Preventive Intervention in Diabetes
A New Model for Continuing Medical Education

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Abstract: Competence and skills in overcoming clinical inertia for diabetes treatment, and actually supporting and assisting the patient through adherence and compliance (as opposed to just reiterating what they "should" be doing and then assigning them the blame if they fail) is a key component to success in addressing diabetes, and to date it is a component that has received little formal attention. To improve and systematize diabetes care, it is critical to move beyond the "traditional" continuing medical education (CME) model of imparting knowledge as the entirety of the educational effort, and move toward a focus on Performance Improvement CME. This new approach does not just teach new information but also provides support for improvements where needed most within practice systems based on targeted data— based on self-assessments for the entire system of care. Joslin data conclude that this new approach will benefit support, clinical, and office teams as well as the specialist. In short, the Performance Improvement CME structure reflects the needed components of the successful practice today, particularly for chronic conditions such as diabetes, including the focus on interdisciplinary team care and on quality improvement, which is becoming more and more aligned with reimbursement schemes, public and private, in the U.S.
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Diabetes: Scope of the Problem

The condition known as "diabetes" usually makes most lay people think of a disorder in which the blood sugar is too high. However, to clinicians who understand the more extensive implications of this condition, the word "diabetes" often conjures up thoughts of a constellation of metabolic derangements and the vascular end-organ damage that they can cause. Treatment can be complex, and therapeutic targets often seem ill defined and elusive. Interventions often touch on multiple organ systems such as vascular, renal, ophthalmologic, and neurologic diseases; and there is also the imperative to design treatments that extend beyond medications into the realm of training patients in self-management and lifestyle changes.

Type 2 diabetes is the more common form of diabetes and is frequently accompanied by cardiometabolic risk factors such as hypertension, dyslipidemia, and overweight/obesity. It has been estimated that more than 90% of people with type 2 diabetes, and probably even higher percentages of people with risk factors for diabetes, are cared for in the primary care setting.[1] Primary care clinicians are therefore in an ideal position to intervene early in the natural history of this condition, potentially preventing progression of the metabolic impacts of the various risk factors. However, this early, preventive approach is not taken as often as it should be.

Diabetes is the leading cause of kidney failure, non-traumatic lower-limb amputations, and new cases of blindness among adults in the U.S. It is also a major etiologic factor in heart disease and stroke, and the seventh leading cause of death in the U.S.[2] The epidemics of diabetes, obesity, and cardiovascular disease (CVD)[1] have resulted in CVD being involved in the death of approximately 65% of people with diabetes.[2]

Data from 2011 suggest that 25.8 million children and adults in the U.S. have diabetes, which reflects 8.3% of the population. This is an increase from 7.8% in the 2008 statistics. Of these, 18.8 million have been diagnosed and 7.0 million undiagnosed,[3] and the numbers continue to grow.[4] In data using fasting glucose or hemoglobin A1c (HbA1c) levels, and reflecting the period 2005–2008, 35% of U.S. adults aged ≥20 years had prediabetes (50% of adults aged ≥65 years), which leads to an estimate of 79 million American adults aged ≥20 years who have prediabetes.[5] Unfortunately, current care for diabetes fails to meet standards with respect to both the provision of needed medical services and the achievement of recommended targets,[6,7] as reflected by data such as those from the National Health and Nutrition Examination Survey (NHANES).[3]

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Prevention, Diagnosis, and Early Intervention

One possible role for primary care providers is in the prevention and early diagnosis of diabetes. Once diabetes is diagnosed, therapeutic interventions can blunt the impact of some complications[8,9] but do not optimally restore normal glycemic homeostasis or fully stop the development of complications. Unfortunately, the diagnosis of diabetes often occurs after complications manifest,[10] and when diagnosed, the advancement of therapy is often slower than ideal.[11] Greater attention must be paid to timely prevention and diagnosis if the tide of cardiometabolic complications is to be stemmed in the years to come. Without prevention efforts, the numbers of people with diabetes and other major cardiometabolic risk factors are likely to increase.

There have been several demonstrations of interventions to prevent type 2 diabetes.[12–15] The most notable of these demonstrations is the Diabetes Prevention Program (DPP),[16] a large RCCT in the U.S. that targeted high-risk adults. The study sought to determine if lifestyle intervention or treatment with the anti-diabetes medication metformin prevented or delayed the onset of diabetes and, if so, the relative efficacies of these approaches. The results of this important trial showed an incidence of diabetes of 11.0 cases per 100 person-years in the placebo group, 7.8 in the metformin group, and 4.8 in the lifestyle group. The lifestyle intervention reduced the incidence by 58% and metformin by 31%, as compared with placebo. Lifestyle was significantly more effective than metformin in preventing the onset of type 2 diabetes.

Following the publication of these results, attempts have been made to roll out diabetes prevention activities targeting a wide-based population in a cost-effective manner. Such activities include one developed through the YMCA network[17] and the University of Indiana[18] and another developed by the University of Pittsburgh.[19] A DVD-delivered program has also been developed.[20] These efforts have demonstrated that the translation of the results of the DPP is practical and effective. These early preventive interventions are also cost effective.[21,22]

The key question is how to create the environment whereby these prevention efforts are supported, promoted, and thus, actually occur as a widespread clinical trend. Many suggestions have been made. One proponent of prevention from the insurer side[23] suggests that we need improved risk-assessment methods to identify subpopulations that will benefit most; new models of care that more effectively attract people to programs that promote lifestyle change; more-effective interactions with a team of providers including pharmacists, nurses, and health coaches; and Medicare and Medicaid programs that provide encouragement for engagement in programs that support lifestyle change. Coverage to support screening of an expanded list of high-risk groups could improve prevention and early treatment.[24] Although it has been suggested that improved cost models for preventive care are possible,[25] some argue that early detection and intervention to blunt the impact of diabetes is still the most practical approach.[26]

Once patients have been diagnosed with diabetes, how can outcomes be improved? One study[27] provides some insight. Through modeling, a 30-year clinical trial was simulated to compare the impact of compliance with process-of-care standards (foot and retinal exams, renal screening); control of biomarkers (HbA1c, blood pressure, low-density lipoprotein [LDL] cholesterol); and lifestyle modifications. The modeling suggested that if all U.S. adults with type 2 diabetes met all quality targets, there would be substantial improvements in quality-adjusted life-years and mortality. Prioritizing the impact of these factors showed that the most effective component was aggressive biomarker targeting (HbA1c of 7%, blood pressure 130/80 mm Hg, LDL cholesterol ≤100 mg/dL); followed by conservative biomarker targeting (HbA1c of 9%, blood pressure 140/90 mm Hg; LDL cholesterol ≤130 mg/dL); closely followed by process-of-care standards. Lifestyle modifications had the least impact.

Improving Treatment Through Continuing Medical Education

Although it is clear that improved adherence to recommended goals can improve outcomes for people with diabetes, clinical inertia—the failure of clinicians to make timely initiation of advancement of therapies—is common in diabetes care, and a major factor in uncontrolled diabetes complications.[28] National guidelines are often held up as tools that can help move therapies forward toward recommended goals, but even these have not been optimally adopted. Guideline use could provide a common care template and help clinicians to self-define what services primary care versus specialty practices might provide and to determine clear indications for consultative referrals. Yet, data from a recent external Joslin Diabetes Center primary and specialty care survey to determine the Center's focus of continuing medical education efforts[29] revealed that primary care providers are not following national guidelines for initiation and advancement of diabetes treatments or identification of risk factors, despite these recognized guidelines. Confusion over apparent inconsistencies in recommendations within guidelines is suggested as a possible reason, as well as the recognition by many clinicians but not by many guidelines that goals must

be individualized for some groups such as older people[30] and those with major comorbidities.[31,32]

Competence and skills in overcoming clinical inertia, and actually supporting and assisting the patient through adherence and compliance (as opposed to just reiterating what they "should" be doing and then assigning them the blame if they fail) is a key component to success in addressing this condition, and to date it is a component that has received little formal attention. To improve and systematize diabetes care, efforts must move beyond the "traditional" primary care training and continuing medical education (CME) model of imparting knowledge through didactic lectures as the entirety of the educational effort. Physicians do not lack the knowledge, for the most part, regarding what they need to do. They need support and skills-building in actually accomplishing positive outcomes for their patients. Lectures, meetings, and print and web publications have an infinite place in the educational continuum, as they produce measurable improvement in individual practitioner knowledge,[33] which is important as a starting point. However, knowledge improvement has not been shown to affect positive performance. Indeed, data are limited that demonstrate any impact of traditional knowledge-based CME on performance improvement (PI) or improved quality outcomes.[34,35]

A key way to target practice process and treatment goals is through a focus on performance improvement, which is supported in a structured way by newer models of CME as introduced by the American Medical Association (AMA) in 2004 (Table 1).[36] This new approach does not just teach the latest information as the traditional model did, but also provides support for improvements where needed most within practice systems. In short, the structure of performance improvement CME is intended for a broad scope of clinicians and office staff, and

supports the needed components of the successful practice today, particularly for chronic conditions such as diabetes, including the focus on interdisciplinary team care and on quality improvement, which is becoming more and more aligned with reimbursement schemes, public and private, in the U.S.

Physicians' determinations of their own knowledge and skill gaps through unguided self-assessments have been demonstrated to be inaccurate in comparison to the use of actual performance parameters.[37] Further, those who perform most poorly are the ones who are most likely to overestimate their abilities.[38] Another problem with traditional CME is that clinicians tend to gravitate toward topics with which they already have familiarity and avoid areas where they do not have experience.[39–41] Therefore, leaving physicians to use unguided self-assessment results is a missed opportunity for them to truly realize the nature of their own knowledge, skill, and performance gaps.

Joslin Approach to Improving Diabetes Treatment Through Continuing Medical Education

In contrast, in the primary care setting, evidence from Joslin's activity outcomes data suggests that guided PI CME helps a full range of HCPs. In 2011, the Professional Education Department at Joslin Diabetes Center held a 4-hour cardiometabolic risk assessment "Diamond" workshop involving both providers and their staff (all groups meet, split off separately, then come back together, following a "diamond" path). Participants were given the opportunity to reflect on actual clinical data outcomes and practices, develop team-based strategies that improve the practice's performance, and set goals to

Table 1. Components of a complete performance improvement–continuing medical education activity[36]

Stage	Description
A: Baseline assessment of current practice performance	Assessment of current practice performance is conducted utilizing a specific performance measure or set of measures that is applied to chart reviews, database queries, claims data, or another appropriate, predefined mechanism. Participating physicians must be actively involved in data collection and analysis and ideally will be provided with feedback comparing their performance to national benchmarks and to the performance of peers.
B: Identification, design, and implementation of a practice improvement intervention	Based on the assessment of current practice deficits as identified in Stage A, a practice improvement intervention is designed and implemented. The design of the intervention should define the number of patients and the time required to assess the impact of the performance change. The implementation of the practice improvement is tracked using a predefined database, flow-sheet, or patient registry.
C: Reassessment of practice performance	After an appropriate, predetermined interval and using the performance measures adopted in Stage A, the effectiveness of the completed intervention is compared with the outcomes from Stage B. To complete this stage of the activity, physicians must summarize all three stages, including the clinical impact—if any—of the intervention, barriers to change, and lessons learned.

optimize patient care relative to managing patients with type 2 diabetes. Results from the workshop, as well as completed baseline and follow-up data, showed improvements of 12%–14% and as high as 20% in categories of patient outcomes.

The improvement of practice processes, leading to true change in patient outcomes, is becoming the core objective of the "new" CME. At Joslin, this is referred to as a focus on "outcomes," not "hours," as an hour was the traditional metric for a unit of CME. This continuum from traditional CME to the improvement of practice performance is being accomplished through activities that provide physicians and clinical professionals with accurate, guided self-assessment tools that can illustrate their practices' gaps in knowledge, competence, skill, and performance. CME programs at Joslin Diabetes Center utilize the self-assessment process through pre- and post-tests aligned with learning objectives. This guided approach empowers learners to engage in self-directed learning[42] which is key to an effective, targeted PI program for diabetes care.[37]

In the IOM's 2001 *Quality Chasm* report,[43] there is a recognition that health care in the future must be knowledge-based, patient-centered, and systems-minded. To this end, in 2005, AMA guidelines were approved, establishing the award of up to 20 *AMA PRA Category 1 Credits*™ for participation in structured performance improvement CME (PI-CME) activities (Table 1).[36] Taking into account these individual practice needs and gaps, and health delivery systems changes on a national level, The Joslin Professional Education Program (accredited by the Accreditation Council for Continuing Medical Education as a Level-3 provider of CME) re-engineered its process and focus over the past 6 years to be entirely focused on performance improvement and behavior change that results in positive patient outcomes for the care of patients with diabetes, its comorbidities and complications, including prevention and risk reduction.

This new educational system is called the Joslin Professional Education Continuum (JPEC; Joslin Diabetes Center, www.jpec.joslin.org). JPEC is a vehicle for continuous performance improvement (CPI) over time, utilizing a live and online multimodal curriculum approach, which incorporates education with point-of-care and patient, clinical, and office staff support materials and training and data-driven individual performance improvement (PI-CME) pathways. (Four Clinical Centers have structured PI-CME activities. As of June 2012, all four JPEC PI Pathways—Type 2 Diabetes: Improving Office Systems of Care, Advancing Therapies for Type 2 Diabetes, Cardiometabolic Risk Reduction, and Insulin Therapy Management— are approved through the American Board of Internal Medicine's [ABIM's] Approved Quality Improvement

[AQI] Pathway and is eligible for 20 points toward the Self-Evaluation of Practice Performance requirement of Maintenance of Certification [MOC]).

This evolutionary approach integrates CME into daily practice with support for knowledge, skill building, and improvement in personal and practice performance, aimed at improving patient outcomes. CME is no longer just a commodity the physician needs to "go and get" but is instead a tool for continuous quality and performance improvement in practice. The online platform (www.jpec.joslin.org) is organized around therapeutically focused clinical centers. Simulated patient-based interactions in the Joslin Virtual Clinic allow learners to build clinical skills by managing a virtual patient through multiple visits and making key clinical decisions. The Joslin CareKit, hosted within the clinical center, is a collection of downloadable support materials to improve knowledge and competence for staff, and also provides instruction in overcoming systems barriers and addressing adherence issues through turn-key patient education materials (handouts) and checklists and instruction for support.

Entry to the JPEC online system is promoted via targeted messaging, participation in live activities aligned with one of the clinical centers, or via original or abstracted audio, web, or mobile education (including the custom Joslin smartphone app). Once in an activity within JPEC.org, the learner is "pulled through" to the data-driven (ABIM MOC-Qualified) Performance Improvement Pathway.[44] Learners conduct guided self-assessments by collecting data from their own practices, and enter the relevant data into the form within the pathway. Utilizing a custom clinical algorithm proprietary to the system, JPEC then guides learners to the educational interventions that will best address identified weaknesses. After a period of time (4–6 months), the learner will then enter and review post-intervention clinical data points as required per the specific pathway, and reassess their progress. The system automatically documents resulting performance improvement and further needs and gaps.

Early evidence suggests the potential for success of this effort. In an analysis of our PI CME efforts in 2012, a high percentage of participants in Type 2 Diabetes Performance Improvement CME who entered data continued further and developed an action plan. Further, data from the type 2 diabetes activity showed improvement in patient outcomes such as HbA1c and LDL from baseline to follow-up, averaging 39%. Improvement for the five outcomes measures ranged in improvement from 12% to 57%. In the same analysis, developing a self-directed learning plan resulted in changes to the provider's behavior as well as in clinical outcomes. Physicians who choose

to improve one of five performance measures in a structured PI CME activity targeting type 2 diabetes showed an average improvement from baseline to follow-up several months later of 36% (from 30% to 44%).

It has been well documented that passive learning is not effective at achieving true change in physician behavior.[34] As evidenced above, systems such as JPEC that use actual data and provide a continuum of multifaceted educational interactions through activities combining several evidence-based interventions have been proven more effective in engendering real change and improvement.[45,46] Further, JPEC PI has a longitudinal design—the PI pathways and tools exist over time—whereas the knowledge and competence-based activities that lead into them are regularly changed or updated. This construct allows the repeated measurement of data points as the provider's knowledge and skills evolve. Although still early in its implementation and adoption, this approach shows promise in improving patient and population outcomes.[47] Ideally, this process will allow identification of quality gaps in the management of diabetes in the primary care setting, leading to the subsequent development of other integrated PI CME programs, on a continuous targeted basis.

Joslin, as shown here, is in the early stages of establishing some success in establishing the benefits that CME, and in particular performance-focused CME, can provide in the establishment or improvement of preventive strategies and programs in the primary care setting that target diabetes and related conditions and complications. Joslin has shown that newer models of CME that include knowledge-based activities, but also move beyond knowledge into skill-building and performance improvement, have been demonstrated to affect patient outcomes more effectively than traditional CME. Programs such as JPEC that reflect updated application of behavior-change strategies for physician practice can deliver such education, allowing for interventions that may be physician-centric but are also practice-inclusive.

Evidence is beginning to reveal that more-effective provider and practice behavior and process changes can be achieved through this approach, by which learner's cycle through a continuum of discovery, knowledge, competence, and performance domains. Importantly, ultimately, this approach is more directed and integrated into practice, making CME more relevant and useful, as it should be, based on its critical role as the only comprehensive mechanism for training physicians in today's fast-evolving and ever more complicated clinical environment. Although this approach is in its infancy, it has shown promise in that the physician, particularly in primary care, can play an important role in the improvement process despite frustrations over their lack of

control over the practice environment and their perceived inability to improve patient adherence and compliance; and play an active, successful role in helping the patient overcome their internal barriers to optimized care. With this evolution being led by innovators in academic CME, continuing medical education can finally realize its promise as a serious and effective tool deployed to help solve the enormous current challenges in turning the tide for prevention of diabetes and related conditions and complications.

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