

Implementing the Chronic Care Model for Improvements in Diabetes Practice and Outcomes in Primary Care: The University of Pittsburgh Medical Center Experience

Linda Siminerio, RN, PhD, CDE; Janice Zgibor, RPh, PhD; and Francis X. Solano Jr., MD

Background

Diabetes care is becoming a priority for health systems as costs and health outcomes are being closely scrutinized. Because traditional health care systems are designed to provide symptom-driven responses to acute illnesses, they are poorly configured to meet the needs of the chronically ill.¹ Models that are focused on both outcomes and prevention have been developed and proposed as viable alternatives to our current care systems to address these problems.¹⁻³

To date, few organizations have made the comprehensive systems changes associated with demonstrably better patient and system outcomes.⁴ Successful chronic disease management has been a difficult challenge within the United States because of numerous factors, which include lack of information technology in outpatient settings; multiple sources of non-integrated information; limited access to and use of diabetes specialists including education services; and time constraints.

A Chronic Care Model (CCM) has been developed that is organized around elements that have been shown to improve outcomes. The elements of the CCM include decision support, clinical information systems, self-management education, and delivery system design.¹ The University of Pittsburgh Medical Center (UPMC) has taken steps to implement the CCM into its network to improve diabetes care processes and outcomes in its practice settings.

The UPMC Diabetes Initiative

Of the 17 million people with diabetes nationwide, 1.1 million are Pennsylvanians. It is estimated that 660,000 people in Pennsylvania have been diagnosed with diabetes (7.0% of the population).⁵ UPMC provides services for the vast majority of people with diabetes throughout western Pennsylvania.

UPMC is an integrated health system including 19 hospitals; a diversified services division with information technology, laboratory, and community diagnostic services; a physician division, which includes 220 primary care providers (PCPs) and 1,200 academic physicians; and an insurance division. UPMC provides services for ~80,000 people with diabetes. With its expansive network of academic, community hospital, and primary care practices, UPMC serves a wide range of diverse populations throughout 15 counties in Pennsylvania.

Several studies performed within UPMC substantiated the need for improvements in diabetes care and outcomes.⁶⁻⁸ In 2000, UPMC leadership approved mechanisms for a strategic stepped approach and a reorganization of care. Key thought leaders in the UPMC diabetes community decided to embark on a system-wide diabetes quality improvement initiative and bring the elements of the CCM into practice.

Implementation involved the development of changes at multiple levels over time. First steps included agreement from opinion leaders and physician

champions on practice guidelines, establishment of a diabetes registry, support for meeting the National Standards for Diabetes Self-Management Education (DSME), and integration of pilot projects that required system design changes.

Decision Support

Effective chronic disease programs ensure that providers have access to expertise facilitated through evidence-based guidelines.^{1-3,9,10} Although providers need to rely on expertise such as guidelines, they are often reluctant to do so.^{1,11} Studies done within UPMC demonstrated that physicians were not delivering care based on evidence-based guidelines. Because more than 90% of visits are to PCPs,¹² it became crucial to determine whether PCPs could adopt a process delivery system that included use of evidence-based guidelines.

UPMC's Community Medicine, Inc. (CMI) is the physician division that manages 215 acquired PCPs and their practices. In laying the foundation for improved diabetes care practice through decision support, the quality committee of CMI agreed to facilitate the implementation of the American Diabetes Association (ADA) Standards of Care.¹³ Standards with companion flow sheets were disseminated to all CMI practices. The chief medical officer gave presentations for all of the practices that focused on the standards, rationale, and strategies for treatment to goals, DSME, and opportunities for referral to local DSME programs.

This effort was a major challenge because the UPMC community network extends across a radius of 250 miles. Physician education was delivered through a variety of venues: telecommunicated programs for outlying rural practices, regional CMI meetings, and lectures from the academic endocrine faculty. The overarching goal was focused on reducing hemoglobin A_{1c} (A1C) results, targeting interventions for patients with A1C > 9%, improving blood pressure and LDL cholesterol management, and increasing physician treatment interventions in these areas.

After the presentations, PCPs were given templates to track and report process measures (A1C, blood pressure, and lipid levels). Initial efforts in the diabetes initiative took the form of voluntary participation projects. However, with the evolution of the diabetes initiative, the governing bodies of UPMC eventually required physician participation. At the start of the initiative, ~120–130 PCPs (50–60% of CMI practices) participated in tracking and reporting data based on guidelines. Currently, 95% of the PCPs participate, with 5% either unable or unwilling to implement the mandate.

Information Systems

Timely, useful data about individual patients and populations of patients from clinical information systems is a crucial feature of effective programs using the CCM. The first step is to develop a registry to serve as a mechanism for practitioners to gain information on performance and results.^{1–3}

Over the past 18 months, CMI physicians have received quarterly reports on the laboratory data pertinent to the care of their diabetes patients. Laboratory data is put into an access database so that physician reports can be generated. These reports are physician-specific. The reports rank order patients' lab results and give a 12-month rolling report on A1C, LDL cholesterol, and urine microalbumin results. Individual patient results are also made available on patient

charts for reference at patient visits, and a comprehensive practice report of all patient data is provided quarterly to the practices. In addition, the chief medical officer distributes, by practice, rankings of quarterly average A1C results and gives the providers information regarding how their performance compares to the CMI network practices as a whole.

Laboratory results and patient demographics, visits, and charges are also captured into a large UPMC clinical data repository known as the Medical Archival Retrieval System (MARS). Diabetes patients are identified through MARS by having at least three of the following: outpatient, inpatient, or emergency room visit ICD-9 code 250; glucose value > 200 mg/dl; A1C test; or prescription of an anti-diabetic medication. MARS also holds information on health insurance, medications, co-morbid conditions, and procedures.

A validation process is currently underway to refine the repository so that MARS data will serve as the information systems foundation in facilitating the CCM throughout UPMC. Plans include using the repository for comprehensive monitoring and to develop novel approaches to inform patients and providers of risk factors that may be out of control and issue reminders for services such as DSME.

Self-Management Support

Systems that support the development of informed, activated patients have demonstrated positive outcomes.^{14–17} The CCM differs from traditional approaches in that it emphasizes self-management training and counseling. Increasing patient participation is a crucial element in successful chronic disease management.^{1–3}

The National Standards for DSME¹⁸ and a recognition program administered through the ADA provide a framework for the delivery of quality self-management education. Because the benefits of DSME are now accepted and DSME is now considered an integral component of diabetes care, Medicare and other

third-party payers are reimbursing for services when programs meet the ADA requirements. Medicare supports reimbursement for 10 hours of DSME and up to 2 hours of medical nutrition therapy (MNT) for those who have not had prior comprehensive DSME or those who are experiencing changes in therapies (e.g., starting insulin or experiencing signs of complications). Reimbursement support for follow-up services includes DSME and/or nutrition services (1–2 hours annually). Reimbursement is linked to specific codes, and institutional charges are typically based on the recommended Medicare rates (Table 1).

UPMC has long supported diabetes education with hospital-based outpatient programs. However, at the start of the UPMC diabetes initiative in 2000, only 3 of 19 UPMC education programs had met criteria for ADA recognition. Although UPMC had historically supported programs, cost-cutting initiatives had reduced the number of educators because of their inability to generate revenue. Patients and providers reported access problems in many of the outlying UPMC communities. It was crucial that DSME programs be maintained for patients referred from local CMI practices, particularly for those who required immediate intervention (A1C > 9%).

To assure consistency and quality and sustain educator positions, it became apparent that all of the UPMC education programs needed to implement the National Standards for DSME and be recognized by the ADA. Nurses and dietitians from across the system met and organized efforts to apply for recognition. To streamline the application process, consistent forms, educational materials, a curriculum, and a continuous quality improvement process were agreed upon. The first UPMC system-wide application with eight sites was submitted to the ADA for recognition in November 2000 and approved. Since the initiation of the diabetes project, 18 hospital-based programs located throughout western Pennsylvania and one primary care site

Table 1. Medicare Rates for DSME and MNT Services

DSME Reimbursement			Unit	Rate per unit
Code	Code Type	Definition	(minutes)	
G0108	HCPCS	Diabetes training, individual	30	\$31.37
G0109	HCPCS	Diabetes training, group	30	\$18.36
MNT Reimbursement				
97802	CPT	Nutrition therapy assessment, individual	15	\$14.15
97803	CPT	Nutrition therapy intervention and reassessment, individual	15	\$14.15
97804	CPT	Nutrition therapy (initial or follow-up), group	30	\$11.08

provide access to quality DSME for every UPMC community (Figure 1).

Once programs received ADA recognition, charging and reimbursement tracking mechanisms were implemented in an effort to substantiate the educators' ability to be at least cost-neutral to the system. At the start of the tracking process, numerous problems were identified. In some settings, codes were inaccurately entered, certificates were missing, charge entry staff neglected to enter patient bills, and charges varied from site to site. After the problems were remedied, efforts to establish consistent charges and capture reimbursement were implemented within the hospital programs already linked to the MARS repository.

Reports have demonstrated a significant increase in revenue generated for DSME services (Table 2). Efforts are now underway to track reimbursement for every UPMC program. The

ability to generate revenue has assured UPMC leadership that DSME and MNT are viable services in a cost-cutting environment.

Delivery System Design

Effective chronic illness management also requires attention to delivery system design.^{1,2,19-21} Team-based care has repeatedly been shown to improve outcomes,²² yet it is often unavailable in primary care practice settings. Although the provider office provides a unique opportunity to reach patients at point of service,^{23,24} DSME programs have traditionally been delivered in hospitals, not office settings. This is a remnant of the acute care model, in which services were provided at the hospital, and referral to a program within the hospital was expected. Within the structure of the CCM, which is now recognized as best representing the care needs of people with

diabetes, exploring new methods for care delivery is recommended.

UPMC has begun to implement DSME in primary care offices. Diabetes educators have been hired to provide education at CMI practices. Educators are available on "diabetes days" in order to maximize efficiency with the added benefit of the focused visits for the practice. DSME standards are met, and data are collected for the system-wide ADA recognition process. To date, one primary care site has received ADA recognition and several others are in the recognition process.

Results

Integrating a multi-faceted approach to improving diabetes care, including all elements of the CCM, has been shown to result in the best outcomes. Implementation of the model resulted in significant improvement in provider practices (Table 2) and patient outcomes within the CMI practices as compared to national data (Table 3).

Laboratory results of 15,687 patients were collected in the database, which represents 198 PCPs in the laboratory tracking component of the initiative. The average A1C was 6.97%. Most importantly, providers responded to the data. Over the past year, 67% of providers have helped patients to lower their A1C results. Sixty percent of patients now have A1C results < 7%, and 81.1% of patients now have A1C results < 8%.

PCP participation in using the tracking form for lipid and blood pressure management has also been outstanding,

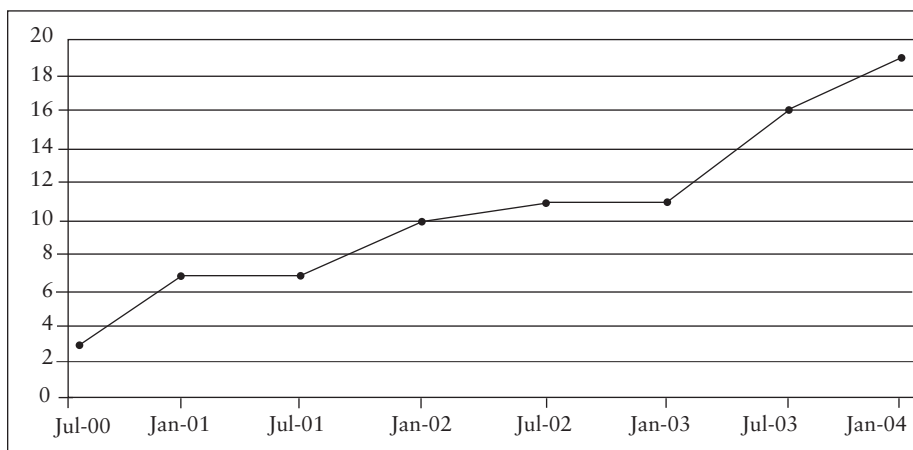


Figure 1. Number of UPMC ADA-Recognized DSME Sites

Table 2. CMI Practice Results

	2000 (% , n = 148)	2003 (% , n = 198)
Percentage of CMI physicians grouped by average A1C		
A1C ≤ 7%	34	46
A1C ≤ 8%	28	9
A1C > 9%	N/A	2
Average A1C (mg/dl)	7.56–8.0%	6.87%
Decrease in average A1C in past year	N/A	67%

with 205 of 215 PCPs (95.3%) tracking and reporting data. There were 4,598 patients tracked with respect to blood pressure and lipid management. Fifty-one percent had blood pressure ≤ 130/80 mmHg, and 78% had blood pressure ≤ 140/90 mmHg.

There was also an increase in the number of interventions used in the treatment of hypertension and lipid management. Seventy-one percent of patients were on an angiotensin-converting enzyme (ACE) inhibitor or angiotensin II receptor blocker (ARB), and 30% of patients had an intervention in the management of blood pressure at the time of encounter. Compliance with annual urine screening for microalbumin was 74%. Average LDL cholesterol was 109.4

mg/dl, 42.8% of patients had an LDL cholesterol ≤ 100 mg/dl, and 76.4% had LDL ≤ 130 mg/dl. Twenty-five percent of the patients had an intervention in the management of their lipids at the time of encounter, and 77% of patients were on a lipid-lowering drug.

Preliminary financial analysis revealed that education services when organized to obtain reimbursement were indeed able to sustain a salary for a diabetes educator position. At the six DSME programs sites for which revenue was captured in the MARS data repository, total charges increased from the beginning of the tracking period from \$64,683.00 to \$312,619.75 in the fourth quarter. Total payment increased from \$26,941.55 to \$152,232.49 over the year

(Figure 2). This is a significant increase in that before 2000, education services were often delivered free of charge.

Discussion

The UPMC integrated system has made major strides in improving care practices and patient outcomes. By utilizing and coordinating the many resources of the system, there have been significant improvements in the health of diabetes patients who receive care in primary care practices. Although it may take years to see significant impacts on micro- and macrovascular disease, results thus far are encouraging.

One of the major factors for success has been getting physicians involved in the quality improvement process and making them responsible for collecting and responding to their data. By asking physicians to track their interventions in patients, physicians were not only assessing their results but also responding to them at the time of encounter. The UPMC information systems, including laboratory reports and monitoring with rapid turnaround, have been instrumental in making the collection of provider-specific data a valuable process that has fostered a team spirit among practices and motivated physician behavior.

UPMC providers, like all primary care practices, have struggled with having adequate resources to meet patient education needs. However, as a result of the networking opportunities within the health system, DSME programs have been successful in assuring quality and sustainability through reimbursement. CMI practices have been able to use the system diabetes education resources strategically to address the needs of patients in community practices. In the current fiscal environment in which administrators are skeptical of services that do not generate revenue, tracking reimbursement to justify educator positions was crucial to lay the groundwork for supporting more educator services within the office setting.

The limitations of our project are recognized, given that the UPMC diabetes

Table 3. CMI Patient Results Compared to National Data (%)

	UPMC CMI	Report Card for U.S. ²⁵
A1C (CMI n = 15,687)		
A1C ≤ 7%	60.0	42.9
A1C ≤ 8%	81.1	56.0
A1C > 9%	9.0	24.9
Average A1C	6.97	N/A
Blood Pressure (BP) (CMI n = 4,598)		
BP ≤ 130/80 mmHg	51.0	N/A
BP ≤ 140/90 mmHg	78.0	65.7
Use of ACE inhibitor or ARB	71.0	N/A
BP intervention	30.0	N/A
LDL cholesterol (CMI n = 4,598)		
LDL ≤ 100mm/dl	42.8	11.0
LDL ≤ 130mm/dl	76.4	42.0
Average LDL (mm/dl)	109.4	N/A
Lipid management intervention	25.0	N/A
Use of lipid-lowering drug	77.0	N/A

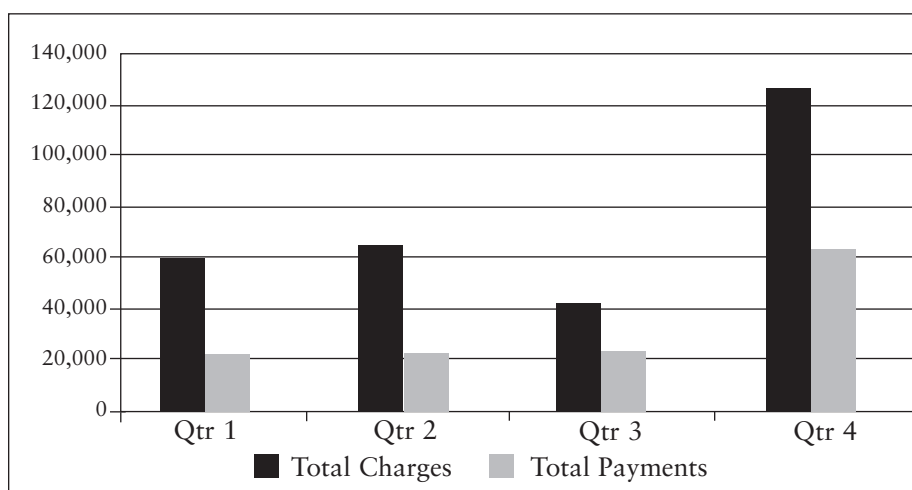


Figure 2. Reimbursement for DSME in Six of the UPMC Programs

initiative is still in its infancy. However, as the project evolves, each of the components of the CCM will continue to be developed, evaluated, and refined. Having an integrated system has been important in that it has allowed community physicians to have access to the many resources that private practicing physicians often lack. A central organization and coordinating structure that brings the resources of an entire system—diabetes education programs, laboratory data, educational resources of an academic medical center, central physician leadership, and information systems—has been crucial for the success of the UPMC diabetes initiative.

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Linda Siminerio, RN, PhD, CDE, is executive director of the Diabetes Institute and an assistant professor of medicine and nursing; Janice Zgibor, RPh, PhD, is a research associate at the Graduate School of Public Health; and Francis X. Solano Jr, MD, is president and chief medical officer of Community Medicine, Inc., all at the University of Pittsburgh, in Pittsburgh, Pa.

The authors welcome the opportunity to answer questions from other health systems regarding the CCM and its implementation. They can be reached at the University of Pittsburgh Diabetes Institute at 412-383-1407 or via e-mail to simineriol@msx.dept-med.pitt.edu.