

Improving Primary Care for Patients With Chronic Illness

The Chronic Care Model, Part 2

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A PREVIOUS ARTICLE¹ DESCRIBED the chronic care model, a guide to improving the management of chronic illness, particularly within primary care. That article featured several case studies of organizations that have implemented components of the model. This article examines research evidence demonstrating that components of the model can improve quality and reduce costs and examines some obstacles that hinder the spread of the model.

Does implementation of the chronic care model actually improve chronic care? Internal evaluations conducted by organizations may conclude that implementation of the model does improve quality of care. However, these evaluations generally use uncontrolled before-and-after study designs, a notoriously weak research method. Randomized trials and controlled before-and-after studies provide a higher standard of scientific evidence about intervention effectiveness. Although the complete chronic care model has not been evaluated with more rigorous research designs, many of its elements have been included in interventions assessed by adequate study designs. These higher-quality studies have most often examined interventions for patients with diabetes.

This article reviews research evidence showing to what extent the chronic care model can improve the management of chronic conditions (using diabetes as an example) and reduce health care costs. Thirty-two of 39 studies found that interventions based on chronic care model components improved at least 1 process or outcome measure for diabetic patients. Regarding whether chronic care model interventions can reduce costs, 18 of 27 studies concerned with 3 examples of chronic conditions (congestive heart failure, asthma, and diabetes) demonstrated reduced health care costs or lower use of health care services. Even though the chronic care model has the potential to improve care and reduce costs, several obstacles hinder its widespread adoption.

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METHODS

We performed a systematic review of studies of diabetes care programs featuring elements of the chronic care model. A recently completed Cochrane review of ambulatory care diabetic management programs formed the substrate for our review.² Of the 1294 citations identified by the Cochrane reviewers, 41 studies in 48 articles involving more than 200 practices and 48 000 patients met their inclusion criteria. We excluded 4 studies included by the Cochrane reviewers because these studies failed to use formal tests of significance.³⁻⁶ We also added 2 randomized clinical trials published after the latest update of the Cochrane review.^{7,8}

Revising the classification scheme developed by the Cochrane reviewers, we determined which of 4 chronic care model components were included as part

of each study's intervention. These components are self-management, decision support, delivery system design, and clinical information systems. The remaining 2 chronic care model components, health care organization and community resources, were not addressed in the Cochrane review. Each intervention could include from 1 to 4 of these components. The interventions most frequently used were self-management support; educational materials and meet-

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ings for physicians (decision support); use of case managers, multidisciplinary teams, and scheduling of planned diabetes follow-up visits (delivery system design); and reminder systems and feedback on physician performance (clinical information systems). Each study was also classified on the basis of whether it detected significant improvements in the process of care (eg, periodic measurement of hemoglobin A_{1c} [HbA_{1c}], urine albumin, and serum lipid levels), patient outcomes (eg, level of HbA_{1c}, end-organ complications), or both. Studies were heterogeneous in the specific types of interventions implemented, sample sizes, and processes and outcomes subjected to evaluation, precluding a quantitative meta-analysis synthesizing all the studies.

RESULTS

The TABLE groups the 39 studies reviewed according to the chronic care model components included in each study intervention. Overall, 32 of the 39 studies found that the intervention

improved at least 1 process or outcome measure. Because of the small number of studies, it is difficult to determine with confidence whether interventions using a greater number of chronic care model components or specific combinations of components are more likely to be effective. Although all 5 studies with interventions featuring 4 chronic care model components were found to improve patient outcome measures, the majority of studies using fewer components were also found to be effective. No single component of the chronic care model emerged as essential (or superfluous) for effectiveness, although it was impressive that 19 of the 20 interventions including a self-management component improved a process or outcome of care.

The single study best exemplifying the evidence about chronic care model effectiveness is the recent Danish study of primary care disease management for diabetes.⁸ This randomized trial included 970 patients treated by 474 general practitioners. Usual care was

compared with a program involving decision support, regular follow-up, reminder systems, and self-management support based on individualized goal setting. After 6 years of follow-up, patients in the intervention group had significantly lower HbA_{1c}, blood pressure, and cholesterol levels than those in the control group, although mortality and rates of diabetic complications did not differ across groups. Noteworthy strengths of this study are its randomized design, recruitment of community-based primary care clinicians, multifaceted intervention, long follow-up with excellent completeness of follow-up data, and sophisticated analytic techniques.

Our review has limitations: it deals with only 1 chronic condition; the methodological quality of the 39 studies is not uniformly high; the interventions differ between one study and another, making generalizations hazardous; and findings made in research settings may not be reproducible for larger populations. Despite these caveats, this review does support the conclusion that the chronic care model, when implemented through multifaceted interventions, can improve process and outcome measures for diabetes.

Does the Chronic Care Model Save Money?

Does implementation of chronic care model components save health care dollars? No systematic reviews addressing this question are available, but individual studies provide some answers. Searching MEDLINE for controlled trials under the headings *congestive heart failure*, *asthma*, and *diabetes* combined with *health care costs*, we identified 27 articles that studied interventions related to the chronic care model and their impact on health care use or costs.

Congestive Heart Failure. Using a randomized controlled trial, Rich et al⁹ demonstrated that a nurse-directed program of patient education with posthospital telephone and home visit follow-up (self-management support and delivery system redesign) was associ-

Table. Summary of Studies of Chronic Care Model Component Interventions for Diabetes Mellitus According to Components Included in Study

Chronic Care Model Components	No. of Studies			
	Overall	Positive Outcomes*	Positive Process*	Positive Outcomes or Process
4 Components Self-management (SM), decision support (DS), delivery system design (DSD), clinical information system (CIS)	5	5/5	2/2	5
3 Components SM, DS, DSD	2	1/1	1/1	2
DS, DSD, CIS	4	0/3	1/2	1
SM, DS, CIS	3	3/3	2/2	3
SM, DSD, CIS	3	2/2	1/2	3
2 Components DS, CIS	7	1/1	5/7	6
DS, DSD	2	2/2	0/0	2
SM, DSD	5	5/5	0/0	5
SM, DS	2	1/2	0/0	1
DSD, CIS	1	0/1	1/1	1
1 Component DS	2	0/2	1/1	1
CIS	2	0/0	2/2	2
DSD	1	0/1	0/0	0
Total	39	20/28	16/20	32

*Figures indicate the number of studies with at least 1 positive finding divided by the number of studies that examined outcome or process measures. Denominators in these columns may sum to more than the total number of studies in each row because some studies examined outcome and process measures.

ated with a 56% reduction in hospital readmissions for congestive heart failure (CHF) and a significant improvement in quality-of-life scores compared with controls. Within a 90-day period, the overall cost of care was \$460 less per patient in the treatment group. A study¹⁰ using a less intensive intervention than the study by Rich et al found a 52% reduction in hospital costs for the intervention group during an 18-month period, resulting in overall savings. Cline et al¹¹ found similar cost reductions with a program of self-management support and a nurse-directed CHF clinic.

A study of CHF patients discharged from 9 Veterans Affairs hospitals compared usual care with an intervention including patient education, nurse telephone follow-up, and enhanced access to primary care. The number of hospital readmissions did not differ between the 2 groups, and the number of outpatient visits was higher in the intervention group.¹² Riegel et al¹³ found that a CHF program showed no overall cost reductions compared with usual care; the intervention did create savings for New York Heart Association class II patients while increasing costs for class I patients.

Asthma. Bolton et al¹⁴ demonstrated that adult asthma patients given self-management support made fewer emergency department (ED) visits throughout a 12-month period compared with a usual care group, with the \$85-per-person cost for the educational sessions offset by the \$628-per-person reduction in ED charges. In another study,¹⁵ severely ill adult asthma patients given intensive self-management training and vigorous medical therapy had a 2-fold decrease in hospital stay compared with a control group. Indigent African American adults with asthma, provided with asthma education and follow-up visits, had a significant reduction in ED visits compared with patients receiving usual care.¹⁶

At a staff-model health maintenance organization (HMO), children who had asthma and were offered a

single educational session had a 40% reduction in ED visits; a similar group also enrolled in a nurse case-management program had 73% fewer ED visits and 84% fewer hospitalizations. Savings greatly exceeded program costs.¹⁷ Three other asthma studies found cost savings from chronic care model-type interventions.¹⁸⁻²⁰ Compared with usual care, a home-based health education program for low-income children previously hospitalized with asthma saved \$11 for each dollar spent to deliver the health education. For children without a recent hospitalization, costs for the 2 groups were the same.²¹

In 3 negative studies, self-management support interventions did reduce health care use, but the control groups showed similar reductions.²²⁻²⁴ In a study with a longer follow-up period, Kauppinen et al²⁵ found no significant reduction in health care costs after 5 years for adult asthma patients given intensive patient education throughout a 1-year period. Another study of patients with mild to moderately severe asthma found that health care costs were higher for the group receiving a self-management program than for a usual care group; the low severity (low baseline rate of ED and hospital use) of the study's patients may explain the study results.²⁶

Diabetes. In contrast with programs for CHF and asthma, which may produce cost savings almost immediately through reduced hospital and ED use, programs that improve diabetic glycemic control would be expected to show savings only throughout the long term, with reduced vascular complications. Surprisingly, some studies have shown that improved diabetes care can save money in the short run.

Wagner et al²⁷ compared 2 groups of diabetic patients at Group Health Cooperative of Puget Sound. Within 1 year, Group Health was saving between \$685 and \$950 per patient annually for the group with improved HbA_{1c} levels. The savings resulted from fewer hospital admissions, ED visits, and physician consultations. Savings were statistically significant only for pa-

tients in the improved group whose baseline HbA_{1c} level was 10% or above. This study does not link the reduced costs of improved glycemic control with chronic care model interventions; thus, it is unknown whether the cost of Group Health's efforts to improve glycemic control was less than the savings generated. Testa and Simonson²⁸ have also shown that improved glycemic control of type 2 diabetes is associated with short-term reductions in hospital stay.

At Kaiser Permanente, diabetes of high-risk patients was intensively managed by a team that offered planned diabetes visits, telephone contacts, and group educational sessions. Patients treated in the intensive program stayed half as long in the hospital as those in the control group. An important finding of this study is that patients discharged from the intensive-management program may revert to their preprogram status.²⁹ In another Kaiser Permanente study, a 6-month program of diabetes group care resulted in reduced hospital and outpatient use compared with usual care.³⁰

Compared with that for a control group, total health care costs dropped for diabetic patients enrolled in a program in which specially trained pharmacists provided patient education, monitoring, and feedback to physicians.³¹ Diabetic patients in rural Austria participating in a structured education and treatment program had lower health care costs after 6 months compared with a control group.³²

Other studies failed to demonstrate reduced costs for diabetic patients enrolled in chronic care model-component interventions. A randomized controlled trial of half-day group-visit diabetes "miniclinics" found that patients in the intervention group had fewer ED visits and specialty visits compared with a usual care group, but total health care costs were not reduced. The study is limited by the fact that a number of intervention group patients did not attend the miniclinics regularly.⁷ De Weerd et al³³ failed to demonstrate reduced costs for diabetic patients pro-

vided with self-management support. Total health care costs were slightly higher for Canadian children who had type 1 diabetes and were enrolled in a home-based nurse-management program compared with usual care.³⁴

COMMENT

Three CHF studies showed that chronic care model—component interventions produced a reduction in health care use, costs, or both; 2 studies failed to show reduced use or costs. For asthma, 8 studies were positive and 5 negative for reduced health care use, costs, or both, and for diabetes, 7 were positive and 2 negative. All the studies included self-management support as part of the intervention; some also featured delivery system redesign. For CHF and asthma, illness severity may play an important role. Risk-stratifying chronic illness and targeting interventions to high-risk individuals may be a cost-effective strategy.

A weakness of most studies—of both the effectiveness and cost-effectiveness of chronic care improvements—is that they offer a particular program under research conditions rather than a permanent change in how chronic care is delivered. The studies of Domurat²⁹ on diabetes and Kaupinen et al²⁵ on asthma suggest that the cost benefit of temporary programs may be short-lived.

Business Case for Chronic Care

Top-of-the-Line Hospital, owned by an integrated delivery system that receives all its income through capitation payments, instituted a CHF program with nurse case managers calling patients in their homes to monitor diets, weights, and use of medications. Hospitalization rates for these patients fell dramatically, thereby reducing the hospital's expenses and improving its financial position.

Bottom-Line Hospital, which receives diagnosis related group payments for Medicare patients, attempted a similar CHF program that also reduced hospital admissions. However, the reduced admissions meant

fewer Medicare dollars, causing the hospital to lose money on the program. The program was discontinued.

Some institutions have upgraded chronic care because they consider it the right thing to do. But in the long run, these improvements must stand up to fiscal scrutiny. For the chronic care model to be widely and permanently implemented, there needs to be a business case for chronic care: Does better chronic care improve the financial bottom line? For whom does it improve the bottom line?

Assessment of the business case depends on the specific chronic disease targeted, the type of organization instituting chronic care improvement, and the mode of reimbursement. Evidence presented in this article has shown that improvements in the care of CHF, asthma, and diabetes have the capacity to reduce expenditures. Briefly discussed below are organizational type and mode of reimbursement.

Hospital Systems

The cost savings achievable through improvements in CHF, asthma, and diabetes care result from fewer days in the hospital and less use of the ED. Whether these savings translate into a favorable business case depends entirely on how the hospital is paid, as the preceding vignettes demonstrate. If the hospital is reimbursed by capitation or is part of a capitated integrated system, reduced hospital and ED use can save money for the organization. If the hospital or integrated system is paying for the chronic care improvements, the savings accrue to the same organization that is financing the innovations; the incentives are aligned to produce a business case for chronic care.³⁵

If, in contrast, the innovating hospital or integrated system is reimbursed per diem or fee-for-service, fewer days in the hospital and fewer ED visits translate into a loss of revenue. Under Medicare's diagnosis related group system, fewer hospital admissions reduce revenue. Doing the right thing loses money for the institution, and the business case

for improving chronic care evaporates. Under per-diem, fee-for-service, or diagnosis related group payment to hospitals and integrated systems, the insurer (whether Medicare, Medicaid, HMO, preferred provider organization, or self-insured employer), not the organization paying for the improvements, may save money from improved chronic care; incentives are misaligned. Ironically, the pioneer program proving savings for improved CHF care⁹ was discontinued because the hospital sponsoring the program benefited from more rather than fewer admissions of heart failure patients.

Some organizational situations are more complex. For example, some hospitals receiving capitated payments from health plans share their savings with physician groups if the physicians reduce hospital use. In this arrangement, physician groups have a financial incentive to initiate CHF and asthma programs that can reward their physicians by reducing hospital use. Many of these programs have been abolished as hospitals renounce capitation in favor of per-diem payment, with which increased hospital use amplifies hospital revenues. Under these contracts, hospitals have no incentive to reward physicians for cost-saving chronic care improvement. In one case, a physician group paying for a CHF program because it profited from reduced hospital use terminated the program when its hospital partner switched from capitation to per-diem payment and stopped paying the physician group for reduced hospital use.

Ambulatory Systems

For a physician office, ambulatory care clinic, or physician group, fee-for-service payment may be compatible with a favorable business case for chronic care. The use of registries and reminder systems for diabetes, asthma, cholesterol management, and other conditions may increase the number of physician visits, laboratory tests, and billable patient education sessions, resulting in higher fee-for-service revenues. Some practices have reported

fewer visits but higher revenues because planned chronic care visits are more comprehensive and can be coded as such. Chronic care model implementation can reduce specialty referrals and lead to increased patient satisfaction; both these factors encourage patients to continue as customers of primary care practices.

Payment Reform

To create a favorable business case, the savings or increased revenues from improved chronic care must accrue to the organization paying for the improvements. Because health care is reverting to a fee-for-service environment, employers, private insurers, Medicare, and Medicaid—whose hospital and ED costs may be reduced by better chronic care—should be rewarding providers who improve the care of chronic illness. Because so much chronic illness is concentrated in the elderly population, one important option for creating a positive business case is reform in the Medicare program. Medicare's payment methods are often copied by private insurers and, because Medicare is such a large program, can change the behavior of provider institutions. If Medicare paid for chronic care start-up costs (including information systems), reimbursed nonphysician personnel who provide chronic care services, and increased reimbursement rates for provider organizations with superior performance, arguing the business case for chronic care would become easier.

Prospects for Chronic Care Improvement

The chronic care model is a guide to improving chronic illness management. Some institutions have successfully implemented components of the model. Initial evidence demonstrates that the model can improve chronic care and in some cases reduce health care costs. What are the prospects for the chronic care model's becoming widely adopted in primary care practice?

To implement the entire chronic care model, conditions must be favorable in

all 3 of the overlapping galaxies that affect health care institutions—the general community, the health care system, and the institution itself. The first article of this series described the forces threatening the primary care home: storms buffeting the home from outside and structural flaws weakening the home from within.³⁶ Analogously, the prospects for chronic care improvement depend on external conditions in the community and health system and on the internal workings of each health care institution. Three brief examples illustrate the obstacles to chronic care model implementation.

In the early 1990s, a chronic care pioneer was Lovelace Health Systems in Albuquerque, NM. In a series of innovations entitled “Episodes of Care,” Lovelace, led by a visionary physician, instituted most chronic care model components, achieving improved measures for several chronic conditions and reductions in hospital use.³⁷ After several years, external events caused the project to fall upon hard times. Capitation payment in the Albuquerque marketplace receded, while fee-for-service made a comeback, meaning that shorter hospital stays equated with fewer reimbursement dollars. Pharmaceutical industry funds that jump-started “Episodes of Care” dried up at the same time that the 1997 Balanced Budget Act, reducing Medicare payments, contributed to the souring of Lovelace's finances. Although several programs continue in less robust form, Lovelace was forced to eliminate most “Episodes of Care” staff and retreat from its ambitious goals.

In 2 other cases, internal factors were primarily responsible for chronic care improvements faltering. One East Coast community health center, a leader in the diabetes collaborative described in an earlier article,¹ downgraded the program after its champions left the organization. A large health system, an early adopter of chronic care innovation, slid backward when its clinical leadership changed but is moving forward again under a new enthusiastic medical director.

These examples suggest 2 lessons: visionary clinical leaders are needed for chronic care improvements, and the financial environment must either help those leaders implement change or at least not hinder them. Even with innovative leaders and favorable finances, provider organizations face internal obstacles to chronic care improvement. Clinical information systems are expensive and hard to install. Chronic illness registries must be an active tool, not simply a repository of information; personnel must be available to put registries to use. Physicians, who are working faster and faster like hamsters on a treadmill,³⁸ do not have time to improve chronic care. Delivery systems must be redesigned to rescue physicians from the hamster syndrome. Some physicians have an overly positive view of the quality of their chronic illness care and do not see a need to change practice systems.

Although adoption of the entire chronic care model presents major difficulties, portions of the model can be implemented easily in any primary care practice, whether a small private office or a large delivery system. A long journey begins with a single step. Below is a review of how 1 private primary care practice began the journey.

As a rudimentary registry, a list of diabetic patients was produced with the billing software. By using easily available diabetes guidelines, one of the physicians created a diabetes reminder sheet, including dates and values for HbA_{1c}, low-density lipoprotein cholesterol, blood pressure, and other standard periodic diabetes management tests. Medical assistants were trained to fill in the reminder sheet, order studies that were past due, and place the reminder sheet on the front of the chart for each visit of a diabetic patient. This reminder prompt does not require a computerized office and reduces the workload of physicians. Diabetic self-management teaching was made available from a community resource outside the medical practice. Medical assistants were also trained to remove diabetic patients' shoes at each visit, looking for lesions and

checking sensation with a microfilament. The next step will be to train a receptionist to check the diabetes registry, determine which patients have not

visited their physician in the past 6 months, and call them.

Ultimately, implementation of the chronic care model signifies a major re-

design of medical practice. In the meantime, the model can guide primary care practices to take the first steps toward improving chronic illness care.

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