
IMPLEMENTING THE CHRONIC CARE MODEL IN AN ACADEMIC SETTING: A RESIDENT'S PERSPECTIVE

Andreea Coca, MD, and Maureen D. Francis, MD

Chronic diseases place a substantial burden on the health of affected individuals as well as on society. More than 90 million people in the United States are living with chronic diseases, and more than 75% of U.S. medical care costs are spent caring for them [1]. The toll on human life is also significant, with chronic diseases accounting for 70% of all deaths and one third of the years of potential life lost before age 65 years [1].

Addressing the burden of chronic disease is a complex challenge faced by every health care organization. The current medical system is designed to respond to acute care problems, and the urgent need to address acute health concerns prevails over the less urgent need to manage chronic illness effectively [2]. Optimal chronic disease management requires planned, regular interactions between patients and their caregivers, with a focus on maintaining and/or improving function and preventing disease exacerbations and complications, needs that are unlikely to be met by a health care system and culture geared to respond to acute care problems [3].

The chronic care model evolved out of an interest at the Group Health Cooperative in Seattle, WA, to correct health system deficiencies undermining the optimal care of patients with chronic illness [2–4]. The model was based on literature review and suggestions from experts at Group Health's MacColl Institute for Healthcare Innovation. According to the chronic care model, optimal care for chronic illness is achieved when a prepared, proactive clinical practice team interacts with an informed, activated patient [3–5]. The model identifies 6 essential components that comprise a system geared to provide such care (**Figure 1**): community resources and policies, organization of health care, self-management support, delivery system design, decision support, and clinical information systems. The chronic care model proposes a new chronic disease paradigm: a physician-

patient relationship based in collaborative care with an emphasis on self-management. The model has been implemented in a variety of nonacademic clinical settings, with significant success. Premier Health Partners (Dayton, OH) implemented the model in its 36 office practices to improve diabetes care and 3 years later reported an increase from 42% to 70% in the proportion of patients with a glycosylated hemoglobin (HbA_{1c}) level less than 7% [5]. Similarly, HealthPartners Medical Group (Minneapolis, MN), using 4 components of the chronic care model over 1 year, improved the percentage of patients with an HbA_{1c} level less than 8% from 60.5% to 68.3% [5].

In 2005, an initiative to foster adoption of the chronic care model in academic settings was launched by the Association of American Medical Colleges Institute for Improving Clinical Care (www.aamc.org/iicc) in partnership with the Improving Chronic Illness Care program of the Robert Wood Johnson Foundation (www.improvingchroniccare.org). The major goals of the Academic Chronic Care Collaborative (ACCC) are to improve the care of chronically ill patients who receive their care at an academic medical center and to ensure that clinical education associated with chronic illness care occurs in an exemplary environment. Southern Illinois University (SIU) is one of 22 academic medical centers involved in this initiative. Clinical practice teams from the division of general internal medicine (GIM), the department of family and community medicine, and the division of rheumatology are involved. The goal of the GIM team in the ACCC project is to redesign the care provided to patients with type 2 diabetes using the components of the chronic care model and to integrate the concepts of the chronic care model into resident education and practice.

This article reports the experience of 3 internal medicine residents who participated on the GIM team in the pilot phase of the ACCC project at SIU. As previously reported in *Seminars in Medical Practice*, second- and third-year internal medicine residents at SIU are required to have 8 months of hands-on participation in a quality improvement (QI) project [6], and working on the GIM pilot team satisfied this requirement. In this article, the contributions of the 3 pilot

Andreea Coca, MD, and Maureen D. Francis, MD; both from the Division of General Internal Medicine, Department of Medicine, Southern Illinois University School of Medicine, Springfield, IL.

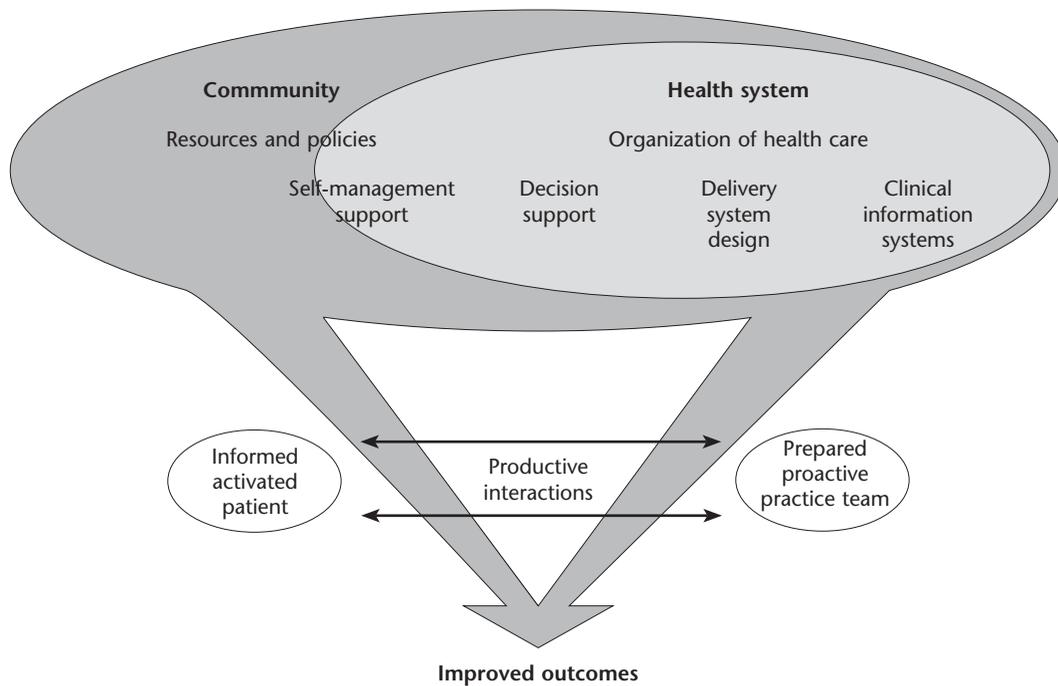


Figure 1. Model for improving outcomes of care for chronic illness. The model has 6 essential components. Health systems must take advantage of community-based programs that enhance chronic illness care and create an environment in which organized efforts to improve chronic illness care can be successful. Self-management support programs should employ strategies to increase patient knowledge, empowerment, motivation, confidence, and self-management skills. Delivery systems must be designed for effective chronic care management and include use of a registry for planned and follow-up visits. Clinical practice teams need tools to support patient assessment and evidence-based patient care decisions. Finally, effective information systems must measure the success of treatments across the patient population and deliver appropriate reminders at the point of care. (Adapted with permission from Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? *Eff Clin Pract* 1998;1[1]:2-4.)

team residents are described, and the results achieved and lessons learned by these residents are shared.

Methods

Setting and Study Population

In addition to the 3 resident members, the GIM pilot team included 3 attending physicians, nursing representatives, a computer specialist, receptionists, and representatives from administration. The 3 pilot team residents (2 second-year, 1 third-year) were recruited from a group of 14 residents who worked with the 3 attending physicians in the continuity clinics.

The study population for the GIM pilot team consisted of patients seen in the continuity clinics with an established diagnosis of type 2 diabetes. A list of patients was initially obtained by screening billing records for codes related to type 2 diabetes mellitus. Medical records were examined, and the diagnosis was confirmed using standard guidelines. This initial screen identified 14, 21, and 6 patients, respectively, in the panels for each pilot team resident. The nursing administrator reviewed panel assignments and reas-

signed a small number of patients, making the final distribution 16, 21, and 11 patients, respectively.

Process and Outcome Measures

Fourteen quality measures (Table 1) were tracked by the SIU GIM team to assess the quality of clinical care provided to diabetes patients seen in the clinics. Four of these measures were required by the collaborative and were common to all ACCC teams working on diabetes care. The remaining 10 quality measures were optional measures chosen by the SIU GIM team. In addition, 2 educational measures (Table 2) were followed by all teams working in the collaborative.

Data Collection

A patient registry was used to identify study patients and capture data related to the care of these patients. A registry is a repository of clinical data with functionality to track the progress of individual patients and to sort clinical data by condition or set of conditions across the population of patients as a whole and at an individual provider level. The registry, therefore,

Table 1. Quality Measures Defined for Diabetes Care

Quality Measure	Goal (% of population)
Required by the ACCC	
Patients with blood pressure < 130/80 mm Hg	40
Patients with HbA _{1c} < 7%	60
Patients with documentation of self-management goal-setting	60
Patients with documentation of a comprehensive foot examination	90
Optional	
Patients with influenza vaccination	90
Patients with pneumococcal vaccination	90
Patients with documentation of a dilated retinal examination	70
Patients with LDL < 100 mg/dL	70
Patients aged ≥ 40 yr on a statin	60
Patients aged ≥ 40 yr on an ACEI/ARB	75
Patients aged ≥ 30 yr on aspirin	80
Patients with 2 HbA _{1c} evaluations in last year	90
Patients with a documented test for microalbuminuria who are not on an ACEI/ARB	50
Current smokers	10

ACCC = Academic Chronic Care Collaborative; ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; HbA_{1c} = glycosylated hemoglobin concentration; LDL = low-density lipoprotein cholesterol level.

makes it possible to provide feedback to individual physicians on their clinical performance on their panel of patients. A clinical information system with these capabilities is 1 of the 6 essential components of the chronic care model. The GIM team used the Chronic Disease Electronic Management System, public domain software developed by the Washington Department of Health (Olympia, WA), to establish a registry for patients with type 2 diabetes mellitus followed in the collaborative. A more detailed description of the registry is beyond the scope of this report.

Interventions

Role of pilot team residents. During the pilot phase of the collaborative, we functioned as core team members who represented the resident point of view at weekly GIM team meetings. Our role was to test and then spread successful changes in diabetes care processes to the other 11 residents working with the pilot

Table 2. Educational Measures Required by the ACCC

Educational Measure	Goal (% of population)
Residents receiving, reviewing, and discussing at least 1 registry report	100
Residents learning and demonstrating self-management support strategies	100

ACCC = Academic Chronic Care Collaborative.

team in the continuity clinics. This first phase of spread was accomplished at a noon conference, during which we familiarized the other residents with the concepts of the chronic care model, with proposed changes to resident practice, and with registry reports. In the months that followed, we helped the other residents in clinic at the point of care, answering their questions, guiding them in completing registry paperwork and taking a proactive role in patient management, and showing enthusiasm about making changes to the system. As members of the pilot team, we also actively participated in Plan-Do-Study-Act (PDSA) cycles related to advancing diabetes care provided in resident practice and meeting the required educational goals. Specifically, we were involved in testing delivery system design, decision support, self-management support, and use of clinical information systems in the resident continuity clinics.

Delivery system design. For delivery system design, each of us started by testing a planned diabetes care visit in clinic with 1 of our assigned diabetes patients. A planned visit for diabetes is an appointment dedicated to the evaluation and discussion of all aspects of diabetes care for that patient. The visit is scheduled in advance and requires that appropriate laboratory studies be performed in advance so that results are available at the time of the encounter. Having these data available at the time of the visit allows for discussion of the results with the patient and decision making regarding any medication adjustments that should be made. Patients who had not been seen in the last 6 months, whose most recently recorded HbA_{1c} level was greater than 8%, were selected for a planned diabetes visit. The registry was used to identify these patients, whom were then contacted and offered a planned visit with their provider. The mechanics of scheduling the planned visits and the flow during the visit, with definition of roles for each member of the health care team, were evaluated during the initial test with a single patient, and a workable system was established.

Decision support. We also helped to develop and test a decision support tool to ensure that all aspects of evidence-based diabetes care were addressed during the planned diabetes visit. The “Planned Visit Worksheet” (**Figure 2**) could later be used as a dictation template and to help update the diabetes registry. The worksheet was particularly useful for guiding the residents in performing and documenting a complete foot examination. At the conclusion of the planned diabetes visit, the timing of the patient’s next visit and laboratory tests was established. The timing of follow-up (eg, 6 months, 3 months, or sooner) was based on the degree of diabetes control.

Self-management support. Self-management support was not routinely provided in our clinics prior to our involvement in the ACCC. Residents, attending physicians, nurses, and support staff had to learn the techniques of collaborative goal-setting and motivational interviewing. Initial training was provided for all pilot team members at the ACCC learning sessions held in Chicago, and we received additional advice and training from our colleagues in the department of family and community medicine. Each resident and attending physician on the pilot team was first asked to do a PDSA cycle to set a self-management goal with 1 patient. Shortly thereafter, self-management support was built into our planned diabetes visits. A common question posed to patients was, “Would you like to change anything in the way you take care of your diabetes?” To guide each patient through the self-management process, the team adapted a “Self-management Goal Sheet” that was made available through the collaborative. This tool was used during the visit to estimate the patient’s degree of confidence in achieving his or her stated goal, using a scale ranging from “not confident” to “very confident.” Two weeks later, the patient was called by the resident to follow-up on the self-management goals set at the time of the appointment. We tested goal-setting and motivational interviewing before spreading these concepts to the other residents.

Clinical information systems. The major advance achieved in the area of clinical information systems was the use of the registry. In addition to generating lists of patients needing a planned diabetes visit, the registry was used to create a monthly report showing performance over time on the 14 quality measures followed by the GIM team. Every month, each resident received an individual and group report. These reports have been used to target interventions and to generate ideas for future PDSA cycles. For example, we used the registry to generate lists of patients without a

documented foot examination and to identify patients who were not on aspirin; we then developed interventions to address these deficiencies.

Results

Results for the 48 patients we followed over the 8-month pilot phase are shown in **Figure 3** and **Figure 4**. Performance improvements occurred in several of the measures being tracked, including self-management goal-setting (from 9.8% to 50%), documentation of a comprehensive foot examination (from 41.5% to 64.6%), documentation of a retinal examination (from 31.7% to 52.1%), influenza vaccination (from 29.3% to 45.8%), pneumococcal vaccination (from 17.1% to 54.2%), aspirin prescription (from 39% to 58.3%), achieving a goal blood pressure less than 130/80 mm Hg (from 34.1% to 47.9%), and achieving a goal low-density lipoprotein (LDL) cholesterol level less than 100 mg/dL (from 51.2% to 66.7%). During this 8-month period, the percentage of patients achieving a goal HbA_{1c} level less than 7% decreased from 63.4% to 58.3%. There were also decreases in the percentage of patients on an angiotensin-converting enzyme inhibitor/angiotensin receptor blocker (from 78.1% to 77.1%) and the percentage of patients on a statin (from 60% to 55.3%). Documentation of self-management goal-setting began to improve when planned visits moved beyond the testing phase and became a regular part of our weekly schedule.

The diabetes registry was used to focus on other measures. Lists of patients who did not have a documented foot examination were obtained. The last clinic note on each of these patients was reviewed, and it was noticed that there was a problem transferring information about foot examinations to the registry system. After proper documentation, the numbers improved dramatically. Another problem discovered involved patients who were not taking aspirin due to contraindications. Initially this was not noted in the registry. This detail can now be added in the comment section on the registry page, but these patients will still appear in the final analysis as not being prescribed aspirin (for this reason, the goal for aspirin is not 100%).

One of us (AC) concentrated on telephone-based patient visits with the patient’s chart available to establish self-management goals and to document retinal examinations and aspirin prescription. **Figure 5** shows how these interventions affected results over the course of the next 5 months (this resident continued working on the project after the pilot phase was completed). Over the 14-month period during which this resident

Patient name: _____
MR #: _____
DOS: _____

PLANNED VISIT WORKSHEET—PHYSICIAN

Date of last ophthalmologist eye exam: _____

Smoking status: Never smoked Prior smoker Current smoker

Exercise assessment: _____

Immunization status: Pneumovax Flu vaccine

Vital signs: Weight _____ Height _____ BMI _____
Pulse _____ B/P _____

Foot exam:
Normal

Neuro: Sensation with monofilament _____

Skin: Inspection of skin and subq tissue _____
 Palpation of skin and subq tissue _____

MSK: Digits/nails (clubbing, cyanosis) _____
 Any foot deformities present? Yes No
Describe: _____

Pulses: Dorsalis pedis _____
 Posterior tibialis _____

Diabetic foot screen test sites

Left foot Right foot

Lab/medication review:

Is HbA_{1c} at goal (< 7%)? Yes No
Changes recommended: _____

Is BP at goal (< 130/80 mm Hg)? Yes No
Changes recommended: _____

Is cholesterol at goal (LDL < 100 mg/dL)? Yes No
Changes recommended: _____

Is the patient on an ACEI/ARB for kidney protection? Yes No Contraindicated
Changes recommended: _____

Is the patient on ASA for cardioprotection? Yes No Contraindicated

Self-management goal-setting: Remember to complete *Healthy Changes Form* with your patient.

Figure 2. Planned diabetes visit worksheet. ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; ASA = aspirin; BMI = body mass index; BP = blood pressure; HbA_{1c} = glycosylated hemoglobin concentration; LDL = low-density lipoprotein cholesterol level; subq = subcutaneous.

was involved in the project, data changed as follows: self-management goal-setting (from 0% to 90.9%), documentation of foot and retinal examinations (from 14.3% to 95.5% and from 21.4% to 77.3%, respectively), influenza vaccination (from 42.9% to 40.9%), pneumococcal vaccination (from 21.4% to 50%), aspi-

rin use (from 28.6% to 72.7%), meeting blood pressure goals (from 28.6% to 50%), and meeting LDL goals (from 42.9% to 50%).

Discussion

Diabetes has reached epidemic proportions in the

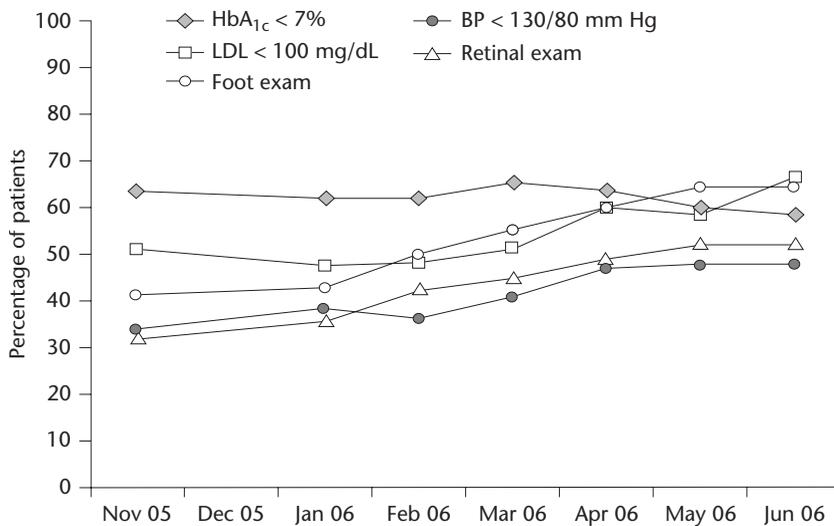


Figure 3. Change in the percentage of patients followed by the 3 pilot team residents over the 8-month pilot phase who were at goal levels for glycosylated hemoglobin (HbA_{1c}), blood pressure (BP), and low-density lipoprotein cholesterol (LDL) and who had documented retinal and foot examinations.

United States, affecting approximately 8.7% of people aged 20 years or older and 18.3% of those aged 60 years or older [7]. Specialized diabetes clinics have been shown to achieve better clinical outcomes, including improved survival, than are achieved with usual primary care because they bring together the many varied resources needed to meet the complex needs of these patients [8–10]. Unfortunately, a significant number of patients with diabetes seen in primary care clinics do not achieve recommended control of their diabetes and related risk factors (eg, blood pressure, LDL) and are not clinically monitored at recommended intervals [11].

Several studies have assessed the impact of applying some or all components of the chronic care model to the management of diabetes. In a meta-analysis of studies comparing chronic disease self-management programs to usual care, which included 26 studies specifically focused on diabetes, Chodosh et al [12] found sufficient evidence to conclude that self-management programs for older adults with diabetes result in clinically and statistically significant improvements in HbA_{1c} levels (equivalent to a reduction of 0.81%). In a study of nearly 900 newly diagnosed diabetes patients randomized to structured personal care or usual care and followed for 6 years, Olivarius et al [13] found that the group exposed to the multifaceted diabetes intervention had significantly lower fasting glucose, HbA_{1c}, blood pressure, and cholesterol levels. Piatt et al [14], looking at the impact of the chronic care model on clinical and behavioral outcomes of diabetes in an underserved community, found that patients receiving model-based interventions had significantly lower HbA_{1c} levels and higher

diabetes knowledge and empowerment scores than those randomized to usual care.

Similar to data from these well-designed studies, our experience suggests that the chronic care model can lead to improved outcomes in diabetes care. Our data demonstrate that planned diabetes visits supported by the visit worksheet and combined with self-management support led to improvement in almost all process and outcome measures tracked: self-management goal-setting, annual foot and retinal examinations, influenza and pneumococcal vaccinations, aspirin prescription, and blood pressure and LDL at recommended levels. Comparing the results achieved by the 3 pilot team residents over 8 months with those achieved by 1 of the pilot team residents over 14 months, significant improvement was seen. This suggests that a more intensified approach will help overcome clinical inertia (ie, failure of health care providers to initiate or intensify therapy when indicated). In our analysis, we were unable to demonstrate improvement in the percentage of patients with an HbA_{1c} less than 7%, but our patient population was small and the time frame for intervention and follow-up was only 8 months. We believe that by applying the same chronic care management techniques in a larger population of diabetes patients over a longer period of time, improvements in HbA_{1c} would be more significant. Whether a multifaceted approach to diabetes care applied early enough could lead to fewer long-term complications (eg, nephropathy, retinopathy, amputation) is unknown, but it is clearly a goal worth pursuing.

Lessons Learned

Working on the ACCC pilot team not only satisfied the residency program requirement for participation

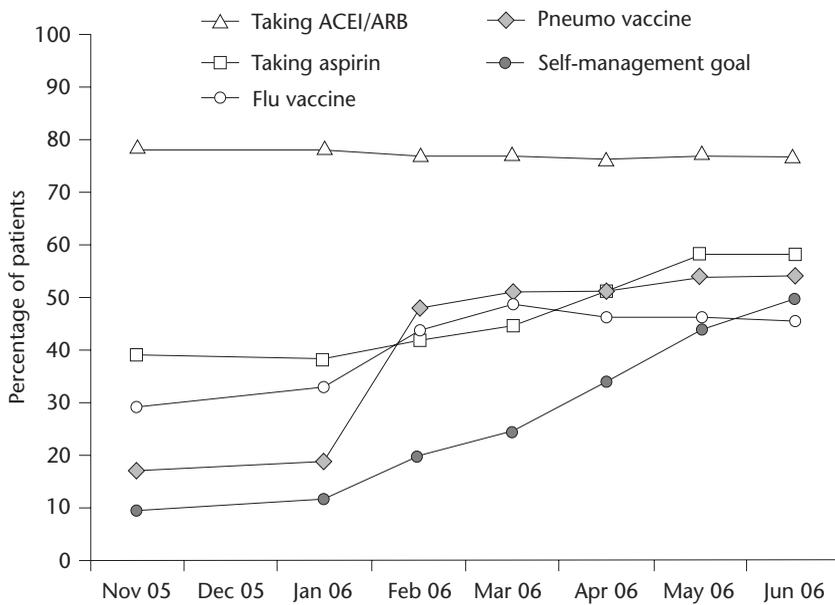


Figure 4. Change in the percentage of patients followed by the 3 pilot team residents over the 8-month pilot phase who had documentation of self-management goal-setting, had pneumococcal and influenza vaccination, were on an ACEI or ARB (if aged ≥ 40 years), and were on aspirin (if aged ≥ 30 years). ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker.

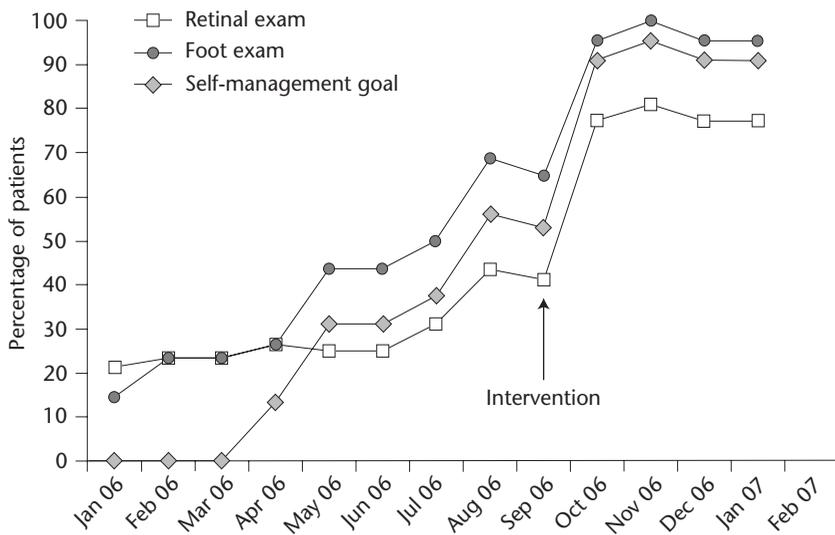


Figure 5. Individual resident results showing changes in self-management goal-setting and documented retinal and foot examination after intervention (chart review).

in a QI project, it also provided us with the opportunity to be a part of a truly multidisciplinary care team. From an educational perspective, the experience allowed us to demonstrate the ability to develop and implement a QI project and to present our results to colleagues and faculty. By making changes in our practice and tracking our individual and group performance over time, we were able to demonstrate key skills and knowledge in practice-based learning. Evaluating and changing the system of care for diabetes patients in the GIM clinics and following this patient population over time enhanced our learning of systems-based practice. Finally, the project offered firsthand experience in applying and honing interper-

sonal communication skills, working with and leading a team, and managing a change process.

This experience has offered further lessons of importance to our future practice. The first is that implementing the chronic care model into a well-established university-based care delivery system is not easy. We had to redesign the care delivery process—including delegation of roles within the practice team, organization of the diabetes care visits, and approach to patient follow-up—while integrating self-management techniques. We found that having the clinical leadership, including the chairman of the department of internal medicine and the chief of the division of GIM, closely involved in the

collaborative was essential to making significant organizational changes. Also, our participation at the initial ACCC training sessions proved to be very useful, as we learned firsthand about the components of the chronic care model.

From our experience applying this model in practice, we observed sufficient evidence that self-management support for diabetes patients is working. We believe this success will motivate us to incorporate a collaborative and supportive care approach into our future practice. We also recognize that having access to a registry for chronic care disease management is invaluable and allows us to easily identify high-risk patients who need to be seen and to capture patients lost to follow-up. Perhaps the most important lesson learned from our involvement in the collaborative is the importance of a team effort. From our perspective, participation in the collaborative gave us a sense of ownership of our patients. Those of us who have been exposed to the chronic care model are more proactive and less reliant on attending physicians in our clinical decision making.

In summary, we are pleased to have had the opportunity to contribute to the redesign of care for diabetes patients seen at our GIM clinics. At this point, the pilot team has spread the concept of chronic care to the entire division of GIM. Although implementing the chronic care model in our clinics has not been easy, we believe that by doing so we are helping to reshape the clinics to better provide evidence-based standard of care for patients with chronic illness.

Corresponding Author: Andreea Coca, MD, Southern Illinois University School of Medicine, Department of General Internal Medicine, P.O. Box 19636, Springfield, IL 62794-9636 (e-mail: acoca@siu-med.edu).

Acknowledgments: The authors acknowledge Robert Bussing, MD, (Chief, Division of General Internal Medicine); David Steward, MD, (Chairman, Department of Internal Medicine); Waneta McKemie, RN, BS (Clinic Administrator and day-to-day leader); Billie Edson (computer specialist); Brenda Vilayhong, RN, MPH (Director of Clinical Operations); Kathryn Mahaffey (Chief Operating Officer); and Omar Vargias, MD, and Lavanya Kolluri, MD (other resident members of the pilot team).

Copyright 2007 by Turner White Communications Inc., Wayne, PA. All rights reserved.

How to cite this article:

Coca A, Francis MD. Implementing the chronic care model in an academic setting: a resident's perspective. *Semin Med Pract* 2007;10:1-8. Available at www.turner-white.com.

References

- Centers for Disease Control and Prevention. The burden of chronic diseases and their risk factors: national and state perspectives 2004. Atlanta: U.S. Department of Health and Human Services; 2004.
- Wagner EH, Austin BT, Von Korff M. Organizing care for patients with chronic illness. *Milbank Q* 1996; 74:511-44.
- Wagner E. Chronic disease management: what will it take to improve care for chronic illness? *Eff Clin Pract* 1998;1:2-4.
- Wagner EH, Austin BT, Davis C, et al. Improving chronic illness care: translating evidence into action. *Health Aff (Millwood)* 2001;20:64-78.
- Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA* 2002;288:1775-9.
- Francis MD, Varney AJ. Learning by doing: use of resident-led quality improvement projects to teach clinical practice improvement. *Semin Med Pract* 2006;9:41-6. Available at www.turner-white.com.
- Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2003. Revised ed. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2004.
- Hayes TM, Harries J. Randomised controlled trial of routine hospital clinic care versus routine general practice care for type II diabetics. *Br Med J (Clin Res Ed)* 1984;289:728-30.
- Verlato G, Muggeo M, Bonora E, et al. Attending the diabetes center is associated with increased 5-year survival probability of diabetic patients: the Verona Diabetes Study. *Diabetes Care* 1996;19:211-3.
- Ho M, Marger M, Beart J, et al. Is the quality of diabetes care better in a diabetes clinic or in a general medicine clinic? *Diabetes Care* 1997;20:472-5.
- Kell SH, Drass J, Bausell RB, et al. Measures of disease control in Medicare beneficiaries with diabetes mellitus. *J Am Geriatr Soc* 1999;47:417-22.
- Chodosh J, Morton SC, Mojica W, et al. Meta-analysis: chronic disease self-management programs for older adults. *Ann Intern Med* 2005;143:427-38.
- Olivarius NF, Beck-Nielsen H, Andreasen AH, et al. Randomised controlled trial of structured personal care of type 2 diabetes mellitus. *BMJ* 2001;323:970-5.
- Piatt GA, Orchard TJ, Emerson S, et al. Translating the chronic care model into the community: results from a randomized controlled trial of a multifaceted diabetes care intervention. *Diabetes Care* 2006;29:811-7.