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Applying Quality Improvement into Systems-based Learning to Improve Diabetes Outcomes in Primary Care

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Abstract

In the U.S., where the prevalence of type 2 diabetes has reached epidemic proportions, many patients with this disease are treated by primary care physicians in community-based systems, including accountable care organisations (ACOs). To address gaps in the quality of diabetes care, national quality measures have been established, including patient-centered measures adopted by the Centers for Medicare and Medicaid Services for its Shared Savings Program for ACOs.

From a patient-centered perspective, high-quality diabetes care depends on effective communication between clinicians and patients, along with patient education and counseling about medications and lifestyle. We designed and implemented a quality improvement (QI) program for 30 primary care physicians treating patients with type 2 diabetes in three structurally similar but geographically diverse ACOs. Retrospective chart audits were conducted before (n = 300) and after (n = 300) each physician participated in accredited continuing medical education (CME) courses that focused on QI strategies. Randomly selected charts were audited to measurably assess essential interventions for improved outcomes in type 2 diabetes including the physicians' documentation of patient counseling and assessment of side effects, and patients' medication adherence status and changes in hemoglobin A1C (A1C) and body mass index (BMI). Paced educational interventions included a private performance improvement Internet live course conducted for each physician, small-group Internet live courses involving peer discussion, and a set of enduring materials, which were also multi-accredited for all clinicians in the physician's practice. Continual improvement cycles were guided by analysis of the baseline chart audits, quantitative survey data, and qualitative feedback offered by participants. To extend the benefit of the education, the enduring materials were offered to the interprofessional team of clinicians throughout the U.S. who did not participate in the QI program. For brevity, this article presents outcomes of the 30 primary care physicians.

Baseline to post-education improvements were observed for percentages of charts with documented assessment of medication side effects (+11%) and counseling about medication risks/benefits (+28%), medication adherence (+13%), and lifestyle modifications (+8%). Improvements were also observed for documented adherence to diabetes medications (+24%) and first-to-last visit changes in A1C (-0.16%) and BMI (-2.1). The findings indicate a positive influence of QI education on primary care physicians' performance of patient-centered quality measures and patient outcomes.

Problem

This systems-based quality improvement (QI) program and outcomes evaluation was conducted by PRIME Education, Inc. (PRIME®), a national medical education company and multi-accredited provider of continuing education for the health care team. Our project addressed needs for continuing medical education (CME) to support primary care physicians in improving their performance on patient-centered quality measures for type 2 diabetes and patient health outcomes, focusing on hemoglobin A1c (A1C) levels and body mass index (BMI). We also provided education for the interprofessional clinical support team, including nurses, pharmacists, medical assistants, and case managers, in community practices. The project was motivated by studies that have revealed deficiencies in the quality of patient-centered type 2 diabetes care in the U.S., and through interviews that we conducted with leading experts on QI programs in diabetes.

The project participants were 30 primary care physicians who practice in accountable care organisations (ACOs). ACOs are groups of physicians, hospitals, and other health care professionals who collaborate to provide coordinated patient care. As established through the U.S. Centers for Medicare and Medicaid Services (CMS) Shared Savings Program, ACO-based providers must achieve benchmark levels of performance on quality measures in order to receive shares of associated cost savings.[1] The 2015 CMS Shared Savings Program includes ACO 33 quality measures, seven of which focus on patient/caregiver experiences. These measures address health promotion and education, provider-patient communication, and shared decision-making.[1] In addition, the CMS program for ACOs includes a quality measure for poor A1C control (>9%) and a diabetes composite measure based on good control of A1C (< 8%), low-density lipoprotein (LDL) cholesterol (< 100 mg/dL), and blood pressure (< 140/90 mm Hg), as well as use of aspirin and nonuse of tobacco.

A recently published CMS report reveals deficiencies in physicians' performance on patient-centered and diabetes-specific ACO quality measures.[2] Among all ACOs in 2013, only 58% achieved the patient-centered quality measure for health promotion and education. In addition, shortcomings were evident in measures for shared decision-making (74%) and communication about health

and functional status (71%). For the diabetes composite measure, mean rates of physician compliance ranged from 54% to 75%. Less than 70% of the ACO providers' patients met the standard for A1C control, and nearly 25% had poor A1C control.[2]

The problem of suboptimal physician performance on patient-centered quality measures for diabetes is compounded by the recent availability of many new therapies, including insulin and noninsulin medications that act through different pharmacologic mechanisms. Notwithstanding their documented effectiveness in promoting glycemic control, the availability of new therapies complicates treatment decisions and management plans for physicians and their patients. This situation places increasingly greater emphasis on patient education and shared decision-making about medication benefits and risks, lifestyle modifications including diet and exercise, and self-care practices.[3]

Background

Approximately 28 million people in the U.S, or 9% of the population, have type 2 diabetes and are at risk of, or affected by, related complications including heart disease, retinopathy, nephropathy, and neuropathy.[4] Direct and indirect costs of diabetes in the U.S. are estimated to total $245 billion.[4] Despite the availability of many effective medical therapies, as well as strong evidence for positive effects of exercise and improved nutrition, the quality of diabetes care and patient health outcomes in the U.S. often fall short of national goals.[5] Gaps are especially evident for racial and ethnic minorities, groups that account for a large proportion of people with diabetes in the U.S.[5-8]

From a patient-centered perspective, important factors that contribute to suboptimal diabetes care include ineffective communication between health care professionals and their patients, and shortcomings in provision of patient education and counseling about medications and lifestyle.[3,9] Gaps in compliance with these types of patient-centered quality measures were recently reported by researchers who analysed the medical records of 27,225 patients with diabetes and 584,587 encounters with their primary care providers.[10] Only 40% of the patients' records indicated that providers offered lifestyle counseling, and only 10% documented medication intensification, which reflects a lack of communication and shared decision-making about appropriate therapy changes. Moreover, among 80% of the patients, values for A1C, LDL cholesterol, or blood pressure were at suboptimal levels.[10]

Deficiencies in patient-centered care predict low levels of patient activation and engagement, negligent self-management practices, nonadherence to medications, and poor glycemic control.[9] Studies have shown that lower levels of satisfaction with diabetes treatments are associated with nonadherence to medications and monitoring regimens, as well as with negative outcomes including poor A1C control.[11] A positive relationship exists between treatment satisfaction and the quality of communication and treatment information provided by health care professionals.[9] Thus, it is not surprising that the quality of providers' diabetes-specific communication is linked to patients' better self-management skills, adherence, and diet and exercise behaviors.[12]

As reported in recent systematic reviews, many studies have demonstrated the potential for various QI interventions to improve providers' patient-centered care processes and patients' health outcomes.[13,14] To our knowledge, however, no previous reports have been published on the influence of QI-focused CME on compliance with patient-centered quality measures for people with type 2 diabetes among U.S. physicians and clinicians who practice in health care systems such as ACOs.

Baseline Measurement

After obtaining independent institutional review board (IRB) approval, we recruited 30 primary care physicians who practiced in three similarly structured ACOs for the QI program, in which the physicians underwent chart audits and completed surveys before and after participating in a series of QI education (QIE) courses. The ACOs were located in Texas, Pennsylvania, and Connecticut. On average, the physicians had been in practice for 16 years and provided care for 23 patients with type 2 diabetes per week. At baseline, administrative staff in each practice randomly selected an oversample of up to 15 electronic charts that met inclusion criteria, with the goal of identifying an average of 10 charts per physician. Patient inclusion criteria were age 18-75 years; diagnosis of type 2 diabetes for at least one year based on ICD-9 codes; current use of diabetes medication; at least 2 diabetes-related visits with the physician in the 12-month baseline chart audit period (1/1/13 to 12/31/13); and no pregnancy during this 12-month period.

Charts that met inclusion criteria were retrospectively abstracted by a trained medical record reviewer. The timeframe for baseline chart abstraction was one year (1/1/13 to 12/31/13). Chart measures included patient demographics, medication adherence status, and changes in A1C and BMI between the first and last visits in the baseline period. (See table 1 in the supplementary file for demographics of patients in the baseline and post-education chart samples.) Charts were also abstracted for the physicians' documented assessment of medication-related side effects and provision of patient counseling about medication risks/benefits, medication adherence, and lifestyle modifications.

To determine rates of baseline compliance with the patient-centered clinical performance measures, we calculated the percentages of each physician's charts that had documentation of patient counseling and assessment of medication-related side effects. In addition, provider-level means were calculated for patient outcomes, which comprised measures of adherence to diabetes medications and changes in A1C and BMI. We then calculated mean baseline values for each performance measure and patient outcome across the 30 physicians. The mean baseline percentages are listed as follows (also see tables 2 and 3 in the supplementary file).

Baseline Rates of Compliance with Patient-Centered Clinical Performance Measures

- Counseling for medication risks/benefits: 55%
- Counseling for medication adherence: 58%
- Counseling for lifestyle modifications: 74%
- Assessment of medication side effects: 47%

Baseline Patient Outcome Measures

- Adherence to diabetes medications: 28%
- Mean change in A1C from first to last visit: -0.12% (first visit = 7.47%; last visit = 7.35%)
- Mean change in BMI from first to last visit: 0 (first visit = 34.1; last visit = 34.1)

After the baseline chart audits, all 30 primary care physicians completed a paper survey with multiple choice questions/items designed to evaluate aspects of their clinical knowledge and confidence that are relevant to effectively aligning practice with the patient-centered measures assessed through the chart audits. (As described later in this article, the survey results were integral to our approach to improving elements of the QIE interventions.) The key survey findings at baseline are summarised as follows (also see table 4 in the supplementary file).

- Mean percentage of correct answers to knowledge-based questions regarding outcomes of treatment for type 2 diabetes: 51%
- Mean percentage of participants who indicated a high level of confidence in counseling patients about various aspects of type 2 diabetes medication use and risks/benefits, and self-management: 36%
- Percentage of participants who indicated “time constraints” as a significant barrier to performing patient-centered clinical measures: 53%

See supplementary file: ds6104.docx - “Supplementary File Tables”

Design

We developed the QIE interventions to directly address the essential health care problem that motivated the QI program: low rates of compliance with patient-centered quality measures among primary care physicians who treat and manage patients with type 2 diabetes in systems such as ACOs. Given our use of baseline and post-education chart audits to assess physicians’ compliance with the measures, a logical and directly appropriate QIE intervention is individualized audit feedback. In a meta-analysis of 140 studies on chart audit and feedback education, Ivers and coauthors concluded that this method can elicit small to moderate improvements in performance that are clinically meaningful.[15] Additional support for our selection of this method as a primary intervention came from other studies and resources from leading health care organisations on applications of audit and feedback education,[16-18] as well as from our use of the method in previous successful QIE programs.[19-21] The greatest improvements occur when audit feedback is offered by a respected colleague or supervisor and accompanied by specific goals or action plans for improvement. Thus, our QIE interventions included, but were not limited to, individualized audit feedback sessions for the physicians who participated in the QI program.

After the baseline chart audits, the 30 physicians participated in a series of CME and CE accredited courses. The first was a private performance improvement Internet live course based on the learning principles of audit and feedback. The 30 sessions were accredited for 1.0 hour by the Accreditation Council for Continuing Medical Education (ACCME) and the American Association of Nurse Practitioners (AANP). During each session, baseline data for the physician’s performance on the patient-centered quality measures and patient outcomes were presented and compared with the de-identified baseline data for the other 29 physicians in the program. A clinician with expertise in presenting chart audit data guided the participating physician in identifying suboptimal measures and developing action plans for improvement.

Following the audit feedback sessions, small groups of primary care physicians were assembled to participate in one of six Internet live courses with four to six other participants in the QI program. These were ACCME- and AANP-accredited sessions led by an expert endocrinologist who guided discussions to identify the participants’ barriers to achieving quality benchmarks and targeted action plans that were achievable within the system. In addition, the small-group sessions included presentations of expert strategies for individualizing diabetes treatment.

Based on continuous improvement models in medical education, learning was reinforced through provision of follow-up enduring materials disseminated in online and mobile formats which were also expanded for the interprofessional team. All physicians in the cohort as well as their clinical team members participated in the following downloadable resources:

- 1.25-hour enduring material accredited through ACCME, AANP, the Accreditation Council for Pharmacy Education (ACPE), the American Nurses Credentialing Center (ANCC), the Commission for Case Manager Certification (CCMC), and Certified Health Education Specialist (CHES) accreditation
- 0.5-hour enduring material accredited through ACCME, AANP, ACPE, ANCC, CCMC, and CHES
- QI patient education tool in English, Spanish, and Creole
- Step protocol to support clinicians in performing, documenting, and reporting quality measures
- Quality measure data collection worksheet

These materials augmented evidence provided in the live courses as well as presented evidence-based rationale for applying patient-centered quality measures in the clinical care of patients with diabetes. Practical tools for performing, documenting, and reporting quality measures were also provided, as well as a multilingual QI patient education guide.

The live courses were designed to meet criteria that have been identified in research on this instructional method for continuing education in the health care professions. Study findings have

demonstrated that positive educational outcomes are associated with the provision of audit feedback on more than one occasion, when the feedback is offered by respected colleague or supervisor, and when the feedback is accompanied by specific goals or action plans for quality improvement.[15-18] Design of the enduring materials was guided by our formal needs assessments and the literature on effective instructional methods for continuing education in the health professions. These sources indicate that clinicians learn best when in-person education is complemented and reinforced by multimedia formats including videos and print materials.[22-23]

To support efforts to improve targeted aspects of care quality, we provided each physician in the cohort with written reports on their baseline chart audit data compared with de-identified aggregated data from their peers, as well as a final report to show outcomes of their participation in the QIE program.

To evaluate the influence of the QIE interventions on compliance with the patient-centered quality measures among the 30 primary care physicians in the cohort, we calculated the baseline to post-education differences in mean provider-level rates of compliance with each quality measure. This analysis enabled assessment at level 5 of the educational outcomes framework of Moore et al.[24] As described earlier, we calculated changes in A1C and BMI between the patients' first and last visits in the baseline and post-education periods. To evaluate the influence of the QIE interventions on these patient outcomes, reflecting level 6 in the Moore et al. framework, we compared the differences in first-to-last-visit values for A1C and BMI, respectively, across the baseline and post-education periods.

The 30 physicians also completed a post-education survey that included the same multiple-choice questions/items from the baseline survey. Thus, we assessed the influence of the QI-focused education on clinical knowledge (level 3 of the Moore et al. framework), confidence, and barriers related to providing high-quality patient-centered diabetes care. The survey outcomes were analysed by calculating differences in the percentages of answers selected by participants on the baseline and post-education surveys. Qualitative data were also collected, through note-taking by a scribe, during the audit feedback sessions.

As the physicians moved through their learning journey to the Internet enduring materials, we administered separate pre- and post-activity surveys to assess changes in knowledge, attitudes and barriers, and competence.

For the more than 3,000 nationwide participants who were not involved in the QIE program chart audits, outcomes assessment surveys were administered before and after each accredited enduring course to evaluate its impact on level 3 and 4 outcomes.

Strategy

The improvement cycles for this QIE program aligned directly with the educational interventions and were based on successful applications in our previous QIE programs.[19-21] The process began with the initial audit feedback session held for each participant. The clinician who led these sessions prompted participants to reflect on performance gaps relative to national benchmarks and the aggregated performance data for the other program participants. The sessions focused on individualized areas and strategies for improvement, as the presenter engaged participants in discussion to devise action plans for closing targeted gaps. During these sessions, we took notes through a scribe to document educational gaps and needs. In a continuous improvement model, these notes prompted revisions to the follow-up educational interventions.

Another improvement cycle corresponded to the small-group live internet courses. The expert endocrinologist who led each program guided group discussion about barriers to achieving quality benchmarks in diabetes care through a systems-based learning approach. The participants shared strategies for overcoming these barriers. Thus, the educational intervention emphasized collaborative learning and problem solving. We administered pre- and post-education surveys for these activities to assess the educational impact on participants' knowledge, confidence, and competence in providing high quality diabetes care.

Findings from the baseline survey, which was administered to the 30 physicians after the baseline chart audits, were also integral to our strategy and improvement cycles. We adapted the content of the educational activities to address survey-identified gaps in knowledge and confidence, as well as barriers to compliance with patient-centered measures. For example, the 6 small-group internet live courses were tailored to address participants' needs for knowledge and confidence-building in specific areas. Moreover, the educational activities were adapted to support participants who indicated specific barriers, such as time constraints, to aligning their practices with the patient-centered measures.

The individualized written report provided to each physician further prompted improvement initiatives by enabling reflection on gaps and strategies for closing them.

Results

Six months after the physicians completed the educational program, an oversample of up to 15 patient charts was randomly selected by administrative staff for the post-education chart audits. A total of 300 charts were retrospectively audited according to the same methods described for the baseline assessment. From the baseline to post-education chart audits, provider-level mean changes in documented physician performance measures and patient outcomes were as follows.

Mean Changes in Compliance with Patient-Centered Clinical Performance Measures

- Counseling for medication risks/benefits: +28%
- Counseling for medication adherence: +13%

- Counseling for lifestyle modifications: +8%
- Assessment of medication side effects: +11%

Mean Changes in Patient Outcome Measures

- Adherence to diabetes medications: +24%
- Change in A1C from first to last visit: -0.16% (baseline change from first to last visit = -0.12%; post-education change from first to last visit = -0.28%)
- Change in BMI from first to last visit: -2.1 (baseline change from first to last visit = 0; post-education change from first to last visit = -2.1)

For A1C and BMI, the negative values reflect greater reductions and more favorable patient outcomes in the post-education versus baseline period. (The complete results are presented in tables 2 and 3 in the supplementary file.)

The survey findings indicate that the QIE program was associated with positive changes in aspects of participants' knowledge and confidence that are relevant to successfully aligning practice with patient-centered performance measures. The mean changes from baseline to the post-education period are summarised as follows and presented in table 4 in the supplementary file.

- Mean increase in the absolute percentage of correct answers to knowledge-based questions regarding outcomes of treatment for type 2 diabetes: +17%
- Mean increase in the absolute percentage of participants who indicated a high level of confidence in counseling patients about various aspects of type 2 diabetes medication use and risks/benefits, and self-management: +9%
- Mean decrease in the absolute percentage of participants who indicated "time constraints" as a significant barrier to performing patient-centered clinical measures: -26%

Lessons and Limitations

The results indicate that QI-focused education was associated with improved compliance with patient-centered quality measures among primary care physicians in their management of patients with type 2 diabetes. In addition, the educational interventions were associated with positive changes in A1C and BMI. One of the key lessons learned from this program is that physicians value the ability to benchmark their own patient charts to those in similar practices and to engage in systems-based learning tied directly to quality measures impacting them at the point of care. During and after the live courses, many of the participating physicians commented on the benefits of seeing their performance and patient outcome data compared with the de-identified, aggregated data of their peers. Several physicians commented that the comparison was helpful because they sometimes feel as if they are practicing in "silos" or "vacuums." Through gaining insights into the practice patterns of their peers, the physicians acknowledged that they were more motivated to improve on substandard quality measures. In addition, many of the participants recognised the importance of improving their patient communication and counseling skills in order to guide key treatment decisions.

One of the greatest challenges we encountered was the recruitment and continuing engagement of the 30 physicians within the identified ACOs who treated an adequate number of patients with type 2 diabetes (>20 per week) and who had the time to participate over a nine month period. To meet this challenge, we assigned a team of education specialists who served as "QI navigators" to personally and consistently communicate with the physicians and their support staff throughout the engagement period. This included personal phone calls, emails, fax reminders, and communications to assist physicians and their clinical teams throughout the educational interventions.

Due to logistical factors and the pragmatic nature of this QI program and outcomes study, there were limitations to the some of the methods and analyses. A noteworthy limitation was the lack of a control group, due to restriction in grant funding. In addition, we were not able to provide direct patient education, which is essential for promoting and maintaining medication adherence and the necessary lifestyle changes for glycemic and weight control in type 2 diabetes.

For assessing compliance with the patient-centered quality measures, the outcomes reflected physician performance; thus, we audited randomly selected charts of the same physicians in the baseline and post-education audits. This design afforded some control over participant-related extraneous variables. For assessing the patient outcomes—adherence status, A1C, and BMI—it would have been ideal to follow the same patients across the baseline and post-education periods. Time constraints on completing the QI program precluded this design. By calculating first-to-last-visit changes in A1C and BMI for each patient during the baseline and post-education chart audits, we identified an association between the QIE interventions and improved patient outcomes. However, the outcomes study was not designed to attribute a cause-effect relationship. Another methodological limitation involves the short duration of the post-education follow-up period, which lasted six months. A longer follow-up, with more patient visits to their physicians, may have resulted in higher post-education rates of compliance with the quality measures.

Restrictions in funding and logistical constraints also precluded additional cycles of chart audits and education. Anticipating this limitation, we designed the baseline and post-education surveys to assess aspects of knowledge and confidence that are requisite to aligning clinical practice with patient-centered measures for high-quality diabetes care. As described earlier, the survey data informed the program's improvement cycles.

Conclusion

Quality measures have been established to address the type 2 diabetes epidemic in the U.S. with a goal to improve provider performance and achieve better patient outcomes. Continuing

medical education can be aligned with these measures and structured to provide nimble education that collectively embraces providers' and systems' needs. While commonly recognised for effectiveness in acute care settings, systems-based learning can also improve performance among primary care physicians treating patients in value-based settings such as ACOs. The QI program results support positive effects of continuing medical education on performance of patient-centered quality measures for type 2 diabetes among primary care physicians who practice in value-based models. In addition, the results indicate associations between physician education and improved patient outcomes. While the long-term implications of this educational intervention are unknown, the methods utilised can be replicated by different types of community-based systems.

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Declaration of interests

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Ethical approval

Independent institutional review board approval was granted before participants were recruited and enrolled in this quality improvement education program (Sterling IRB, Atlanta, GA, USA; IRB ID #4594-001).