Curr Rev Musculoskelet Med (2012) 5:265–273
DOI 10.1007/s12178-012-9137-8

HEALTH POLICY (AD SHARAN, SECTION EDITOR)

Brief history of quality movement in US healthcare

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Published online: 9 September 2012

Abstract The current healthcare quality improvement infrastructure is a product of a century long experience of cumulative efforts. It began with an acknowledgement of the role of quality in healthcare, and gradually evolved to encompass the prioritization of quality improvement and the development of systems to monitor, quantify, and incentivize quality improvement in healthcare. We review the origins and the evolution of the US healthcare quality movement, identify existing initiatives specific to musculoskeletal care, outline significant challenges and opportunities, and propose recommendations for the future. Elements noted to be associated with successful healthcare quality improvement efforts include the presence of physician leadership, infrastructural support, and prioritization of healthcare quality within the culture of the organization. Issues that will require continued work include the development of a valid and reliable evidence base, accurate and replicable performance measurement and data collection methods, and development of a standard set of specialty specific performance metrics, with accurate provider attribution, risk adjustment and reporting mechanisms.

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Keywords Quality · Healthcare · Musculoskeletal · Orthopedics · History · Improvement · Performance measurement · Standards · Reporting · Reimbursement · Cost · Value · Public · Private · Government · Evidence-base · Structure · Process · Outcome · Monitoring and evaluation

Introduction

The roots of the quality improvement movement can be traced back to the work of epic figures such as Ignaz Semmelweis, the 19th-century obstetrician who championed the importance of hand washing in medical care. In addition, Florence Nightingale, the English nurse, identified the association between poor living conditions and high death rates among soldiers treated at army hospitals. Ernest Codman, a surgeon, pioneered the creation of hospital standards and emphasized and implemented strategies to assess healthcare outcomes. The modern quality movement has since transformed to include a wide variety of stakeholders, a range of unique and modified approaches, and an evolving set of goals [1].

There have been several notable quality improvement efforts over the past half-century. A substantial number of these efforts were spawned by the academic health quality movement. This was launched with a series of articles that began to outline the deficiencies in the delivery of healthcare, which prompted numerous and multidimensional efforts towards healthcare quality improvement [2-6]. These included the re-engineering and restructuring of systems of healthcare delivery, the encouragement of peer review, and the incentivizing of competition among providers and organizations. They also included the identification of medical processes that affected patients' health, rewarding of good performance, and reprimanding of poor performance, improvement of methods for monitoring, and evaluation of performance, implementation of rapidly evolving quality improvement tools, public reporting of quality data, and the redesign of professional medical education [7, 8].

A brief history of healthcare quality efforts in the United States

The Institute of Medicine (IOM) defined quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" [9]. There have been numerous attempts at conquering the challenges of improving healthcare quality and safety in the United States, which predate and follow this definition. Though there have been several short lived successes, none have been substantial enough to address the complex, and evolving challenges associated with achieving adequate healthcare quality. The following section is a brief timeline chronicling events that contributed to the evolution of the healthcare quality movement to its present form.

Improvement efforts in the early days of Medicare

In 1965, Congress passed legislation which established the Medicare and the Medicaid programs as Title XVIII and Title XIX of the Social Security Act [10]. Medicaid was established in response to the perceived inadequacy of the "welfare medical care" under public assistance at the time. Title XVIII of the Social Security Act, commonly known as Medicare and entitled "Health Insurance for the Aged and Disabled," established a health insurance program for aged persons. Under this provision, Americans 65 years and older were qualified to receive compulsory hospital insurance (part A) and voluntary supplementary medical insurance (part B) [11]. In anticipation of the need to assess and direct the care of Medicare patients, Congress established a set of conditions entitled "Conditions of Participation," which required the implementation of several elements deemed necessary for hospital operation. These conditions included staff credentials, 24-hour nursing services, and utilization review [12]. In accordance with these requirements, Utilization Review Committees were established in 1972, to identify if hospitals and medical personnel were providing appropriate clinical services that met conditions of participation. While this system of review committees held potential for effective monitoring, its success was limited. The lack of effectiveness was retrospectively attributed to an absent association between the review process and the identification of ways to improve care. In addition there was an absence of formal evaluation criteria to guide providers' decision making, and to adjust payment based on the quality of care [13•].

Several years later, in response to the ineffectiveness of the 1965 Utilization Review Committees, Congress established pilot organizations entitled "Experimental Medical Care Review Organizations" [11] in 1972. These were physician organizations funded by the National Center for Health Services Research; they were given the authority and responsibility of reviewing healthcare delivery in the inpatient and ambulatory setting, and of assessing the quality and appropriateness of care delivered. Unlike the aforementioned Utilization Review Committees, these organizations developed projects and models that adjoined the findings of the quality review process with appropriate improvement strategies. These pilot projects shortly became a blueprint for Medicare's Professional Standards Review Organizations (PSROs) established soon thereafter in 1972.

Based on the success of the pilot Experimental Review Organizations, PSRO legislation created a federally funded network of nonprofit physician-run organizations, tasked with assessing the necessity, applicability, and quality of healthcare services rendered [11]. As with Utilization Review Committees, the goal of PSROs was to affirm that physicians and hospitals met Medicare specific obligations to provide high quality care, which generally involved the avoidance of unnecessary overuse, inappropriate misuse, and non-indicated underuse of services. However, while promising in concept, PSROs never met governmental expectations and were simultaneously viewed as a form of governmental interposition into the practice of medicine, one that was sternly resisted by the AMA and state medical societies. Thus, by the early 1980s, PSROs were considered unsuccessful in both improving quality and containing costs, and were questioned regarding their prioritization of cost over quality. In 1983, PSROs were replaced by the utilization and quality control Peer Review Organizations (PROs) [11].

PROs were established during the implementation of the hospital prospective cost-per-case, diagnosis-related groups (DRGs) model. Accordingly they were tasked with validating assignments to the DRGs, reducing unnecessary admissions and readmissions, and reducing complications, and mortality rates. What set PROs apart from previous models is that beyond simply identifying the problem, they were given the authority to implement different solutions. These solutions ranged from retrospective reviews and continued medical education requirements to disciplinary action and loss of Medicare billing privileges. PROs were successful in achieving the intended goals of quality enhancement and cost containment; as a result they have continued to play a considerable role under the new Centers for Medicare and Medicaid Services (CMS) label of Quality Improvement Organizations (QIOs) [14].

During this time period and preceding it, governmental programs were being supplemented by efforts undertaken by leaders in organized and academic medicine as well as non-profit organizations. In 1951, the Joint Commission on Accreditation of Hospitals (JCAH) was established [15]as a non-profit organization with the intended function of providing voluntary accreditation

of hospitals based on a rubric of defined minimum quality standards. It has since become The Joint Commission, with an objective of improving the quality of healthcare by evaluating healthcare organizations and providing guidance on the elements necessary to deliver care that optimizes quality and value.

Framework for measuring quality

In 1966, Dr. Avedis Donabedian, physician and founder of the study of quality in health care and medical outcomes research published "Evaluating the Quality of Medical Care" [16], a replicable and highly useful model that relies upon the elements of structure, process, and outcomes to examine the quality of care delivered. When applied to orthopedics, the Donabedian Model suggests that care structures (ie, assigning a dedicated arthroplasty care team) and care processes (ie, designing and implementing a standard arthroplasty care pathway) can contribute to patient outcomes. This will also include clinical endpoints such as functional status, pain, complications, morbidity and mortality, as well as patient based experiences, and utilization of resources. This model provides a basis for the current methods used to evaluate healthcare quality [17•].

Shortly after Dr. Donabedian's transformative contribution to the field of healthcare quality, The National Academies of Science established the Institute of Medicine (IOM) in 1970, which has since launched numerous concerted efforts focused on evaluating, informing, and improving the quality of healthcare delivered [18]. In 1989, the Agency for Health Care Policy and Research—currently known as the Agency for Healthcare Research and Quality (AHRQ)—was created [19, 20]. AHRQ replaced the National Center for Health Services Research, and was created by Congress in response to newly reported data that revealed wide geographic variations in practice patterns without supporting clinical evidence, and with reports of misuse and overuse of procedural treatments [21]. These findings helped drive Congressional prioritization of this research program, with a focus on investing in clinical effectiveness, treatment outcomes, and practice guidelines [22].

Shortly thereafter, the National Committee for Quality Assurance (NCQA) was established in 1990, with an objective of improving health care quality [23]. NCQA is a nonprofit organization tasked with managing accreditation programs for individual physicians, health plans, and medical groups. It measures accreditation performance through the administration and submission of the Healthcare Effectiveness Data and Information Set (HEDIS) and the Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey.

Why has quality been difficult to achieve

With the ability to deliver the highest standards of care and to perform the most complex of procedures, the magnitude and ubiquity of healthcare quality challenges in the United States are often attributed to the problems of underuse, overuse, and misuse of resources [9, 24•]. The underlying causes of these issues are multilayered and complex. They include a previously observed lack of accountability for inadequate quality rendered and for high costs incurred, the existence of diffuse and non-specific goals, and the measurement of processes, structures, and outcomes that only diffusely inform objectives without necessarily improving care. They also include the existence of insufficient information on healthcare outcomes and relative effectiveness, and the presence of perversely incentivized payment systems that encourage volume without regard to value [24•]. However, while much remains to be achieved, a review of the historical progression of the healthcare quality movement reveals that over the past century, productive steps have been made towards helping providers improve their ability to deliver high quality care. Legislative action, healthcare improvement initiatives, and quality improvement organizations continue to equip providers with the tools to quantify, measure, and report their performance, as a means of identifying where the gaps in quality are occurring. An increasingly focused healthcare agenda has helped to align different stakeholders around similar fundamental goals for change; an increasing awareness among patients and consumers has helped them to identify their role in recognizing and expecting quality care [25].

During the gradual evolution of the quality movement, there was a purposeful attempt to transition towards models that relied on data driven quality improvement initiatives. One example was the 1992 Quality Improvement Initiative proposed by the Health Care Financing Administration (HCFA), which aimed to create a patient care algorithm system based on clinical guidelines and information provided by claims history and data set [26]. This was implemented in an effort to achieve evidence-based continuous quality improvement. Another example is the 1994 National Surgery Quality Improvement Project (NSQIP), developed in the VA system at the behest of Congress to address higher surgical mortality in VA hospitals [27]. The VA NSQIP developed an active program of data collection of both risk adjustment and outcome data, which were then used to develop risk adjustment models and benchmarks for participating VAs [28]. In 1999, a VA study showed that NSQIP methods were transferable to non-VA hospitals. The American College of Surgeons (ACS) subsequently collaborated with the VA to implement NSQIP at 14 academic hospitals through a pilot project funded by AHRQ, which has since become an established system of methods at these hospitals [29].

Over the period from 1995 to 2000, several quality improvement initiatives, task forces, and sentinel reports were initiated and published. The IOM launched the comprehensive quality initiative, the Joint Commission established the sentinel event policy, the Quality Interagency Coordination Task Force (QuIC) was established, the Leapfrog Group was founded, and the IOM published the transformative article "To Err is Human" [30] followed by "Crossing the Quality Chasm" [31]. The National Quality Forum (NQF) was created [32]. The National Quality Forum (NQF) is a nonprofit organization established in 1999 with a mission to improve the quality of US healthcare. The forum works to define national goals and priorities for healthcare quality improvement, and to build national consensus around these goals and to endorse standardized performance metrics for quantifying and reporting on national healthcare quality efforts. NQF endorsement has thus become the "gold standard" for healthcare performance measures, relied upon by healthcare purchasers such as CMS. The forum's membership includes a wide variety of stakeholders including hospitals, healthcare providers, consumer groups, purchasers, accrediting bodies, and research and healthcare quality improvement organizations. The wide scope and assortment of its membership has allowed for a comprehensive understanding of the challenges associated with quality improvement, and for the design of multidisciplinary and collaborative solutions to address them [33].

Several years later along the healthcare quality timeline, in 2003, the Surgical Care Improvement Program (SCIP) was established. SCIP is a voluntary multidisciplinary partnership of organizations that was created based on the Surgical Infection Prevention (SIP) program and the NSQIP model, and aimed at reducing surgical complications and mortality [34, 35•]. The targeted measures were related either to infection prevention, or venous thromboembolism (VTE) prevention. SCIP transitioned to a mandatory publicly reported system in 2003, with participation incentivized by a Medicare payment that would otherwise be withheld for non-participation.

The use of public reporting has since then continued to expand, with the 2003 Hospital Inpatient Quality Reporting (IQR) program. IQR was intended to provide consumers with healthcare quality information that assists in making informed decisions regarding their healthcare. It was also intended to guide hospitals and providers towards improving the quality of inpatient care delivered to patients, through the incentive of higher annual update to their payment rates [36•]. The information gathered through the program is made publicly available through the Hospital Compare Website.

Physician Quality Reporting System (PQRS)

With a growing focus placed on the physician as the target of feedback and incentives, public reporting efforts in 2006 led to the development of the Physician Quality Reporting Initiative (PQRI), entitled the Physician Quality Reporting System (PQRS) as of 2011 [37]. Under the Tax Relief and Health Care Act of 2006 (TRHCA), PQRI began as a voluntary pay-for-reporting program. The program was set to provide incentive payments in the form of a 1.5 % bonus on total allowed Medicare Part B Fee-For-Service (FFS) charges for successful reporting on a minimum of 3 quality measures, or for 1 of 14 measure groups for the reporting period of July 1, 2007 through December 31, 2007 [37]. Under the Medicare Improvement for Patients and Providers Act of 2008 (MIPPA) [38], PQRI incentive payments were increased to 2 % for successful participation in both the 2009 and 2010 program years, and public reporting became mandatory. A unique element of the PQRS was its focus on pay-for-reporting at the individual physician level [17•]. However, while participation in PQRS is currently voluntary, beginning in 2015, all providers eligible for incentive payments will be subject to penalties for failing to participate. The penalty is set to begin at a 1.5 % reduction for those who fail to report on the minimum measure set and scheduled to increase to a penalty of 2 % reduction in reimbursement in 2016 and beyond [39]. The goal of the PQRS program is to incentivize the discussion of quality oriented questions between patients and providers, and to promote awareness among providers of the opportunities for quality improvement present in daily care and process [40].

Recent efforts and the patient protection and accountable care act

The intense focus on quality in healthcare was brought to the forefront with the passage of the Patient Protection and Accountable Care Act (PPACA), signed into law by President Obama on March 23, 2010 [41]. The law contains multiple provisions designed to modify the manner in which care is delivered to Medicare and Medicaid patients, and the system by which provider payment is determined, with a central objective of improving quality while lowering healthcare costs and expanding access. One of the key provisions centered around quality is the creation of a non-profit Patient-Centered Outcomes Research Institute (PCORI) to conduct research that compares the clinical effectiveness of medical treatments, otherwise known as Comparative Effectiveness Research (CER) [42]. CER is intended to determine which interventions are most effective for certain patient populations under specific circumstances, and to use these findings to guide treatment algorithms that

support patient-centered, evidence-based, high quality care. Another PPCA quality centered provision is a penalty based quality improvement provision, which prohibits federal payments to states for Medicaid services related to certain hospital-acquired infections starting February 2011 [43], and also the National Quality Strategy, formally released in March of 2011 [44].

The remaining quality related provisions of the law have yet to be implemented. Several are scheduled for implementation in the fall of 2012, including the Medicare Value-Based Purchasing program [45], and the provision to reduce Medicare Payments for Hospital Readmissions, which aims to reduce Medicare payments that would otherwise be made to hospitals to account for excess (preventable) hospital readmissions [46].

Accountable Care Organizations (ACOs)

On October 20, 2011, CMS released the final rules for the official implementation of Accountable Care Organizations (ACOs) under the Affordable Care Act. ACOs were established with the intention to guide healthcare providers and hospitals towards more coordinated, higher quality, and patient centered care for Medicare patients, and to replace the often fragmented care received under the single payment, single provider system of the Fee-for-Service payment system [38]. The Act also delineates that for an ACO to share in any savings created, it must prove that it has met the quality performance measures defined. These currently include 65 process and outcome measures spanning 5 quality domains: patient experience of care, care coordination, patient safety, preventive health, and at-risk population/frail elderly health. Several of the proposed quality measures align with those used in other CMS quality programs, such as PQRS, the Electronic Health Record (EHR) incentive program, and the Hospital IQR [38].

Quality in musculoskeletal care

The essential role of quality and safety improvement efforts permeates the general scope of health care. Improving quality in musculoskeletal care has progressively become a goal of increasing importance to payers, hospitals, surgeons, patients, and governmental entities, particularly given the increasing complexity and cost of surgical procedures and the rising public demand for information regarding the safety, quality, and efficacy of treatment [47]. However the complexity of health care delivery in the United States has made quality assessment and improvement a relatively dynamic and challenging process. Based on the conceptual framework of Donabedian, efforts have generally focused on assessing data that captures and integrates structural measures (ie, surgical case volume), process measures (ie, SCIP measures linking process to outcome), as well as clinical outcomes (ie, NSQIP data) [16]. A significant focus has also been placed on developing payment and delivery models that incentivize and support the provision of high quality, cost-efficient care.

Structural metrics generally revolve around the health care system, and include variables such as organizational structure, material, and human resources [47]. Examples of structural measures include surgical case volume, access to technology and equipment, and provider to patient ratios. The association between surgical case volume and health outcomes is one that has received notable attention in recent years, with research that has revealed a positive correlation between volume and outcomes, and policy discussions have begun to consider volume in reimbursement decisions [48]. The advantage of structural measures in assessing quality hinges on the presence of readily available data usually collected in administrative databases and therefore access to large volumes of data, as well as the opportunity for rapid review of easily analyzed data [49]. The disadvantages however, include a difficulty with discerning whether measured structural differences necessarily correlate with differences in surgical quality, and also include a limitation towards assessing the quality delivered by individual hospitals or providers. Most importantly however, most structural measures are not easily actionable [47]. Therefore even if easily defined and measured, allowing for straightforward assessment, they are not necessarily appropriate for achieving quality improvement goals; hence the need for integrating all arms of the structure, process, and outcome model.

Process measures are targeted towards assessing the practical, diagnostic and procedural activities carried out when health providers deliver care to patients, including the history and physical exam, diagnostic testing, and the justifications and indications for therapeutic interventions [50]. The theoretic advantage of these measures is that if accurately chosen and assessed, they directly measure the care received by the patient, allowing for prompt recognition, and remedial action if needed [47]. These measures are therefore inherently actionable, and relevant in quality improvement efforts, but the disadvantage often lies in the absence of a firm designative link to patient outcomes, and the challenge of identifying appropriate patient populations for each intervention examined. However since process metrics can be easily tracked and measured, they have often been chosen to be the focus of national quality improvement programs. One such program is the Surgical Care Improvement Program (SCIP), which, as previously mentioned, is a voluntary collaborative that was created based on the Surgical Infection Prevention (SIP) program and the NSQIP model, aimed at reducing surgical complications and

mortality [34]. SCIP processes of care measures that are of importance to musculoskeletal care include; the prevention/reduction of surgical site infections (SSIs) through assessment of whether the proper antibiotics were selected, whether prophylactic antibiotics received within one hour of incision; and if they were discontinued at 24 hours. They also include the prevention/reduction of venous thromboembolism (VTE) through the initiation of recommended VTE prophylaxis within 24 hours postoperatively.

As the final arm of the 3 part quality assessment model, outcome measures generally assess the effect that delivered care has directly on the health status of patients and populations [50]. These measures are generally associated with a presumed level of validity, as the achievement of improved outcomes is generally the goal of surgical treatment. Historically quality assessment of surgical outcomes has relied on direct measurement of outcomes in the form of average 30-day morbidity and mortality rates. Other measures have included hospital length of stay, hospital readmission rates, cost-effectiveness, and patient experience. The direct measurement of surgical outcomes is challenged by the problem of inadequate patient population sample size, which results from the difficulty in gathering sufficient and meaningful data for individual surgeon or procedure- specific outcomes, as a high frequency, and volume would need to be reached in order to achieve reliable outcomes [47]. An additional disadvantage arises from the inherent nature of outcome measures being delayed events that are difficult to prospectively track and measure. Hence, the measurement of an outcome may be too delayed to allow for intervention if indicated and may only allow for future change should a similar circumstance arise. In addition, outcome measures are influenced by many steps along the continuum of care, and therefore it is difficult to attribute a positive or adverse outcome to any particular intervention along a complex sequence of events.

The most critical concern in relying upon outcome measures is the absence of appropriate risk adjustment, which could inaccurately equate outcomes of physicians, and institutions caring for the sickest patients as poor quality care. The public reporting of unadjusted outcome data could therefore lead to the denial of care to the sickest patients for fear of acquiring poor scores and a negative reputation [51]. In the existing team-based care models that define our healthcare delivery system, an added challenge lies in the accurate attribution of physician services. It has been demonstrated that accurate and reliable attribution of costs to the individual physician is very difficult to achieve [52]. Furthermore, in the effort to quantify the reliability of quality measures used in appraising physician performance it has been shown that typical health plan administrative data provided insufficient numbers of reported quality events, rendering the findings of quality measurement unreliable [53].

Value-based payment

Quality reporting and hospital value-based purchasing program

An example of the application of process measures is the Quality Reporting and Hospital Value-Based Purchasing program, a newly proposed program being implemented by CMS under the Affordable Care Act, and scheduled to begin in October 2012 with full implementation to be completed by 2016 [36•]. Under the Hospital VBP program, hospitals would be able to earn incentive payments either based on their performance on Clinical Process of Care Measures; there are 12 measures, including several SCIP measures, as well as Patient Experience of Care Measures based on their performance improvement relative to their starting baseline. The Hospital VBP program is designed to improve quality, reduce inappropriate care and promote better health outcomes, and patient experiences during hospital stays through a system of financial incentives and penalties.

Physician value-based modifier program (CMS)

The Physician Value-Based Modifier Program intends to transition physician reimbursement from one that rewards volume to one that reimburses based on value. It functions to provide physicians with comparative performance information that is actionable and can be used to improve the care they provide. The program contains 2 components: The Physician Quality and Resource Use Reports (QRURs), and the development and implementation of a Value-based Payment Modifier (VBPM) [39]. Many challenges still exist in defining and attributing quality and resource use to a specific physician, and to developing valid, risk-adjusted value-based payment modifiers.

What have we learned?

There are a number of elements that have been associated with successful healthcare quality efforts and can be deemed essential for the achievement of sustainable systems of quality assurance. Of crucial importance is the presence of physician leadership, infrastructural support, and prioritization of healthcare quality within the culture of an organization. Existing performance measurement methods are frequently derived from administrative claims data, as there is a paucity of other sources of data available, and further limited by the low validity of using administrative claims data to accurately reflect the clinical record. This was confirmed in a study that directly assessed the validity of using administrative claims data in total joint arthroplasty (TJA)

outcomes research [54]. The authors found that some International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnosis and procedure codes used to define comorbidities and complications were accurate in reflecting the clinical record, whereas others were not, and their use in quality/performance measurement systems could result in inaccurate assessment of quality in TJA care.

Other elements identified to be instrumental in successful healthcare quality efforts in the United States include the existence of a reliable evidence base with valid and replicable data collection mechanisms, and a flexible, pragmatic approach to the pursuit of healthcare quality improvement that captures the input of all stakeholders involved. Attempts to develop a standard set of reportable metrics for orthopedics in order to build an evidence base, and attempts to collect the data derived from applying those metrics have highlighted the difficulties of collecting sufficient data that is accurate, has appropriate attribution for participating providers both for performance and cost [55], and actionability in using the data to improve clinical practice [56].

Another lesson learned is the need for a strategy and plan for transitioning from innovative ideas to demonstration projects to implementation mechanisms and scale up strategies, with comprehensive plans for monitoring and evaluation. The absence of well-planned scale-up strategies has led to many stagnant and repeated quality improvement efforts. Finally, and of critical importance, is the focus that needs to be placed on developing and operationalizing the appropriate incentives for encouraging healthcare quality improvement.

Conclusion

In the ever-evolving healthcare delivery environment aimed at rewarding value and quality, a focus on performance improvement and outcome measurement will be necessary for achieving success. As the provisions of the heavily debated healthcare law begin to transform the framework of the US healthcare system, it is quickly becoming evident that the quality of care delivered will be a central and integral element of any adopted change. It is particularly the case that quality, as it becomes quantifiable, standardized, routinely measured, and reported, will be linked to economic rewards and penalties. These links will be driven by concepts such as value-based purchasing, performance-based reimbursements and deductions, and several other described approaches. Though several examples of successful healthcare quality efforts have been documented over the past century, much work remains to be done to address the complex and evolving challenges associated with achieving optimal healthcare quality. Given the more recent rise in prioritization and resource allocation towards healthcare quality improvement, coupled with the growing requirements for evaluation, reporting and reimbursement based on healthcare quality performance and a simultaneous increase in demands for transparency and accountability at all levels of the healthcare system, there are valuable contributions to be made in developing valid and reliable research, and data collection methods, as well as specialty-specific evidence-based performance measures. This will certainly require significant investment in the infrastructure and resources needed to support valid and reproducible quality measurement and linkage to improved outcomes. Through informed leadership and involvement in systems-base research as well as policy formulation and development, musculoskeletal care providers are well positioned and equipped to practically and comprehensively inform the delivery of high quality healthcare.

Disclosure KJ Bozic: Paid consultant for Blue Cross Blue Shield Association, Integrated Healthcare Association, Pacific Business Group on Health; Y Marjoua: none.

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