Adapting the Chronic Care Model to Treat Chronic Illness at a Free Medical Clinic

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Abstract: This pilot project was designed to determine the feasibility and effectiveness of an adaptation of the chronic care model applied to uninsured patients in a free medical clinic staffed by volunteer physicians. Of the 149 enrolled patients, 117 had hypertension, 91 had diabetes, and 51 had hyperlipidemia. Patients were enrolled in a chronic disease registry from March 1, 2001 through September 30, 2002 at the Salvation Army Free Clinic (SAFC). Two part-time registered nurses served as care managers providing disease-specific management using evidence-based guidelines. Consistent specialty consultation was available via phone, e-mail, or physician visit. Patient self-management was encouraged through collaborative goal setting. There were 40 patients lost to follow-up; 109 completed the study. A clinically significant improvement was obtained in at least one chronic disease for 79 patients. The chronic care model was a useful template for the delivery of effective chronic disease care to a group of uninsured patients at a free medical clinic.

Key words: Medically uninsured, chronic disease, diabetes, hypertension.

In 2000, an estimated 38 million nonelderly adults in the United States were without health insurance.1 The literature suggests a high chronic disease burden among uninsured and minority populations and a greater degree of morbidity and mortality compared with their insured counterparts.2-4 Increasingly, in response, free clinics have developed across the United States to provide health care to the uninsured.5,6

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Effective models of care delivery must be explored to ensure that the medically uninsured are not underserved in such settings.

In 1995, the Salvation Army Free Clinic (SAFC) was founded by a group of physicians in Rochester, Minnesota, to provide medical care to a low-income, uninsured, culturally diverse population in our community. Since its inception, SAFC clinicians have recognized the need to provide chronic illness care to SAFC patients. A number of conditions characteristic of free clinics, however, interfere with the delivery of effective chronic illness care. Typically, providers are rotating volunteers, a circumstance that interrupts continuity of care, and specialty consultation is often limited and inconsistent. Finally, the frequent transience of the uninsured patient population impedes appropriate follow-up. Many of our patients were migrant workers, spending anywhere from 4–6 months in the area before moving on to other work locales. Many other patients were also in transition, both geographically and economically. As a result of these obstacles, the SAFC had no capacity to provide effective ongoing care to patients with chronic illnesses such as diabetes or hypertension.

A retrospective chart review of patients with hypertension seen at our clinic in the 2 years prior to this study supports this assertion. We reviewed the charts of 48 patients with at least two recorded blood pressures who were receiving usual care for hypertension at our clinic. No change was seen in the average mean arterial pressure between their first (111.18 mm Hg) and last (111.06 mm Hg) blood pressure readings during this period, and only 13% of these patients had blood pressure values considered to be under control.

The chronic care model is a comprehensive approach to the management of chronic illness that enables the health care team to achieve a planned, productive interaction with an informed, activated patient. The focus of the model is the transformation of chronic care delivery from a reactive, acute illness model, to a proactive planned care approach. Six elements of the model contribute to the delivery of high-quality chronic illness care: community involvement, health system leadership buy in, self-management support, delivery system redesign, decision support, and clinical information systems.7

The effectiveness of the chronic care model has been demonstrated in many primary care settings.8 Several adaptations of the model described in the literature seemed potentially useful in the delivery of chronic disease care at the SAFC. For example, nurse managers guided by evidence-based treatment protocols might provide improved continuity of care in a system relying wholly on volunteer physicians.9,10 Innovative primary care–specialist interaction might allow a volunteer endocrinologist to provide specialty expertise to a large group of patients.11,12 Entry of patients into a chronic disease registry might facilitate effective tracking and disease management of a relatively transient population of patients.13,14 Finally, language-sensitive and culturally competent adaptations could better serve the ethnically diverse population cared for at the SAFC.15,16

Given these potential benefits, the leadership of the SAFC endorsed a proposal to proceed with a trial implementation of an adaptation of the chronic care model in an effort to improve the quality of chronic illness care we were providing to our
medically uninsured patients. This paper presents a description of that pilot project and a summary of our results.

**Methods**

**Setting.** The SAFC operates 2 nights per week in the Rochester Salvation Army Building. A staff nurse is available on a limited basis during the day. The Salvation Army building is centrally located in the downtown area. A satellite office was established in the Rochester Red Cross building, staffed by a second nurse, with flexible office hours to accommodate patients’ working schedules. The Red Cross building is located near a canning factory, employing large numbers of migrant workers. The two staff nurses devoted a total of 0.75 full-time equivalent nurse time to this project. Both offices were supported by a roster of volunteer physicians, nurses, diabetes educators, dietitians, social workers, and lay personnel. A core group of two internists, one endocrinologist, one dietitian, and two diabetes educators provided the majority of volunteer support. The study was approved by both the Mayo Clinic Institutional Review Board and the governing board of the SAFC. All participating patients provided informed consent.

**Population.** The population of Rochester, Minnesota and surrounding Olmsted County is approximately 120,000. The study population consisted of uninsured patients who live or work in the Rochester area. A small number of patients in the study had some form of health insurance coverage (e.g., catastrophic care) but were unable to afford ongoing care for their chronic disease. Patients with hypertension and/or diabetes mellitus visiting the SAFC from March 2001 through September 2002 were invited to join the study. These patients were then screened for hyperlipidemia.

Of the 149 enrolled patients, 117 had hypertension, 91 had diabetes, and 51 had hyperlipidemia. Ninety-two patients had multiple diagnoses. There were 76 female patients; the mean age was 51.9 years. The racial/ethnic background of the sample was as follows: 71 Hispanic, 57 white, 11 African American, 4 Asian, and 6 other. English was the primary language of 59 patients; Spanish of 58; English, but learned as a second language, for 23; and 9 spoke other languages.

**Intervention.** Key components of the chronic care model were integrated and utilized in our intervention strategy (Figure 1). We employed several strategies that had previously been demonstrated to be effective in other care settings. The community component was relatively limited in scope.

**Information system.** At enrollment, patients were entered into a chronic disease registry. The registry was a Microsoft Excel spreadsheet adapted for use in this project to record pertinent demographic and clinical information. Evidence-based, disease-specific guidelines were integrated into the registry to organize data collection, stratify outcomes, and trigger appropriate management. Conditional formatting was used to highlight needed testing or values and test results not meeting the target goal. The registry resided on a single computer with password protection and restricted user access to ensure patient confidentiality. One of the staff registered nurses assumed primary responsibility for registry maintenance. She entered the majority of data and used the registry data to guide proactive visit planning for enrolled patients.
Delivery system design. The delivery system was designed to maximize continuity and optimize resource utilization. The two staff nurses provided primary patient management using evidence-based algorithms derived from The Institute for Clinical System Integration (ICSI) Clinical Guidelines for Hypertension, Diabetes, and Hyperlipidemia. ICSI is a nonprofit quality improvement organization that supports the development and implementation of evidence-based clinical guidelines for use within member medical groups. Patients were seen at enrollment by one of the two staff RNs, and within 4 weeks by a volunteer physician. Timing of subsequent visits was determined by the care team, according to guideline recommendations and based on disease status. The majority of contacts were with the staff nurses, but volunteer physician and limited specialty consultation was available.

Algorithm-driven medication changes were made by the nurses and reviewed by a volunteer physician. Telephone and e-mail consultation was used extensively to maximize efficient use of physician resources. Management decisions not requiring direct physician assessment, such as medication adjustment or timing of follow-up, were handled by phone, chart review, or e-mail whenever possible. Physician visits were arranged for patients with acute problems, difficult medication management issues, or specific questions for the doctor. A volunteer endocrinologist saw particularly challenging diabetes cases in consultation.

Patients completing the study had an average of 9.5 encounters with a staff nurse, either in person or by telephone follow-up. There was an average of 1.8 encounters with a primary care physician. Among the patients with diabetes, nine had one clinic visit with an endocrinologist and one patient saw the endocrinologist twice.

Medications were provided at no cost to patients, in keeping with clinic policy. Generic medications were used whenever possible and were purchased by the clinic.
Brand name medications were used when indicated or necessary. Brand name medications historically had been donated to the Free Clinic by area pharmaceutical representatives and this practice continued during the course of the study.

**Decision support.** Decision support was facilitated by the integration of the ICSI clinical guidelines into the registry design and the treatment algorithms. In addition, the core physicians supporting the project were proponents of guideline-based management. As mentioned, specialty expertise was consistently available by phone or e-mail with a volunteer endocrinologist. A certified diabetes educator met at least once with 24 of the diabetic patients.

**Patient self-management.** Patient self-management was encouraged through the use of collaborative goal setting. Goal options addressed self-monitoring and lifestyle modification and were displayed visually using a self-management wheel (Figure 2). All patients were asked to establish a self-management goal. Nurse follow-up phone calls or visits were used to monitor progress toward the goal.

A menu of educational topics, based on the American Diabetes Association self-management education program content areas, was offered to patients in support of their collaborative goals. Education was offered by the staff nurses and diabetes educators, one of whom was fluent in Spanish. All educational materials were available in English and Spanish.

**Community involvement.** The SAFC itself is a product of community partnership and collaboration. Both project sites were community resources. The volunteer staff of the Free Clinic was drawn widely from both the lay and professional local community.

**Health system and leadership.** The Health System, as represented by the Governing Board of the SAFC, was (crucially) fully supportive of the project. Our efforts were facilitated through allocation of space and resources.

**Study design and measures.** The primary research design was a prospective cohort study. Individuals were assessed on enrollment and reassessed after a minimum intervention of 100 days. We felt this was the minimum time necessary to assess meaningful change in a chronic disease parameter. Individuals were then followed as long as possible, up to the 22-months study duration.

Patients were considered lost to follow-up if they did not complete 100 days of management or did not complete postintervention assessment. Enrolled patients who acquired insurance during the course of the study were considered lost to follow-up if they had not completed 100 days of intervention. If they had completed a minimum of 100 days in the study we included for analysis the exit labs obtained by us, or the patient’s entry labs with his or her new provider.

Patients with chronic disease were recruited and enrolled from March 1, 2001 through September 30, 2002 at both the SAFC and at the satellite clinic. Screening and informed consent occurred at the time of initial visit with one of the two staff nurses. Patients choosing to not participate in the pilot program were invited to continue receiving usual care through the SAFC.

The primary efficacy endpoint was the proportion of patients with clinically significant improvement in at least one of their chronic diseases. Disease-specific endpoints were a minimum one-stage reduction in blood pressure for hypertensive patients, a decrease of at least 1% of HbA1c for diabetic patients, and a reduction
of risk group in low-density lipoprotein (LDL) cholesterol for patients with hyperlipidemia. Additional measures included change in mean arterial pressure (MAP), change in HbA1c, and change in LDL cholesterol for patients completing the study. Enrollment rates, dropout rates, and length of participation were also measured.

**Statistical analysis.** The primary efficacy endpoint was assessed by developing a 95% confidence interval around the overall proportion of patients who attained clinically significant improvement in at least one of their chronic diseases. This endpoint was assessed both for all patients completing the study and for all patients enrolled (intent to treat). We assumed that under normal circumstances, if this cohort were to remain untreated, no more than 10% of patients would experience a one-class drop in chronic disease status. Based on our clinical experience with the SAFC, this is an optimistic estimate for unmanaged patients. Although any clinical improvement for patients in the study would be beneficial, we established a goal of 50% of the patients experiencing an improvement in one disease outcome to demonstrate the effectiveness of the program.

Further assessment included analysis of the disease-specific changes for those patients completing the study. Paired *t*-tests were used to determine degree of change for the physiologic measurements underlying each disease entity. We also compared disease-specific control rates to published national control targets.

**Results**

We enrolled 149 patients into the study. There were 40 patients lost to follow-up within 100 days of enrollment. Of those patients lost to follow-up, 17 acquired...
insurance, 13 moved from the area, and 10 were unaccounted for. Over the 22 months of the study 109 patients were managed for a mean of 361 days (SD143.3). The success of our colleagues in maintaining these patients in the program is demonstrated in Figure 3.

A clinically significant improvement was obtained in at least one chronic disease for 79 patients. Of the patients completing the study, 72.5% improved. Of all enrolled patients (intent to treat) 53% improved. For the 89 patients with the diagnosis of hypertension who completed the study, 57 (64%) improved at least one stage. For the 60 study patients with diabetes completing the study, 32 (53%) reduced their HgbA1c values at least 1%. For the 19 patients with elevated LDL cholesterol completing the study, 11 (58%) dropped one risk group. Several patients with hyperlipidemia did not complete postintervention lipid testing, but were able to complete postintervention assessment of blood pressure or HgbA1c testing (see Discussion).

The degree of change in MAP, HgbA1c, and LDL using paired $t$-tests are displayed in Table 1. Pre- and postintervention control rates for hypertension, diabetes, and hyperlipidemia are displayed in Figure 4 and compared with the NCQA/ADA Diabetes Physician Recognition Program targets at the time of the study.25

**Discussion**

The chronic care model was successfully used as a template for the delivery of chronic disease care to an uninsured population using the relatively limited resources of a free medical clinic staffed primarily by volunteers. Several elements of the chronic care model were adapted for use in the project and contributed to the success of the project.

The chronic disease registry enabled effective tracking and management of a diverse, uninsured patient population. Dropout rates of over 40% are documented in the delivery of chronic disease care to similar populations.26 In our study, 27% of patients were lost to follow-up. If we exclude from analysis those who acquired health insurance during the study, only 17% of patients were lost to follow-up.

The nurse-managed delivery system, evidence-based disease management guidelines, volunteer specialty support, and promotion of patient self-management proved to be a viable format for the sustained delivery of quality chronic disease care. This approach to chronic disease management enabled a group of uninsured patients to achieve clinically significant improvement in the control of their chronic illnesses. With the exception of a case study describing implementation of the chronic care model in a community health center, we are unaware of published data chronicling the use of the model for the medically uninsured.8

There are a number of limitations in this study. A randomized, controlled trial would have more clearly demonstrated the effectiveness of this model. The experience of our hypertension patients in the 2 years prior to the study (as described in the Introduction) offers some basis for comparison. Unfortunately, a similar analysis of prior diabetes care is not feasible due to a paucity of laboratory data. We felt it was important to demonstrate the feasibility of applying the Chronic Care Model to the Free Clinic despite the lack of a control group.
The length of intervention varied greatly among our patients, confounding data analysis and raising questions about sustainability of the results. In large part, the variation was inherent in our highly transient patient population.

Figure 3. Follow-up of enrolled patients.

Table 1.

CHANGES IN DISEASE SPECIFIC PARAMETERS

<table>
<thead>
<tr>
<th>Measure</th>
<th>Initial</th>
<th>Final</th>
<th>Change</th>
<th>p-value*</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Arterial Pressure** (sd)</td>
<td>110.1 (15.8)</td>
<td>97.4 (10.6)</td>
<td>-12.7 (15.4)</td>
<td>&lt;0.001</td>
<td>89</td>
</tr>
<tr>
<td>Mean HgbA1c (sd)</td>
<td>9.68 (2.12)</td>
<td>8.44 (1.92)</td>
<td>-1.24 (2.05)</td>
<td>&lt;0.001</td>
<td>60</td>
</tr>
<tr>
<td>Mean LDL (sd)</td>
<td>174.2 (33.3)</td>
<td>130.6 (43.2)</td>
<td>-43.5 (33.1)</td>
<td>&lt;0.001</td>
<td>19</td>
</tr>
</tbody>
</table>

* A Paired T-test was used to calculate significance.
** Mean Arterial Pressure calculated as (Diastolic + [Systolic-Diastolic] / 3)
Finally, beyond extensive volunteer involvement, the community component of our adaptation of the chronic care model was quite limited. A more coordinated effort with community agencies and resources may have resulted in more significant improvements in care.

We faced a number of significant challenges frequently encountered in providing care to underserved populations. No systematic approach to chronic disease care existed at the SAFC prior to this project. Our patients were racially and culturally diverse. Transportation difficulties, childcare concerns, extended work hours, and language barriers were all obstacles to care delivery. Finally, space and financial constraints interfered with optimal management. The improvements our patients achieved attest to the strength of both the chronic care model elements and the patients. Clinics and organizations facing similar challenges are likely to find the chronic care model similarly useful. Potential sites for additional trials include other free care clinics and community-based health organizations. Randomized, controlled trials could further strengthen the case for widespread implementation of the model.

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Figure 4. Change in key measure from pre- to postintervention with comparison to 2002 NCQA/ADA targets.
Notes


