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Clinical Performance Measures and Quality Improvement System Considerations for Dental Education

Joseph W. Parkinson, DDS, MPA; Gregory G. Zeller, DDS, MS

Abstract: Quality improvement and quality assurance programs are an integral part of providing excellence in health care delivery. The Dental Quality Alliance and the Commission on Dental Accreditation recognize this and have created standards and recommendations to advise health care providers and health care delivery systems, including dental schools, on measuring the quality of the care delivered to patients. Overall health care expenditures have increased, and the Affordable Care Act has made health care, including dentistry, available to more people in the United States. These increases in cost and in the number of patients accessing care contribute to a heightened interest in measurable quality improvement outcomes that reflect efficiency, effectiveness, and overall value. Practitioners and administrators, both in academia and in the “real world,” need an understanding of various quality improvement methodologies available in order to select approaches that support effective monitoring of the quality of care delivered. This article compares and contrasts various quality improvement approaches, programs, and systems currently in use in order to assist dental providers and administrators in choosing quality improvement methodologies pertinent to their practice or institution.

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Interest in quality improvement in health care delivery has risen sharply as health care expenditures have increased in the United States. In addition, the Affordable Care Act has contributed to a heightened focus both on the quality of care and on the cost-effective value of that care, particularly for the increasing number of Medicaid patients seeking medical and dental care. The need for a greater quantity of quality health care that offers the best value requires the application of quality improvement systems to produce better outcomes in the most efficient and effective manner. Dentistry and dental education recognize this imperative for clinical quality improvement and have started developing, implementing, and enhancing continuous quality improvement systems.¹⁻³

Various entities, such as organized dentistry and dental education, as well as involved stakeholders, such as employers, third-party payers, and governmental agencies, have efforts under way to examine quality issues and quality improvement systems. In addition, potential compliance requirements associated with performance and quality outcomes are driving consideration of metrics and

reporting.^{4,5} Due to these prevailing winds of change in the quality of care climate, both individual health care providers and health care systems are confronted with many and, often, conflicting proposed approaches to performance improvement, quality indicators, and outcomes assessment.⁶ Although the dental profession has not formally implemented any standardized approaches or metrics, distinct changes are undeniably under way in the evaluation of the quality of clinical dental care.

The Health Resources and Services Administration of the U.S. Department of Health and Human Services states that “quality improvement (QI) consists of systematic and continuous actions that lead to measurable improvement in health care services and the health status of targeted patient groups.”⁷ The Health and Medicine Division of the National Academies of Sciences, Engineering, and Medicine⁸ (formerly known as the Institute of Medicine, IOM) defines quality in health care as “a direct correlation between the level of improved health services and the desired health outcomes of individuals and populations.”⁹

The Dental Quality Alliance and the Commission on Dental Accreditation (CODA) are organiza-

tions that share an interest in quality improvement in dentistry.^{2,10} These organizations are similar in that they develop goals and promote the use of performance measures in continuous quality improvement systems, though they differ in areas of focus. The Dental Quality Alliance primarily develops and tests specific performance measures, usually collected electronically, and currently primarily aimed at children.^{11,12} CODA accredits schools and programs in predoctoral, allied, and advanced dental education, with a separate set of standards for each area. CODA, as the governing body for the accreditation of dental education programs, mandates the use of a rational continuous quality improvement system without requiring the use of a specific system or specific performance measures. The term “quality assurance” (QA), sometimes used synonymously with QI in health care, often implies a focus on the use of quality indicators either to determine that desired quality standards are met or to identify problems so that corrective actions may be instituted to address, measure, and improve the quality of health care services outcomes. CODA defines QA in this manner.³

Dental education programs must have a broad perspective on QI because these programs function as health care providers as well as educators. As a result of this dual role, CODA must constantly ensure that dental schools are providing both excellent patient care and quality student education. This is a difficult and daunting task for many dental educators. An understanding of some of the primary QI systems utilized today, along with comprehension of the basic principles of health care QI espoused by the Dental Quality Alliance and CODA, will benefit dental clinicians, educators, and administrators as they attempt to improve patient care. Eventually, shared measurements and benchmarks that may be acquired easily will be useful for dental schools for the implementation of comprehensive QI programs.

In this article, we will review the specific Dental Quality Alliance and CODA recommendations for QI. We will then briefly describe and compare some of the currently used continuous quality improvement systems pertinent to dental practice and dental education in order to lay a foundation for common understanding of quality of care improvement issues in dentistry. Finally, we will offer some initial suggestions to aid dental educators in the creation of an institutional continuous quality improvement program for clinical care.

Dental Quality Alliance

In 2008, the Centers for Medicare and Medicaid Services (CMS) proposed that the American Dental Association (ADA), which also collaborates with the independent CODA, establish a Dental Quality Alliance (DQA) to develop performance measures for oral health care. The mission of this group is to advance performance measures, developed through consensus agreement of involved stakeholders, as a means to improve oral health, patient care, and safety. The DQA is currently comprised of 29 member entities and ADA agencies including the Academy of General Dentistry (AGD), the American Dental Education Association (ADEA), the Centers for Disease Control and Prevention (CDC), the CMS, and The Joint Commission.² In the guidebook released by the DQA, the IOM is cited as the source for the DQA framework for quality improvement with six important goals for quality improvement based on an IOM report released in 2001. This report, *Crossing the Quality Chasm*, focuses on how the health system can be improved to increase innovation and improve care delivery.¹³ In this report, the IOM outlined six important aims for quality improvement with the goal of providing the “right care for every person, every time” (Table 1).

There are various challenges to developing, testing, and implementing performance measures for use in QI systems in dentistry. These include very few evidence-based guidelines, limited knowledge of outcomes based on data, limited diagnostic data collection to establish benchmarks, limited information systems for capturing and transmitting data from patient records, and limited accessibility of claims data.⁹ The goal of the DQA is to help to overcome these obstacles through the use of DQA performance measures in continuous quality improvement systems. The initial performance measures sought by CMS through the DQA are primarily intended for use in evaluating public programs such as Medicaid and are aimed at pediatric populations.^{11,12} This approach will enable dental providers and administrators to use defined data-driven measures to improve the quality and efficiency of care for pediatric Medicaid patients.

In addition to identifying methods by which dental care may be evaluated, the acquisition of data for performance measurement should be made easy for providers and administrators so that analysis can be done quickly and then acted upon to improve the quality and efficiency of patient care in a reasonably

Table 1. Institute of Medicine's six aims for quality improvement

Aim	Description
1. Safe	Avoiding injuries to patients from care that is intended to help them.
2. Effective	Providing services based on scientific knowledge to all who could benefit and refraining from providing services to those who are not likely to benefit (avoiding underuse and overuse, respectively).
3. Patient-centered	Providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions.
4. Timely	Reducing waits and sometimes harmful delays for both those who receive and those who give care.
5. Efficient	Avoiding waste, including waste of equipment, supplies, ideas, or energy.
6. Equitable	Providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.

Source: Institute of Medicine. *Crossing the quality chasm: a new health system for the 21st century*. Washington, DC: National Academy Press, 2001.

short period of time. Long delays in the utilization of QI data are not conducive to effective and efficient patient care. Electronic health record (EHR) systems are often promoted as a means to enhance the acquisition and analysis of data regarding the delivery of care.^{5,14}

CODA's Role in Quality Improvement

CODA is the governing body of the accreditation of dental education programs. CODA performs an external evaluation of an institution that occurs after the school or program has completed an internal evaluation, known as a "Self-Study" document. This internal and external evaluation supports the accreditation process used for the predoctoral programs in U.S. dental schools, which are accredited every seven years. Schools submit self-study documents, and a team of site visitors visits the school to evaluate and clarify what has been detailed in the self-study.¹⁰

CODA is not prescriptive in recommending which QI system predoctoral programs use as long as there is evidence of continuous quality improvement. The goal is to give schools the flexibility to meet accreditation requirements in the manner that is most effective for their institution. These requirements are written and communicated in the form of Standards, which have "must" statements that schools are required to satisfy in order to receive accredited status. Since the focus of this article is clinical quality improvement, we will focus on CODA Standard 5-3 in the Patient Care Services requirements, which states the following: "The dental school must conduct a formal system of continuous quality improvement

for the patient care program that demonstrates evidence of a) standards of care that are patient-centered, focused on comprehensive care, and written in a format that facilitates assessment with measurable criteria; b) ongoing review and analysis of compliance with the defined standards of care; c) an ongoing review of a representative sample of patients and patient records to assess the appropriateness, necessity, and quality of the care provided; d) mechanisms to determine the cause(s) of treatment deficiencies; and e) implementation of corrective measures as appropriate."³ The intent statement for this requirement is as follows: "Dental education programs should create and maintain databases for monitoring and improving patient care and serving as a resource for research and evidence-based practice."

The flexibility offered to schools to demonstrate compliance with Standard 5-3, when combined with the clarity of the written CODA accreditation documents, might lead to the conclusion that meeting the Standard 5-3 requirement for a formal system of continuous quality improvement for patient care is relatively easy. However, some schools may not have faculty or administrators who possess detailed knowledge of clinical quality improvement systems. Others may not capture critical information, such as a diagnostic rationale for treatment, in a systematic and standardized manner. Consequently, some predoctoral programs might have difficulty developing and implementing comprehensive continuous quality improvement systems for patient care programs. These challenges sometimes lead to underperformance in the area of clinical quality improvement and could lead to formal recommendations for correction, based on the personal observations of the lead author, who serves as a CODA site visitor.

In CODA's *Accreditation Standards for Dental Education Programs* section entitled "Definition of Terms Used in Accreditation Standards for Dental Education Programs," quality assurance is defined as follows: "A cycle of PLAN, DO, CHECK, ACT that involves setting goals, determining outcomes, and collecting data in an ongoing and systematic manner to measure attainment of goals and outcomes. The final step in quality assurance involves identification and implementation of corrective measures designed to strengthen the program."³ This "PLAN, DO, CHECK, ACT" cycle is an integral part of three of the five quality improvement systems that are outlined below.

Comparison of DQA and CODA

When comparing the goals for QI set forth by the DQA and by the CODA standard for clinical quality improvement, we see similarities in the concepts regarding what constitutes a continuous quality improvement system. Both groups mention the importance of being patient-centered and focus prominently on the importance of data-driven continuous quality improvement systems. The DQA views assessment of quality patient care as the creation of metrics using the available defined and tested DQA data-driven performance measures. CODA requires a continuous quality improvement system that relies on standards of care to demonstrate the provision of comprehensive care using measurable criteria defined by the institution. Both DQA and CODA aim to increase data collection and aggregation for use in continuous quality improvement systems, with DQA specifically supporting collection of digital data for performance measures through digital forms or EHRs. The similarities between DQA and CODA regarding the need for quality care measures emphasize the need for dental education programs to focus on performance measures and benchmarks for analyses that will result in actionable information for decision making to improve health care quality.

CODA goes beyond the creation and aggregation of data-driven clinical performance measures to require an assessment of the appropriateness and necessity of care as part of the determination of quality of patient care. In addition, CODA requires demonstration of mechanisms to evaluate treatment deficiencies along with the implementation of ap-

propriate corrective measures that are, in turn, subsequently evaluated for improvement in outcomes.

At this time, DQA remains focused on developing some foundational performance measures that may be used in a QI system. Specifically, the initial DQA performance measures, which are tested for feasibility, reliability, and validity, are aimed at providing consensus measures, primarily aimed at pediatric care, that are suitable for demonstration of "meaningful use" to receive Medicaid and Medicare EHR incentive payments. These Medicaid and Medicare programs provide financial incentives for achieving "meaningful use," which is the use of certified EHR technology to achieve health and efficiency goals.¹⁵

These initial DQA measures may also be among those used by dental education programs as part of the QI system necessary for CODA accreditation. Dental schools, however, must also have a working continuous quality improvement system in place and may use any appropriate performance measures, such as standards of care and indicators of comprehensive care, as part of that system. Through the acquisition and evaluation of performance data that use appropriate measurable criteria, schools can demonstrate to CODA that the quality and effectiveness of patient care meet or exceed the desired benchmarked performance levels. Also, if necessary, a school may implement "corrective measures" to address deficiencies and show subsequent improvement through data-driven performance metrics. Such a QI system will also serve as a desired resource for research and evidence-based practice. Table 2 shows a sample grid that could be used as a starting point to compile QI data to meet the requirements of CODA Standard 5-3.

Overview of Continuous Quality Improvement Systems

There are numerous QI systems currently utilized in health care.¹⁶ These systems include the following: Total Quality Management/Continuous Quality Improvement (TQM/CQI), Rapid Cycle Change/Institute for Health Care Improvement (IHI), Business Process Reengineering (BPR), Lean Thinking, and Six Sigma. Knowledge of the basic tenets of these systems would be helpful for all health care providers and administrators. Several of the five

share common characteristics, and each has a distinguishing feature that makes that system distinctive (Table 3). Health care administrators, including those in dentistry, should study these systems in greater detail and choose the system that best meets their institutional goals, culture, and capabilities for data capture, aggregation, and analysis.

TQM/CQI

The terms “Total Quality Management” and “Continuous Quality Improvement” refer to essentially the same system.¹⁷ TQM is focused on systems of continuous improvement, rather than individuals, and on avoiding mistakes before they happen. TQM differs from traditional quality assurance in that the emphasis is on understanding and improving the underlying work processes and *systems*, rather than correction of the *individual’s* mistakes after the fact.¹⁸

TQM utilizes the concept that quality is the result of complex processes that either help or hurt the attainment of good outcomes. It focuses on both internal and external customers to improve their satisfaction with the goods and services provided and on prevention of problems, rather than on inspection at the end of production. A dental education example is the production of prostheses that are delivered to the patient without problems and do not result in a remake or redo, where a remake is a case sent back to the lab at time of attempted insertion due to inadequate quality and a redo is required at a later date for quality reasons such as open crown margin observed at the very next patient recall.

TQM/CQI utilizes many tools, including cause and effect diagrams, statistical methods, and “Plan-Do-Study-Act” (PDSA) cycles. The need for thorough data collection and analysis is accomplished before making changes, and the need to engage front-line staff in the process and making it part of their daily work is emphasized.^{17,18}

Business Process Reengineering

BPR involves more radical change by essentially starting over from the ground up.¹⁶ “Process” is defined as a “structured, measured set of activities designed to produce a specified output for a particular customer or market,” and “business process” is defined as “a set of logically related tasks performed to achieve a defined business outcome.”¹⁹ Thus, BPR is different from TQM/CQI in that it is an “all or nothing” approach, while TQM/CQI applies incremental improvement to existing processes.

In BPR, change is driven from the top by a visionary leader and is based on the belief that organizations should be arranged around key processes rather than relying on individual specialists performing defined functions. Specialists are replaced by multiskilled workers in self-management teams that are responsible for designing appropriate work processes.¹⁶ Patient-focused care, which emphasizes redesigning processes around the patient, could be considered as an application of BPR in health care.¹⁹

Rapid Cycle Change/IHI

Rapid cycle change is similar to CQI in using a systematic and data-driven approach, but differs in that *sufficient* data are collected to know if a change has had an effect, whereas CQI focuses on flowcharting and more extensive measuring.¹⁶ The strengths of rapid cycle change are that it can utilize the ideas and ingenuity of staff at the lowest level and that it can be scaled up or down to address very large or very small issues. On the negative side, similar to all bottom-up changes, there may be differences between changes desired at a local level and the organization’s overall strategic initiatives.

Rapid cycle change also uses the principles of PDSA cycles to promote small-scale changes to test interventions, thereby enabling rapid assessment and flexibility to adapt the change according to feedback to ensure the right solution for the problem. The theory of PDSA is that by starting with small-scale tests, users are provided with the freedom to act and learn. This minimizes the risk to patients and the organization and minimizes the resources required since small changes can be evaluated before committing large amounts of time and energy. This approach also provides the opportunity to build evidence for change through pilot projects and engages those who would ultimately implement the solution during the time that confidence in the intervention increases.

Lean Thinking

The core principle for lean thinking is to provide the value the customer wants with minimal wasted time, effort, and cost. Actions or processes that do not create value are modified or eliminated. Lean interventions attempt to reduce waste and facilitate flow in care processes. They utilize value stream mapping as well as identifying and streamlining value-adding activities.¹⁶

There are five key concepts in an implementation of lean thinking:

Table 2. Sample table for use in addressing CODA 5-3 standards of care, measurements, results, and corrective actions

Standard of Care	Criteria Evaluated	Data Collection Methodology	Benchmarks	Result	Corrective Action	Follow Up	Evaluation Frequency	Quality Assurance Committee Review
Standard 1: Comprehensive Care	Treatment plan completed and consistent with data collected	Chart audits	90%				Two times/year	Two times/year
The College of Dentistry will provide comprehensive care to all patients who desire it.	Proper sequencing of treatment	Treatment phase evaluations	90%				Ongoing	Quarterly
	All treatment complete and acceptable	Exit exam/final phase evaluation	<5% incomplete or unacceptable				Ongoing	Quarterly
Standard 2: Timely Care	Timely patient care (patient seen at least once every 60 days)	Electronic health record (EHR) report	80%				Ongoing	Two times/year
The College of Dentistry will provide timely care to all patients.	Patient satisfaction with timeliness	Patient satisfaction report	90%				Two times/year	Two times/year
	Recall rate	EHR report for clinic	80%				Monthly	Two times/year
Standard 3: Quality Care	All care complete and correct at end of treatment	Exit exam or final phase evaluation report	<5% incomplete				Ongoing	Two times/year
The College of Dentistry will provide the highest quality of care to all patients.	Fixed/removable quality	Laboratory remake/redo* report	<5% redo*				Monthly	Quarterly
	Ceramics lab remakes*	Laboratory remake/redo* report	90% satisfactory				Monthly	Quarterly
	Removable lab remakes*	Laboratory remake/redo* report	90% satisfactory				Monthly	Quarterly
Standard 4: Patient Satisfaction	Radiology documentation (need, findings, recommendations)	Chart audits	90% appropriate				Two times/year	Two times/year
	Overall patient satisfaction	Patient satisfaction report	90%				Ongoing	Two times/year
	Patient complaints	College quality manager report	<3% of total patient visits				Ongoing	Two times/year
The College of Dentistry will strive to have the highest level of patient satisfaction.	Patient satisfaction at exit exam	Exit exam or final phase evaluation report	95%				Ongoing	Two times/year

<p>Standard 5: Regulations Followed</p> <p>The College of Dentistry will comply with all federal, state, and local regulations.</p>	Confidentiality-EHR lock out	EHR report	100%	Ongoing	Two times/year
	Patient rights & responsibilities and notice of privacy provided, and treatment plan signed	EHR report, chart audits	100%	Monthly	Two times/year
	Informed consent	Chart audits	100%	Two times/year	Quarterly
	Dental consults requested and answered	Chart audits	100%	Ongoing	Two times/year
	Biohazard incidents	Reports to clinic manager, log maintained	≤5 incidents per semester	Ongoing	Two times/year
	Bloodborne exposures	Incident reports	≤5 similar exposures	Ongoing	Quarterly/ maintain log
	Bloodborne pathogen training	Tracking software	100%	Ongoing	Quarterly/ maintain log
	CPR training	Tracking software	100%	Ongoing	Quarterly/ maintain log
	HIPAA training	Tracking software	100%	Ongoing	Quarterly/ maintain log
	Hazardous communication/waste training	Tracking software	100%	Ongoing	Quarterly/ maintain log
	Vaccinations	Tracking software	100%	Ongoing	Quarterly/ maintain log
	Emergency cart, monitors, and drugs/oxygen	Log maintained	100%	Ongoing	Quarterly/ maintain log
	Dental unit water line monitoring	Log maintained	100%	Ongoing	Quarterly/ maintain log

*Remake is sent back to lab at time of attempted insertion. Redo is accomplished at a later date—for example, an open crown margin discovered at next patient recall.

Note: This table was developed through the practical experience of the first author.

Table 3. Overview of five quality improvement systems utilized in health care

	TQM/CQI	BPR	Rapid Cycle/IHI	Lean Thinking	Six Sigma
Organizing concepts	Focuses on systems of continuous improvement, rather than on individuals. Avoids mistakes before they happen.	Visionary leader. Specialists replaced by multiskilled cross-trained workers. Organizations arranged around key functional processes.	Bottom-up changes. Short-cycle, small-scale tests and quick wins.	Provides value to customer; minimal wasted time, effort, and cost. Utilizes process mapping, also known as value stream mapping.	Eliminates defects and reduces variation in the process of care to avoid “defects” in outcomes.
Strengths	Engages front-line staff in process. Relatively small-scale change.	Redesigns the process around the patient. Large-scale change as result of “blowing up” existing systems.	Utilizes ideas and ingenuity of staff at front-line level. Relatively small-scale, quick changes can increase staff motivation.	If successful, smooth patient care process. Elimination of all sources of waste. Relatively small-scale changes involving front-line employees at every step with quick wins to increase motivation.	Goal: create reliable and repeatable evidence-based processes, which will therefore be optimal and delivered in same way. Relatively large-scale change.
Weaknesses	Reliance on flow-charting and extensive measuring.	Top-down approach, “big bang” change with many simultaneous changes.	Since bottom-up, there may be differences between changes at local level and organization’s strategic plans.	The customer is usually not the only limiting factor in the health care system.	Utilization of data to drive human behavior can be difficult. Relatively high cost for training.
Similarities	Uses Plan-Do Study-Act (PDSA) cycles as do BPR and Rapid Cycle/IHI.	Similar to Lean and Six Sigma with elimination of non-value-adding activities. Uses PDSA cycles, as do TQM/CQI and Rapid Cycle/IHI.	Uses PDSA cycles as do TQM/CQI and BPR.	Elimination of non-value items, as with Six Sigma and BPR, although Lean emphasis on customer value over all other factors could ignore some issues in health care systems.	Uses statistical tools to identify cause of variation, similar to PDSA cycles, although with much greater granular detail and more data.
Differences	Different from Rapid Cycle/IHI in that it requires more data collection and analysis.	Different from TQM/CQI and Rapid Cycle/IHI in that it is an “all or nothing” (“big bang”) approach, rather than smaller incremental improvement of distinct existing processes.	Different from TQM/CQI in that it utilizes less intensive “sufficient” data to know if small, quick changes had an effect.	Elimination of non-value items, as with Six Sigma and BPR, accompanied by complete emphasis on customer value over all other factors.	Uses statistical tools to identify cause of variation similar to PDSA cycles, although with much greater granularity and very structured overall approach.

TQM/CQI=Total Quality Management/Continuous Quality Improvement
 BPR=Business Process Reengineering
 Rapid Cycle/IHI=Rapid Cycle Change/Institute for Health Care Improvement

1. Specify the value desired by the customer. Products and services should be designed with the customer in mind. Value is defined as anything that improves the customer's experience. In health care, the customer is usually the patient.
2. Identify the "value stream," otherwise known as the process. This is the core group of actions necessary to deliver value for customers and/or patients. Each step in the process should provide value for the customer/patient, thus eliminating all sources of waste. In health care, the patient journey is the process and is important to ensure that it is as smooth and efficient as possible.
3. Make the process and value flow continuously. Processes should be designated so that there is efficient flow in the system and the information and services are available as needed. In health care, an example is establishing the continuous flow of patients along with the necessary patient information to different treatment areas in the system.
4. Introduce pull between all steps where continuous flow is possible. The concept of pull is that the customer pulls products or services so that he or she determines demand.
5. Manage toward perfection. In lean, processes are continuously improved, with the goal being kaizen or perfection. The goal of lean thinking is to create an environment of constant review, emphasizing solutions from front-line employees, and to learn with every step.¹⁶

Six Sigma

The term "Six Sigma" is said to have derived from physicist Walter Shewhart's observation that three standard deviations (sigma) from the mean is the point that requires correction, so Six Sigma is "perfection."¹⁶ "Perfection," for practical purposes, is achieving a rate of 3.4 defects per million. The main thrust of Six Sigma is to eliminate defects and reduce variation in the process to improve outcomes. Six Sigma makes use of statistical tools and analyses to identify the cause of variation.²⁰

The Six Sigma QI model refers to a five-step process in the following stages: 1) Define: define who the customers are, what they want, current process capabilities, and objectives for improvement; 2) Measure: this step provides the metrics for data on which the improvement efforts will be based, as well as measures for the quality characteristics that reflect improvement in customer satisfaction and product performance; 3) Analyze: the data collected

are analyzed using tools such as Pareto analysis, flow diagrams, and other statistical tools to identify design and process modifications to achieve desired performance objectives; 4) Improve: resources are allocated to achieve the necessary changes to improve performance; and 5) Control: the process is monitored so that the performance improvements are maintained.²⁰

The challenge for health care institutions in adoption of Six Sigma is the utilization of data to drive human behavior. Patient care involves human behavior, and often the variability is very subtle and hard to quantify. Successful utilization of Six Sigma depends on the combination of a technical strategy with a cultural strategy for implementation of organizational change.²⁰ Six Sigma relies heavily on measurement and data, and data analysis is paramount. Data have to be gathered both at baseline and then later to show that improvement is occurring. Decisions must be made on statistics and facts, not on instincts or what has worked in the past. All of the Six Sigma roles require extensive training at a relatively high cost to become familiar with the tools.

Conclusion

Skyrocketing health care costs and implementation of the Affordable Care Act have sharply increased the focus on more efficient health care delivery systems, while also emphasizing the need for more effective, higher value quality outcomes. With an increasing number of patients receiving dental benefits from Medicaid and with a limited number of dental practitioners accepting Medicaid for dental treatment, many dental schools may see their patient base expand beyond their capacity and will need to evaluate performance and quality more closely using better quality improvement systems. The ability to treat patients more efficiently (faster, cheaper) while maintaining high quality (better value, more effective) care outcomes will be more critical in the future. To be most useful, quality improvement systems will need to acquire the necessary data and allow quick and precise analysis of that data. Clinicians and administrators will have to be knowledgeable concerning continuous quality improvement systems as well as guidelines from health care groups and governing bodies to ensure compliance with best practices and regulations. Dental health care delivery systems, including academic dental institutions, will need to continue to increase

focus on data-driven performance measures for oral health quality outcomes. This focus will include the use of standardized diagnostic coding systems to better measure oral health outcomes in individuals, communities, and populations. The implementation of useful EHRs is also increasing at a steady rate; thus, improving our ability to acquire data as part of the clinical workflow and to use that data more readily to measure care outcomes. Future clinicians and administrators will need to continue to determine how to best utilize these data to demonstrate improved oral and general health outcomes for the increasing patient pools they are expected to serve.

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