

Improvement in Diabetes Care Using an Integrated Population-Based Approach in a Primary Care Setting

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ABSTRACT

The care for people with diabetes and most chronic illness suffers if it is acute, reactive, and fragmentary. We report the first 5 years of a comprehensive, integrated approach to diabetes care at Group Health Cooperative of Puget Sound, a large group model Health Maintenance Organization in Washington State. The program is population-based, evidence-based, and patient-centered. Primary care teams receive support in the form of electronic diabetes registries, evidence-based guidelines, patient self-management support, and decentralized onsite consultation with a diabetes expert team (a physician and nurse specialist). In a population of more than 15,000 patients with diabetes, by 1998 more than 70% had had a dilated retinal examination and microalbuminuria test in the previous 12 months, 82% had received a foot examination, and 68% of patients have a hemoglobin A_{1c} (Hb A_{1c}) under 8.0%. Patient satisfaction improved while costs and utilization decreased. Overall costs decreased by \$62 per member per month, despite a slight increase in pharmacy costs. In conclusion we have shown that an integrated and proactive approach to diabetes care improves health outcomes and patient satisfaction and decreases overall costs of care.

INTRODUCTION

FOR THE PAST 5 YEARS, a multidisciplinary team has been guiding a comprehensive strategy for improving the care of patients with diabetes at Group Health Cooperative (GHC) of Puget Sound. The approach can best be described by three hyphenated jargon terms: population-based, evidence-based, and patient-centered. It is population-based in that through the use of registries, practitioners are encouraged to examine their entire panel of patients with diabetes and organize care for them. It includes efforts to reach out to patients proactively to ensure that diabetes care guidelines are met. It is evidence-based in that programmatic decisions are based on scientific data,

with particular emphasis on data from randomized controlled clinical trials.

Two types of clinical research have influenced the program. Specific clinical guidelines such as the guideline for microalbuminuria testing or the guideline for foot assessment are based on methodologically rigorous clinical studies. Second, interventions to implement elements of the program are based, whenever possible, on rigorous clinical studies. For example, the work of Litzelman et al.¹ had significant impact on the design of our foot care self-management program. We are attempting to make the program as patient-centered as possible by emphasizing the critical role of the patient as self-manager of their illness. With all intervention components, we have attempted

to develop supporting information directed at patients in support of the guidelines.

In designing the program, we carefully reviewed the literature about interventions for chronic illness. We have summarized this literature in previous publications.²⁻⁴ Our findings suggest that programs that improved outcomes in chronic illness were those that facilitated, focused, and planned interactions between patients and providers other than the usual, rushed symptom-focused visits that are experienced by most patients with chronic illness. Productive interventions are those that allow for appropriate assessments to be completed, for the development of treatment plans, for the initiation and maintenance of guideline-directed therapy, for the provision of high-quality self-management support, and for the maintenance of careful follow-up (Fig. 1). Productive interactions occur when patients are informed and activated and providers have the information, expertise, time, and tools to provide high-quality patient care. To equip a practice team to provide productive interactions, the literature suggests practice changes in four areas: self-management support, decision support and clinical expertise, the design of practice, and information systems. Effective chronic disease program interventions assure continual attention to the patient's ability to manage their illness, and provides them

with the information, skills, and psychosocial support to assure competent self-management. Successful chronic illness interventions tend to be guided by explicit protocols or guidelines, and ensure that those providing care have sufficient expertise or access to expertise to execute the protocol. In our model, we term this decision support. Because of the difficulties of providing high-quality chronic illness care in a traditional 15-minute office visit, successful programs often alter the organization of practice (e.g., appointments, follow-up) and the roles of practice team members to better meet the needs of patients with diabetes. This reorganization is often assisted by enhanced information systems that facilitate the creation of registries and the implementation of reminders.

At Group Health Cooperative, we have attempted to change the system of care for patients with diabetes in accord with this model. Figure 1 shows the various features of the Group Health diabetes improvement program in the context of the chronic care model.

SETTING AND PROGRAM

GHC of Puget Sound is a not-for-profit health management organization (HMO) that serves more than 400,000 enrollees in western Wash-

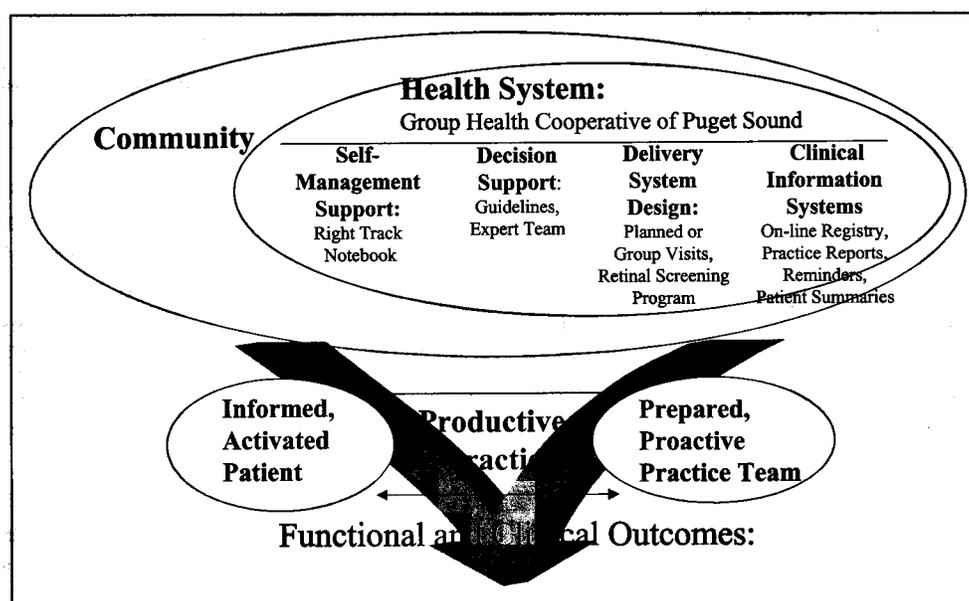


FIG. 1. The diabetes clinical improvement road map.

ington State. These enrollees include approximately 15,000 patients with diabetes who are cared for by more than 200 primary care providers practicing in 25 clinics around Puget Sound. The diabetes improvement program was initiated in 1994 and has been described in detail elsewhere.²⁻⁴ The overall goal of our program was to provide an integrated set of tools, guided by the chronic care model, that would support and encourage improved diabetes care by the primary care teams. Early results (up to the end of 1996) have already been published.⁴ In this article, we will extend our observations out to the end of 1998, and will add findings relating to patient satisfaction and cost.

Beginning in 1995, a quarterly printout of the registry was sent to each provider telling them who their patients with diabetes were, when they had been last seen, and the dates and results of routine assessments (retinal eye examinations, hemoglobin A_{1c} [Hb A_{1c}] tests, etc.) The online electronic version of this registry became available in May 1996, with four improvements and upgrades added over the following 2 years in response to feedback from providers. The current electronic registry now includes information that is updated daily. It also produces on demand a printed, two-page, individualized patient summary that can be used to guide patient visits.

KEY PROGRAM ELEMENTS

Figure 2 shows the key program elements and the date on which they were introduced. The improvement in outcomes (Fig. 3) should be viewed in the context of that timeframe.

The Diabetes Registry

The concept of population-based care has been widely promoted in the organization since 1994.

The Diabetes Expert Team

A system of disseminated expertise, in which primary care providers could see their patients jointly with a diabetologist and diabetes nurse specialist, was initiated in January 1995 and slowly adopted. By the end of 1995, 85 primary care teams had had at least one visit with the Diabetes Expert Team, but only 16 had done so on more than one occasion. By the end of 1996, a total of 193 teams had done at least one joint visit. Of this number (193), 108 had two or more

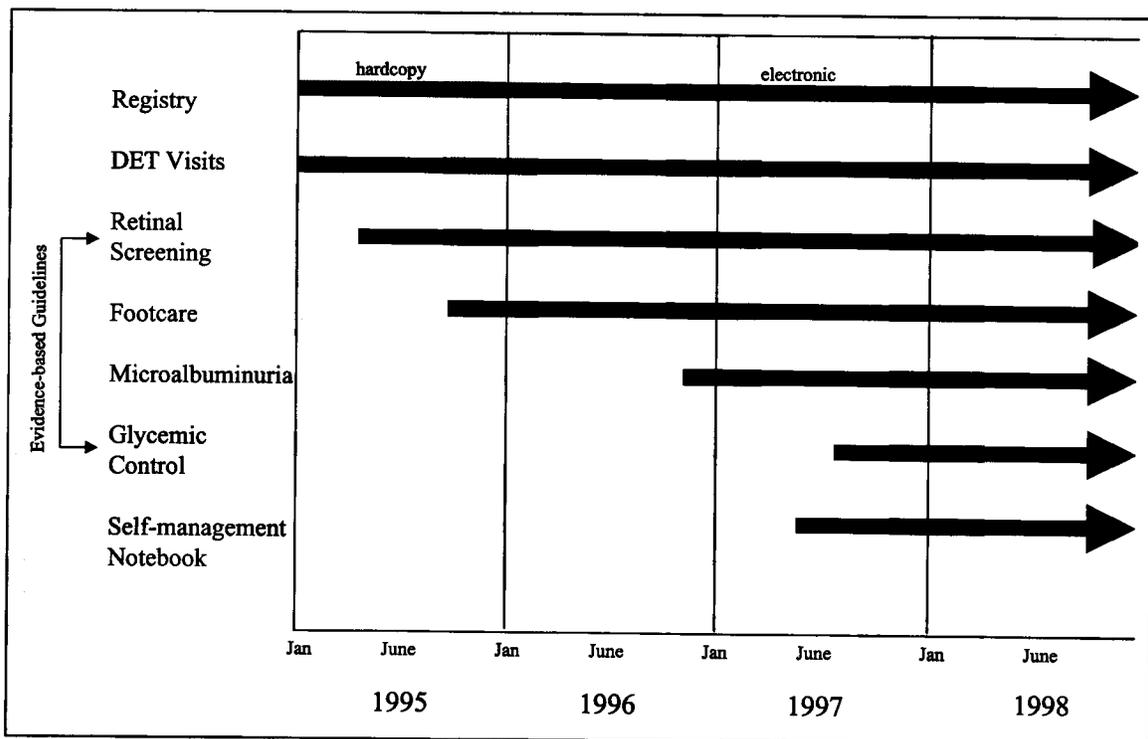


FIG. 2. Diabetes clinical improvement timeline.

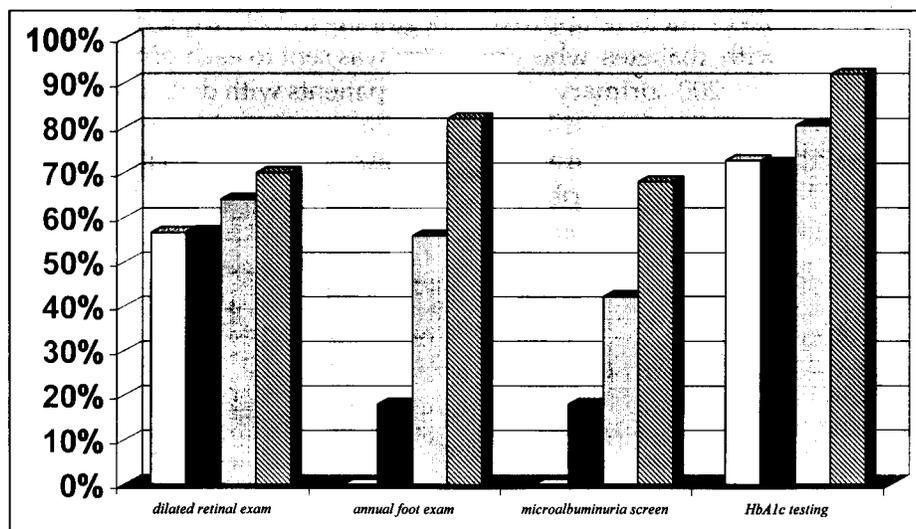


FIG. 3. Selected diabetes care process improvements from 1995 to 1998.

joint visits. The numbers by the end of 1997 were 259 and 167, respectively.

Evidence-based diabetes guidelines

These guidelines have been described in detail in a previous publication.⁴ The guideline for retinal screening was introduced in March 1995; for footcare in August 1995; for microalbuminuria in November 1996; and for glycemic management in July 1997. Specific guideline information is available in detail on GHC's internal Web site, and includes a summary of supporting scientific evidence. Each guideline is supported by an implementation plan that includes provider education, patient education, and supporting tools (e.g., monofilaments for foot assessment), if appropriate.

Self-management support

To standardize patient information about diabetes, the authors developed internally a printed patient notebook ("Right Track"). The notebooks are distributed through GHC pharmacies free of charge by physician prescription. They have been available to patients with diabetes since May 1997. As of December 1998, 5,603 "Right Track" notebooks have been distributed. The notebook also includes many worksheets and tools to support identifying and overcoming behavioral barriers to diabetic

self-management. A variety of ways of providing individualized self-management support has been piloted, including nurse case-management, group visits, and telephone-based counseling. All have used the material in the "Right Track" notebooks but, as yet, no consistent framework for self-management support has been adopted and disseminated throughout the GHC system.

CLINICAL DIABETES INDICATORS

Dilated retinal examinations

This was the first clinical diabetes indicator on which the organization focused. During a National Committee on Quality Assurance (NCQA) review in 1993, using the Health Plan Employer Data Information Set (HEDIS), only 43% of patients with diabetes at GHC had documentation of receiving a dilated retinal eye examination in the previous 12 months. Following adoption of the Retinal Examination guideline, GHC optometry services used the Diabetes Registry to identify and make appointments for patients needing eye examinations. Two problems have contributed to full implementation and measurement of this clinical indicator: (1) limited personnel resources in some eye clinics and (2) inconsistent elec-

tronic capture for documentation of dilated retinal examinations in the Diabetes Registry, as well as within the medical record.

Foot assessment

Patient surveys and chart audits prior to 1995 showed that less than 20% of patients with diabetes were getting an annual foot examination. Also, there was huge clinical variation in what was being done and recorded at these examinations. After introducing the standardized evidence-based guidelines for foot assessment in August 1995, and then the availability of the Diabetes Registry in May 1996, primary care teams were asked to electronically enter the date and results of the examination using a simple data entry screen on the Diabetes Registry. This was a significant "culture shift" and was initially perceived by many as being extra and unnecessary work, yet there was no other way to electronically document and track this important assessment. To encourage data entry, a hardcopy, carbonized form was provided to clinics so that one copy could be placed in the medical chart and the other copy could be given to one of the clinic staff for data entry at another time. The outcome measure that we track is the percentage of patients with diabetes who have had a foot examination entered in the Diabetes Registry. This obviously underestimates the number of patients who may be getting some form of foot examination done.

Microalbuminuria screening

Evidence of the merit of this test (and treatment of those testing positive using angiotensin-converting enzyme [ACE]-inhibitors) led to the development and introduction of the guideline in July 1996. Laboratory services also collaborated with us to provide accurate, convenient, inexpensive testing for microalbuminuria (albumin to creatinine ratio). This convenient spot urine collection made the measure of this clinical indicator feasible and easily accessible to family practice clinicians.

Glycemic control

The glycemic management guideline was introduced in July 1997. Metformin was available

in the GHC formulary in June 1995. The guideline defines an evidence-based stepped approach to glycemic control, how to assess and set glycemic targets, and how to monitor therapy.

Data sources for analysis

The data presented here are collected routinely by GHC's Quality and Systems Resources Division. The patient satisfaction data derives from the annual surveys of randomly sampled patients with diabetes. Surveys prior to 1997 were conducted by telephone, while the 1997 survey was by mail. Samples sizes were in the vicinity of 1,000 each year. The remaining measures were taken from GHC automated data either from the Diabetes Registry (e.g., foot examinations) or administrative data systems (e.g., utilization costs). These data systems have been used extensively for research and evaluation.⁵ For 1998, data were obtained by random audit of 275 charts or part of a study in conjunction with Washington State Department of Health.

RESULTS

Care process

Figure 3 shows the proportions of GHC population with diabetes receiving eye examinations, foot examinations, microalbuminuria screening, and Hb A_{1c} testing in accord with GHC guidelines during the years 1995–1998. The percentage with foot examinations in 1995 is displayed as 0 because the registry, which has been used as the source of subsequent foot data, was not operational. As described in Figure 2, microalbuminuria testing did not begin until 1996 when the test became available in GHC system. For all four procedures, there has been a steady increase in guideline compliance. In 1998, 70% of GHC patients with diabetes had a recorded retinal examination and microalbuminuria screen, 82% had a recorded foot examination, and 92% had a Hb A_{1c} test.

Glycemic control

The overall mean Hb A_{1c} level for the GHC population with diabetes dropped below 8.0% for the first time in 1996 and has fallen slightly

since then. Preliminary data suggest that the mean Hb A_{1c} in 1998 was just under 7.6%, and that 68% of patients had a most recent Hb A_{1c} less than 8%.

Patient satisfaction

Table 1 shows the responses to items of patients' ratings of their care (from excellent to very poor) of four aspects of their care. Between 1996 and 1997, GHC patients with diabetes reported greater satisfaction with all four elements of care; these increases in the percentages of excellent ratings to overall quality of care and coordination of services reached statistical significance. It is possible that these improvements were a function of the shift in survey method (from telephone to mail), but surveys of other GHC populations (e.g., older women, patients with heart disease) did not exhibit these temporal changes.

Utilization and costs

Changes in utilization and costs are shown in Table 2. Inpatient admissions for patients with diabetes have decreased by 17%, inpatient days by 25%, and average length of stay by 10% (whereas all of these have remained unchanged in the past 3 years for GHC patients as a whole). Primary care visits have decreased by 6.6% and specialty visits by 23% (similar decreases have been seen for GHC patients as a whole). For patients with diabetes this represents one less specialty visit per year. Emergency visits are unchanged. Total costs for diabetic patients have decreased by 11% from 1995–1997, whereas they have increased by 4% for GHC patients as a whole. It is worth noting that the decrease in diabetic per member per month (PMPM) costs of \$62 has been achieved

despite an increase in the pharmacy PMPM costs for diabetic patients during this time. These medication costs rose from \$70.16 in 1995 to \$81.36 in 1997, the increase of \$11.20 being almost entirely explained by metformin use.

DISCUSSION

By the end of 1996, 18% of patients had had data entered on the Registry. This rise has increased dramatically in the last 2 years and is now over 80%, as verified by random chart audits. Measures of care process derived by the automated data systems, therefore, underrepresent the true rates to some extent; however, they are an excellent way to track trends in the population with diabetes as a whole.

The percentage of patients with diabetes who have had at least one Hb A_{1c} test in the previous year was 73% in 1995 and has risen to over 90% in 1998. Our Hb A_{1c} assay gives values calibrated to the Diabetic Control and Complication Trial (DCCT) standard and is DCCT-certified. The mean Hb A_{1c} for the entire population of patients with diabetes dropped below 8.0% in 1996 and is currently 7.58%. Improved glycemic control can be attributed to three factors. First, metformin became available in June 1995 and approximately 1,000 patients had begun taking this drug by the end of 1995. Use of metformin has risen to just over 3,000 patients at the present time. The second reason for glycemic control improvement (despite the lack of a major emphasis on this aspect of diabetes care until the second half of 1997) is likely due to a general increased awareness and confidence about diabetes care as a result of the overall diabetes program. Third, it is possible that general awareness through the popular press regarding the value of improved blood glucose control has been growing in the past few years with the publication of results of the DCCT, the United Kingdom Prospective Diabetes Study (UKPDS) among others.

TABLE 1. THE DIABETES CLINICAL IMPROVEMENT ROAD MAP AT GROUP HEALTH COOPERATIVE: PATIENT SATISFACTION

% Rating Excellent	1995	1996	1997
Overall quality of care	na	24%	30%
Thoroughness of treatment	26%	26%	29%
Doctor's skill/experience	na	31%	37%
Coordination of services	22%	22%	28%

CONCLUSIONS AND FUTURE PLANS

Using a systematic, integrated approach, we have shown substantial improvements in mea-

TABLE 2. THE DIABETES CLINICAL IMPROVEMENT ROAD MAP AT GROUP HEALTH COOPERATIVE: COST AND UTILIZATION OUTCOMES PER PATIENT

	1995	1996	1997	Change
Inpatient admissions/1000	289.9	259.3	240.6	-17%
Inpatient days/1000	1311	1175	978	-25.6%
Average length of stay	4.52	4.53	4.07	-10%
Primary care visits	6.40	5.91	5.98	-6.6%
Specialty care visits	3.92	3.09	3.01	-23%
Emergency room visits	0.18	0.20	0.17	none
Total costs PMPM	\$566	\$541	\$504	-11%

PMPM, per member per month.

asures of process of diabetes care and intermediate clinical outcomes in a large population of patients with diabetes receiving care in a primary care setting. These changes are especially significant given that the improvements have occurred at a time of financial constraints, staff reductions, and organizational upheaval and restructuring. During this time we have demonstrated reduced utilization of services and reduced costs of care, and patient satisfaction has increased. We believe that there are several reasons for these results:

- The program has allowed better coordination and integration of diabetic services and provides a clear plan for the overall goals of diabetes care along with practical tools to facilitate this work. Initially there was some perception that each new innovation was a separate "new thing," but by the last quarter of 1997, all components were in place and more than half of the primary care teams had had two or more visits by the Diabetes Expert Team.
- There has been a steady rise in the confidence and competence among primary care teams for setting and achieving diabetic priorities.
- Repeated reminders of the "right work" has been provided in a variety of formats, all of which are consistent with each other. Clinical practice reports are now available to show providers how they are doing with respect to their peers on measures of diabetes care. Individual patient summaries from the Diabetes Registry, and coaching from the Diabetes Expert Team, also reinforces application of all program components and resources.

Future efforts will be directed to three targeted areas:

1. We need to continue to implement all the current aspects of care. Staff turnover in physicians, registered nurses, and physician assistants, clinical administrators, and restructuring of the delivery system means that we are trying to implement improvements in a dynamic system. These improvements are unlikely to be self-sustaining unless we continue to monitor and modify care processes as needed.
2. Although we have seen substantial improvement in the rate at which patients with diabetes get a screening evaluation of their feet, we have not yet seen a significant decrease in the prevalence of foot ulcers, or amputations. This suggests that although we are improving "high-risk" feet, we need to be more effective in our intervention to prevent and manage foot ulcers.
3. Although we have seen a modest improvement in the distribution of Hb A_{1c}, we still have one-third of patients with a Hb A_{1c} over 8.0%. Our program lacks an effective strategy for self-management support throughout the system. Our ideal is to provide all patients with a planned visit at least once a year where they can do collaborative goal-setting with a trained patient-centered team who can offer a variety of options for supporting self-management goals (individual case management, group visits, telephone or interactive computer support, etc.). We will also put significant effort to documenting collaborative goal-setting in routine clinical practice and encourage that this becomes the "dri-

ver" for the agenda during all planned diabetes clinical encounters.

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