional efforts are needed to evaluate more of the part 4 (Assessment of Practice Performance) modules to assess their impact on patient care. The continued commitment to quality of care and quality improvement in hospitals will likely result in a further adoption of MOC requirements as the process matures and demonstrable impacts on patient outcomes are assessed. Furthermore, greater coordination of MOC with quality assessments in health plans and in the changes taking place in the process of licensure will likely help to streamline the paperwork and documentation burden placed on physicians by multiple assessment efforts.

This study has several limitations. Because the MOC program was initiated by the ABP in January 2010, there may be a lag in uptake of this particular requirement by hospitals. In some cases, this may have been the first time that members of the credentialing staff had considered the MOC program. It is probable that staff awareness will increase over time, as hospital policies are further developed and greater exposure to the specifics of the MOC program occurs. Additionally, although we compared stratified random samples of hospitals in 2005 and 2010, we did not follow the same group of hospitals over time.

As with all changes to the certification program over the years, there is a period of time required for new requirements to be understood and accepted by both those in regulatory positions and those in the medical profession. The demands of the public for increasingly comprehensive assessments of healthcare quality will continue into the future.

Disclosures: Funding was provided by a grant from the American Board of Pediatrics Foundation. The authors have no other disclosures or conflicts of interest to report.

References

- Freed GL, Uren RL, Hudson EJ, Lakhani I, Wheeler JR, Stockman JA III. Policies and practices related to the role of board certification and recertification of pediatricians in hospital privileging. *JAMA*. 2006;295(8):905–912.
- American Board of Pediatrics. Maintenance of Certification: MOC requirements. 2011. Available at: <https://www.abp.org/ABPWebStatic/#murl%3D%2FABPWebStatic%2Fmoc.html%26url%3D%2Fabpwebsite%2Fmoc%2Fphysicianrequirements%2Fphysreq.htm>. Accessed May 23, 2011.
- Chaudhry HJ, Rhyne J, Cain FE, Young A, Crane M, Bush F. Maintenance of licensure: protecting the public, promoting quality health care. *J Med Regul*. 2010;96(2):13–20.
- Hess BJ, Weng W, Lynn LA, Holmboe ES, Lipner RS. Setting a fair performance standard for physicians' quality of patient care. *J Gen Intern Med*. 2011;26(5):467–473.
- Stone TJ, Sullivan D. Payer trend: "tiering" physicians and "steering" patients. *Fam Pract Manag*. 2007;14(10):24–26.
- Holmboe ES, Wang Y, Meehan TP, et al. Association between maintenance of certification examination scores and quality of care for medicare beneficiaries. *Arch Intern Med*. 2008;168(13):1396–1403.
- American Board of Medical Specialties. ABMS Maintenance of Certification. Available at: http://www.abms.org/Maintenance_of_Certification/ABMS_MOC.aspx. Accessed January 23, 2012.
- American Board of Medical Specialties. ABMS Maintenance of Certification/MOC_competencies.aspx. Accessed January 24, 2012.
- Hibbard JH, Stockard J, Tusler M. Hospital performance reports: impact on quality, market share, and reputation. *Health Aff (Millwood)*. 2005;24(4):1150–1160.
- Romano PS, Marcin JP, Dai JJ, et al. Impact of public reporting of coronary artery bypass graft surgery performance data on market share, mortality, and patient selection. *Med Care*. 2011;49(12):1118–1125.
- Liebhauer A, Draper D, Cohen G. Hospital strategies to engage physicians in quality improvement. Available at: www.hschange.org/CONTENT/1087. Accessed June 4, 2012.
- The Physician Quality Reporting System Maintenance of Certification Program Incentive Requirements of Self-Nomination for 2012. http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/PQRS/downloads/2012_MaintenanceofCertificationProgram_mmrsvd01162012.pdf. Accessed June 4, 2012.
- Chung KC, Clapham PJ, Lalonde DH. Maintenance of Certification, maintenance of public trust. *Plast Reconstr Surg*. 2011;127(2):967–973.
- Cassel CK, Holmboe ES. Credentialing and public accountability: a central role for board certification. *JAMA*. 2006;295(8):939–940.
- Freed GL, Dunham KM, Clark SJ, Davis MM. Perspectives and preferences among the general public regarding physician selection and board certification. *J Pediatr*. 2010;156(5):841–845, 845.e1.
- Boscarino JA, Adams RE. Public perceptions of quality care and provider profiling in New York: implications for improving quality care and public health. *J Public Health Manag Pract*. 2004;10(3):241–250.
- Weiss KB. Future of board certification in a new era of public accountability. *J Am Board Fam Med*. 2010;23(suppl 1):S32–S39.
- Turchin A, Shubina M, Chodos AH, Einbinder JS, Pendergrass ML. Effect of board certification on antihypertensive treatment intensification in patients with diabetes mellitus. *Circulation*. 2008;117(5):623–628.
- Chen J, Rathore SS, Wang Y, Radford MJ, Krumholz HM. Physician board certification and the care and outcomes of elderly patients with acute myocardial infarction. *J Gen Intern Med*. 2006;21(3):238–244.
- Norcini JJ, Lipner RS, Kimball HR. Certifying examination performance and patient outcomes following acute myocardial infarction. *Med Educ*. 2002;36(9):853–859.
- Sharp LK, Bashook PG, Lipsky MS, Horowitz SD, Miller SH. Specialty board certification and clinical outcomes: the missing link. *Acad Med*. 2002;77(6):534–542.
- Pham HH, Schrag D, Hargraves JL, Bach PB. Delivery of preventive services to older adults by primary care physicians. *JAMA*. 2005;294(4):473–481.
- White B. Are you ready for maintenance of certification? *Fam Pract Manag*. 2005;12(1):42–48.
- Levinson W, King TE Jr, Goldman L, Goroll AH, Kessler B. Clinical decisions. American Board of Internal Medicine maintenance of certification program. *N Engl J Med*. 2010;362(10):948–952.
- Tarkan L. As doctors age, worries about their abilities grow. *New York Times*. January 24, 2011:D.1.
- Choudhry NK, Fletcher RH, Soumerai SB. Systematic review: the relationship between clinical experience and quality of health care. *Ann Intern Med*. 2005;142(4):260–273.
- Davis DA, Mazmanian PE, Fordis M, Van Harrison R, Thorpe KE, Perrier L. Accuracy of physician self-assessment compared with observed measures of competence: a systematic review. *JAMA*. 2006;296(9):1094–1102.
- Bernabeo EC, Conforti LN, Holmboe ES. The impact of a preventive cardiology quality improvement intervention on residents and clinics: a qualitative exploration. *Am J Med Qual*. 2009;24(2):99–107.
- Holmboe ES, Meehan TP, Lynn L, Doyle P, Sherwin T, Duffy FD. Promoting physicians' self-assessment and quality improvement: the ABIM diabetes practice improvement module. *J Contin Educ Health Prof*. 2006;26(2):109–119.

30. Duffy FD, Lynn LA, Didura H, et al. Self-assessment of practice performance: development of the ABIM Practice Improvement Module (PIM). *J Contin Educ Health Prof.* 2008;28(1):38–46.
31. Mladenovic J, Shea JA, Duffy FD, Lynn LA, Holmboe ES, Lipner RS. Variation in internal medicine residency clinic practices: assessing practice environments and quality of care. *J Gen Intern Med.* 2008;23(7):914–920.
32. Schulman J, Stricof R, Stevens TP, et al. Statewide NICU central-line-associated bloodstream infection rates decline after bundles and checklists. *Pediatrics.* 2011;127(3):436–444.
33. Crandall W, Kappelman MD, Colletti RB, et al. ImproveCareNow: the development of a pediatric inflammatory bowel disease improvement network. *Inflamm Bowel Dis.* 2011;17(1):450–457.
34. Mandel KE, Kotagal UR. Pay for performance alone cannot drive quality. *Arch Pediatr Adolesc Med.* 2007;161(7):650–655.
35. Anderson JB, Iyer SB, Beekman RH III, et al. National pediatric cardiology quality improvement collaborative: lessons learned from development and early years. *Prog Pediatr Cardiol.* 2011;32(2):103–109.
36. Miller MR, Niedner MF, Huskins WC, et al. Reducing PICU central line-associated bloodstream infections: 3-year results. *Pediatrics.* 2011;128(5):e1077–e1083.