

## Diabetes Managed Care and Clinical Outcomes: The Harbor City, California Kaiser Permanente Diabetes Care System

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### **Abstract**

**Objective:** To investigate diabetes clinical outcomes in a large patient population by comparing results of computer-supported team care to those of usual care.

**Study Design:** Patients enrolled in a diabetes care management program were tracked by a computerized system. Their subsequent healthcare outcomes were compared with those of usual-care patients and those of patients who had been discontinued from being managed in this program.

**Patients and Methods:** Screening rates for glycosylated hemoglobin (GHb), urinary protein, serum lipids, and glycemic and blood pressure control were compared between currently managed and usual-care patients. Hospital days and screening rates in a subset of the currently managed group, long-term managed patients, were compared with those of no longer managed patients.

**Results:** Screening rates for GHb, urinary protein, and serum lipids were higher in currently managed patients than in usual-care patients. Follow-up of initially elevated GHb in currently managed and usual-care patients showed an overall decrease in both groups. Follow-up of initially elevated blood pressure in currently managed patients showed a

decrease in both mean systolic and mean diastolic measurements, while follow-up in usual-care patients showed no change in either mean systolic or mean diastolic measurements. Inpatient utilization for the long-term managed patients decreased between 1995 and 1997 and was lower in 1997 for this group than for no longer managed patients. Screening rates for GHb, urinary protein, and serum lipids were higher in the long-term managed patients than in the no longer managed patients.

**Conclusions:** Computer-supported care management by a dedicated team appears to reduce the number of hospitalizations and improve screening rates and glycemic and blood pressure control.

(*Am J Manag Care* 1999;5:1299-1307)

In the United States, caring for patients with diabetes is costly,<sup>1,2</sup> with most of the expenses incurred for associated conditions and complications of diabetes rather than for direct care and management of glycemic events.<sup>2</sup> Of more concern, the prevalence of type 2 diabetes mellitus continues to increase as the general population ages and as obesity becomes increasingly prevalent.<sup>3</sup> Healthcare programs are beginning to focus more on proactive management of chronic disease, particularly chronic management of diabetic populations.<sup>4-7</sup> Glycemic control has been shown to decrease complications of diabetes,<sup>8</sup> and successful management of patients

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with diabetes has been modeled to save substantial amounts of healthcare dollars.<sup>4,9,10</sup>

This study involved members enrolled in Kaiser Permanente, a not-for-profit health maintenance organization (HMO) that is the largest in the United States and consists of 10 geographic regions.<sup>11</sup> Harbor City Kaiser Permanente Medical Center is located in the California region and provides medical services to approximately 170,000 members, including more than 8200 patients with diabetes.<sup>12</sup>

Harbor City Kaiser Permanente Medical Center created the current Diabetes Care System (DCS) in 1995. All interactions involving care of patients with diabetes are recorded and tracked in the DCS computer database using customized diabetes software. In this article, we report the DCS healthcare outcome results for the last 3 years and address the hypothesis that outcomes derived from proactive computer-supported team management of patients with diabetes will show improvement over those in the usual-care setting. These improved healthcare outcomes are consistent with recommended published standards for good diabetes care.<sup>13</sup>

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#### ...METHODS...

##### Site

In 1995, the DCS was formally organized by combining the previously used diabetes specialty office with a newly developed diabetes case management arm and a clinical diabetes pharmacist arm. The DCS team includes the following positions: 2 endocrinologists, 1 working half time; 1 full time nurse practitioner and 1 full time physician assistant; 3 registered nurses, all working half time; 3 full time licensed vocational nurses, 2 full time clinic assistants; 1 full time receptionist, and 3 pharmacists working a total of 1.2 full time equivalents.

Patients are overseen in a variety of settings by any of the DCS team members, with the care of many patients shared by several individuals in this team approach to chronic diabetes care management. Patients are seen in the Specialty Office for one-on-one conventional office appointments, in RN appointments for intensive one-on-one case management evaluation, in LVN appointments for updating diabetes screening items (eg, eye examinations, foot examinations, blood tests), in a patient group encounter (focusing on a yearly diabetes refresher experience or on specific medications), or contacted by telephone. Patients may matriculate from one

care arm to another depending on present needs and disease status.

Patient data from all individual visits, group encounters, and telephone contacts are recorded and tracked in a locally networked diabetes database, which also automatically tracks laboratory results. Communication among the different DCS team members is facilitated by the program's networking features and dedicated computer screen forms allowing data entry, daily tracking and reminders, messaging, patient letter communication, and archiving. The computer program was developed by the author, customized by the entire DCS team, and is continually updated and enhanced as needed.

At any given time, DCS actively focuses on the highest-risk subpopulation, which includes approximately 30% of the entire diabetic population at Harbor City, but the computer system has the capability to track most of the patients with diabetes who are enrolled in this system. Patient criteria for active focus by DCS include, but are not limited to, the following: (1) multiple hospital, emergency department, or urgent clinic admissions or visits; (2) multiple associated disease processes or complications (eg, those with hypertension and hyperlipidemia, particularly if not yet controlled); (3) multiple or new diabetic medication use; (4) new-onset diabetes; (5) poor understanding of disease self-care; (6) general debility or lack of patient support system; and (7) other, less definitive, criteria indicative of the need for more intense follow-up and care. Generally, patients are referred from usual-care providers, who have been educated on the focus of DCS. Patients who are seen by the DCS retain their primary care doctors even though their diabetic care is overseen mostly by DCS team members.

The diabetic care of the other 70% of the diabetic population remains the responsibility of their primary care doctors (usual care). The computerized software allows us to query specific admissions utilization and screening data and make comparisons between the outcomes in DCS patients and the outcomes in usual-care patients.

The Kaiser Permanente Regional Diabetes Registry (Registry) is a database containing information on all patients in the entire California region who are known to have diabetes and is updated annually. Members are identified as having diabetes based on prescriptions, laboratory values, and other criteria. Patient population size as well as rates of adherence to screening for glycosylated hemoglobin (GHb), urinary protein, and serum lipid screening,

among many other parameters, are summarized for the entire region and are tabulated for each medical center. Based on the data in the Registry, Harbor City Medical Center had 8218 patients with diabetes in its service area in 1997. The Registry serves as a basis of comparison for measuring successes in present and future regional and local efforts focused on improving diabetic member health and care.

### Patient Sample

*Currently Managed Patients.* Data were compiled between June 15 and July 3, 1998. All DCS patients who were seen in any of the DCS modes of care (described in the "Site" section) during the year prior to this compilation time comprised the currently managed patient group (n = 2617).

*Long-Term Managed Patients and No Longer Managed Patients.* From June through December, 1995 inclusive, 818 patients were referred to DCS, of which 673 remained actively enrolled in Kaiser Permanente in 1997; others were excluded because of death or change in health coverage benefits. Of these 673 patients, DCS management was continued in 386 (long-term managed group) at least into the year between July 1997 to July 1998, while DCS management was discontinued for the other 287 (no longer managed group) because of patient factors and resource limitations. Disposition into the long-term managed or no longer managed subset was determined by factors such as patient self-motivation for optimizing health status and participation in self-care, repeat referrals from providers outside of DCS, sufficient DCS team member resources to continue contact with those patients, and the patient's phase of illness. Perceived resolution of an acute problem by the patient or DCS team member would allow the patient to return to usual care, which would result in moving to the no longer managed subset. Because the DCS target population is the highest-risk subset of the total diabetic population, its membership will be dynamic. Ideally, patients who move to the no longer managed subset should be lower risk than they were when initially seen, but because of patient and resource factors, this is not always the case.

*Usual-Care Patients.* The total population of usual care patients (n = 5993) was determined by excluding all currently managed patients in the Registry (n = 2225).

*Usual-Care Patients with a Recent Primary Care Visit.* A random sample of 1399 was selected from a subset of 5993 usual-care patients who had visited a primary care physician within the last year

before data compilation. Patients in this sample group were identified by querying a regional database. Glycemic screening and control were studied in this group (see below).

### Quality Measurement

Standards for promoting good health in patients with diabetes include screening of GHb, serum lipids (total cholesterol, high-density lipoproteins, low-density lipoproteins, and triglycerides), urinary microalbumin or protein excretion, and blood pressure, all on at least an annual basis. In agreement with published clinical practice recommendations,<sup>13</sup> the GHb and blood pressure goals for all patients with diabetes were  $\leq 8.0\%$ , and  $< 130/85$  mm Hg, respectively.

### Study Design

*Currently Managed Patients.* Screening rates for these patients were extracted from the DCS database and compared with those of usual-care patients and those of usual-care patients with a recent primary care visit, as reported in the Registry.

Initial and follow-up GHb (glycemic control), and initial and follow-up blood pressures (blood pressure control) were also studied in these patients with the patients serving as their own controls. Initial and follow-up GHb and blood pressure dates and values were taken as the first and last ever recorded in the DCS database. The duration of follow-up in some patients is quite lengthy, but the majority of first recorded entries dated from 1997, while the last recorded entries dated mostly from the year 1998. Only patients with at least 2 recorded GHb or blood pressure values were included in this part of the analysis. Patients who were managed exclusively by telephone contact and those with only a single recorded GHb or blood pressure entry (because the initial entry was normal or because a single entry was recorded very shortly before compilation of data) were excluded from this part of the analysis.

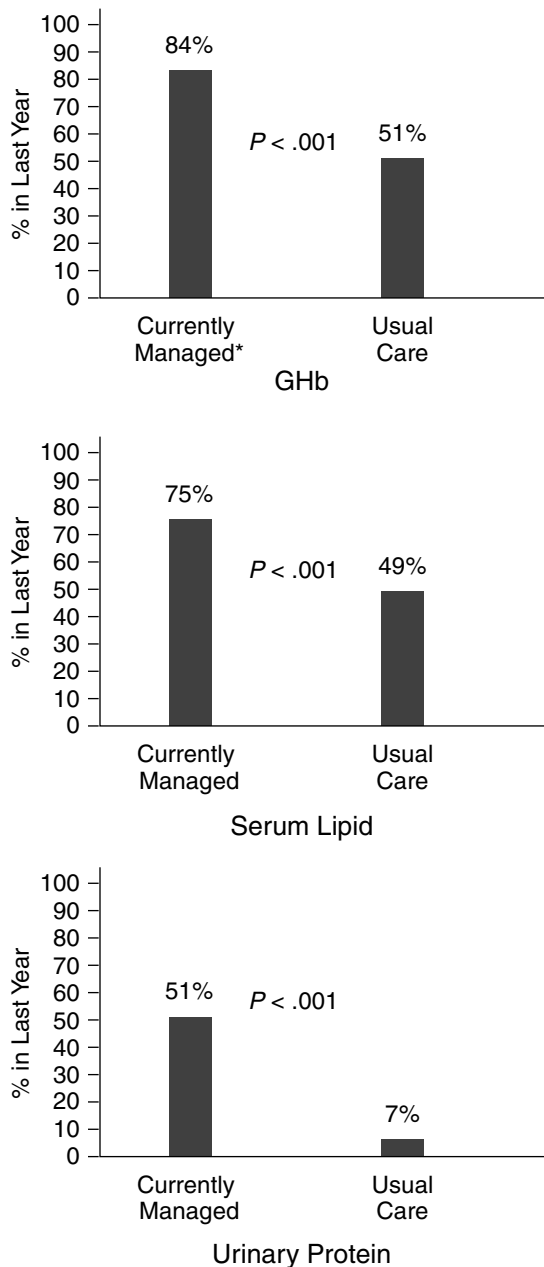
Glycemic screening rate, frequency of repeat GHb testing in patients with initially elevated GHb, and glycemic control in the currently managed patients were also compared with glycemic screening rate, frequency of repeat GHb testing in patients with initially elevated GHb, and glycemic control in the usual-care patients with a recent primary care visit. An electronic file containing this subset of usual-care patients was used to query the DCS database to find their GHb screening dates and values.

Blood pressure control in the currently managed patients was compared with blood pressure control in a subset of usual-care patients. Blood pressure measurements of DCS patients were queried direct-

ly from the DCS database. Blood pressure measurements of patients in usual care were obtained from 300 charts randomly selected for manual review. Of the 300 charts, 106 were not used because they did not contain at least 2 blood pressure recordings in the specified time interval; thus, blood pressure data was obtained for 194 usual-care patients. In the chart review for each patient, the initial and follow-up blood pressures for this comparison were taken as values recorded as far apart as possible in the years 1997 and 1998.

*Long-term Managed and No Longer Managed Patients.* Using the DCS database and an electronic file of admission data reported from the Kaiser Permanente mainframe computer database, inpatient utilization in 1997 versus inpatient utilization in 1995 (the year of initial enrollment into DCS) was compared between these 2 groups of patients. In addition, adherence to standards for screening rates in the long-term managed patients was compared with that of the no longer managed patients.

**Figure 1.** Laboratory Test Screening Rates



\*Currently managed patients, n = 2617; usual-care patients, n = 5993.

### Statistical Analysis

Data values are given as means  $\pm$ SD; adherence rates are given as percentages. Comparisons in inpatient utilization were effected by 2-tailed *t* test, paired or unpaired. Adherence percentage rates were compared by chi-square test. In all cases, a value of  $P < .05$  was considered significant.

### ...RESULTS...

#### Comparison of Screening Rates in Currently Managed Patients and in Usual-Care Patients

Screening rates for GHb, urinary protein, and serum lipids were compared between the 2617 currently managed patients and the 5993 usual-care patients (Figure 1). Screening rates for all 3 parameters were significantly higher in the currently managed patients.

Screening rates for GHb were compared between the 2617 currently managed patients and the 1399 usual-care patients with a recent primary care visit. This comparison showed a significantly higher screening rate for currently managed patients ( $P < .001$ ) than for usual-care patients who were recently seen (85% [2220/2617] and 63% [887/1399], respectively).

Moreover, the frequency of repeat GHb testing in the 868 currently managed patients with initially elevated GHb ( $> 8\%$ ) in the last year compared with that of 312 usual-care patients with initially

elevated GHb and a recent primary care visit showed the follow-up testing rate in the currently managed patients to be significantly higher ( $P < .001$ ) than that of the recently seen usual-care patients: 77% (667/868) and 44% (138/312), respectively.

### **Glycemic Control in Currently Managed Patients and Glycemic Control in Usual-Care Patients**

More than one GHb measurement was recorded in the DCS database for 1774 of the 2617 currently managed patients. Of the 1774 patients, 753 had initial GHb values within goal ( $\leq 8.0\%$ ), while 1021 had initial GHb values above goal. Follow-up in the patients with initial GHb values within goal showed that mean GHb remained within goal, although it did rise significantly ( $P < .001$ ) from  $7.0 \pm 0.7\%$  to  $7.5 \pm 1.6\%$ ; these patients had a mean follow-up interval between initial and follow-up GHb measurements of  $50.5 \pm 29.3$  weeks. The patients with initial GHb above goal showed a significant decrease ( $P < .001$ ) in mean GHb from  $10.7 \pm 2.2\%$  to  $9.4 \pm 2.4\%$ ; these patients had a mean follow-up interval between initial and follow-up GHb measurements of  $51.1 \pm 36.6$  weeks.

Among 312 usual-care patients with a recent primary care visit and an initially elevated GHb in the last year, 55 had follow-up GHb testing. There was a significant decrease ( $P < .001$ ) in the mean GHb in these patients from  $11.1 \pm 2.5\%$  to  $8.7 \pm 2.5\%$ ; these patients had a mean follow-up interval between initial and follow-up GHb measurements of  $19.7 \pm 13.7$  weeks. There was no significant difference ( $P > .05$ ) between the mean follow-up GHb of these usual-care patients and of the currently managed patients ( $8.7 \pm 2.5\%$  and  $9.4 \pm 2.4\%$ , respectively).

### **Blood Pressure Control in Currently Managed Patients**

Of the 2617 currently managed patients in the DCS database, 838 had more than one blood pressure measurement recording, with 249 of these having an initial blood pressure reading within goal ( $< 130/85$  mm Hg) and 589 having an initial blood pressure reading above goal. Follow-up in the patients with initial blood pressures within goal showed that mean blood pressures remained within goal, although the mean systolic blood pressure rose significantly ( $P < .001$ ) from  $116 \pm 9$  mm Hg to  $125 \pm 17$  mm Hg, and the mean diastolic blood pressure rose significantly ( $P < .001$ ) from  $70 \pm 8$  mm Hg to  $74 \pm 10$  mm Hg; these patients had a mean follow-up

interval between initial and follow-up blood pressure measurements of  $27 \pm 39$  weeks. The patients with initial blood pressure above goal showed a significant decrease in mean blood pressure. The mean systolic blood pressure decreased significantly ( $P < .001$ ) from  $148 \pm 16$  mm Hg to  $139 \pm 20$  mm Hg and the mean diastolic blood pressure decreased significantly ( $P < .001$ ) from  $81 \pm 10$  mm Hg to  $76 \pm 11$  mm Hg; these patients had a mean follow-up interval between initial and follow-up blood pressure measurements of  $27 \pm 25$  weeks.

### **Blood Pressure Control in Usual-Care Patients**

Of 194 usual-care patients randomly selected by computer for manual chart review and found to have 2 or more recorded blood pressure measurements, 43 had an initial blood pressure reading within goal ( $< 130/85$  mm Hg) while 151 had an initial blood pressure reading above goal. Follow-up of the patients with initial blood pressures within goal showed that mean blood pressures remained within goal, although the mean systolic blood pressure rose significantly ( $P < .001$ ) from  $114 \pm 12$  mm Hg to  $123 \pm 12$  mm Hg; the mean diastolic blood pressure rose, but not significantly, from  $69 \pm 9$  mm Hg to  $70 \pm 10$  mm Hg ( $P = .36$ ); these patients had a mean follow-up interval between initial and follow-up blood pressure measurements of  $60 \pm 25$  weeks. The patients with initial blood pressure above goal showed no significant change in their mean blood pressures. The mean initial systolic blood pressure was  $145 \pm 14$  mm Hg, and the mean follow-up systolic blood pressure was  $146 \pm 16$  mm Hg ( $P = .86$ ), while the mean initial diastolic blood pressure was  $83 \pm 11$  mm Hg and the mean follow-up diastolic blood pressure was  $82 \pm 11$  mm Hg ( $P = .15$ ); these patients had a mean follow-up interval between initial and follow-up blood pressure measurements of  $58 \pm 30$  weeks.

### **Blood Pressure Control in Initially Hypertensive Currently Managed Patients Versus Blood Pressure Control in Initially Hypertensive Usual-Care Patients**

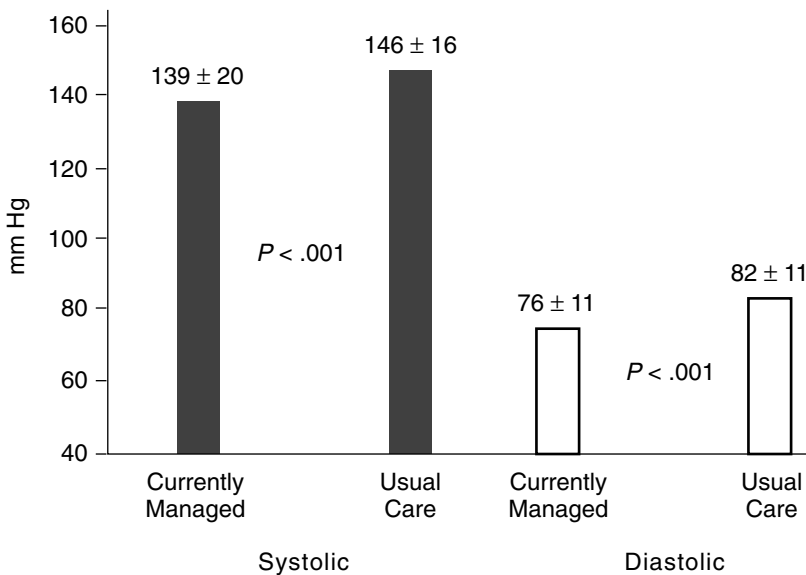
The baseline characteristics of the currently managed patients and usual-care patients with initial and follow-up blood pressure values are shown in Table 1. This comparison includes only patients in these groups who had initial blood pressure measurements that were elevated and currently managed patients for whom complete gender and age data were immediately available in the DCS database. There were more males in the usual-care

**Table 1.** Baseline Clinical Characteristics of Currently Managed and Usual-Care Patients With Initially Elevated Blood Pressure Measurements ( $\geq 130/85$  mmHg)

|                      | Currently Managed | Usual Care    | P    |
|----------------------|-------------------|---------------|------|
| No. of patients      | 565               | 151           | —    |
| Age (y)              | 62.9 $\pm$ 10.6   | 62 $\pm$ 11.8 | .38  |
| Gender (M/F)         | 227/338           | 79/72         | <.01 |
| Initial systolic BP  | 148 $\pm$ 16      | 145 $\pm$ 14  | .06  |
| Initial diastolic BP | 81 $\pm$ 10       | 83 $\pm$ 11   | .02  |

Data are n or means  $\pm$ SD. P value for gender is by chi-square test; others by unpaired 2-tailed t test.

**Figure 2.** Comparison of Follow-up Mean Systolic and Mean Diastolic Blood Pressures in Currently Managed (n = 565) and Usual-care Patients (n = 151)\* with Initially Elevated Blood Pressure Measurements ( $\geq 130/85$  mm Hg).



\*The mean follow-up period between blood pressure measurements was 27  $\pm$  25 weeks in the currently managed patients and 58  $\pm$  30 weeks in the usual-care patients.

group than in the currently managed group. There was no significant difference between the initial systolic blood pressure measurements in the 2 groups, while the diastolic blood pressure in the usual-care group was slightly but significantly higher than that of the currently managed group.

Comparison of follow-up blood pressures in these 2 groups of patients is shown in Figure 2. The follow-up mean systolic and mean diastolic blood pressure measurements in the 565 currently managed patients were both significantly lower than those of the 151 usual-care patients.

**Baseline Characteristics of Long-term Managed and No Longer Managed Patients**

The baseline characteristics of the long-term managed and no longer managed patients are shown in Table 2. There was a small but significant difference in age between the 2 groups, and there were also more females in the long-term managed group. The baseline 1995 utilization rate in the 2 groups was not significantly different.

**Inpatient Utilization in Long-term Managed and No Longer Managed Patients**

Comparison of inpatient utilization in the 386 long-term managed and 287 no longer managed patients is shown in Figure 3. In the long-term managed patients, inpatient utilization in 1997 was significantly lower than inpatient utilization in 1995. In the no longer managed patients, inpatient utilization in 1997 was not significantly different than inpatient utilization in 1995. Inpatient utilization in 1997 in the long-term

managed patients was also significantly lower than inpatient utilization in 1997 in the no longer managed patients.

**Comparison of Screening Rates in Long-term Managed Patients and in No Longer Managed Patients**

Comparison of screening rates in the 386 long-term managed patients with that of the 287 no longer managed patients showed that screening rates for all 3 parameters were significantly higher in the long-term managed patients. Screening rates in the long-term managed patients versus those in the no longer managed patients were, respectively, 84% and 44% ( $P < .001$ ) for GHb, 76% and 43% ( $P < .001$ ) for serum lipids, and 54% and 12% ( $P < .001$ ) for urinary protein.

...DISCUSSION...

Despite provider attempts to optimize diabetes care, suboptimal outcomes have been reported in HMO settings<sup>14</sup> and in private office-based care.<sup>15</sup> Our data suggest that a computer-supported team approach to diabetes care may improve health status and outcomes.

Comparison of apparently more successful screening rates in the DCS currently managed population with those of the usual-care population must include consideration of possible confounding influences. For example, if more patients in usual-care have lower GHb than those referred to DCS, usual-care providers may be less inclined to order screening tests for patients who are already in control. However, the comparison in this study is not of the total number of GHb screenings ordered in each population but of the successful completion of at least one screening test in the preceding year. Therefore, even the patients with GHb levels within goal should have a repeat screening within a reasonable time. As another example, we considered the possibility that more patients in usual

care than those referred to DCS have frank proteinuria, thus the usual-care providers would be less likely to order microalbuminuria screening tests on their patients in general. But as described above, DCS focuses on higher risk and generally more advanced-stage patients who are primarily referred to the system by usual-care providers, so the likelihood that DCS patients would be less likely to have advanced proteinuria than patients remaining in usual care is probably low.

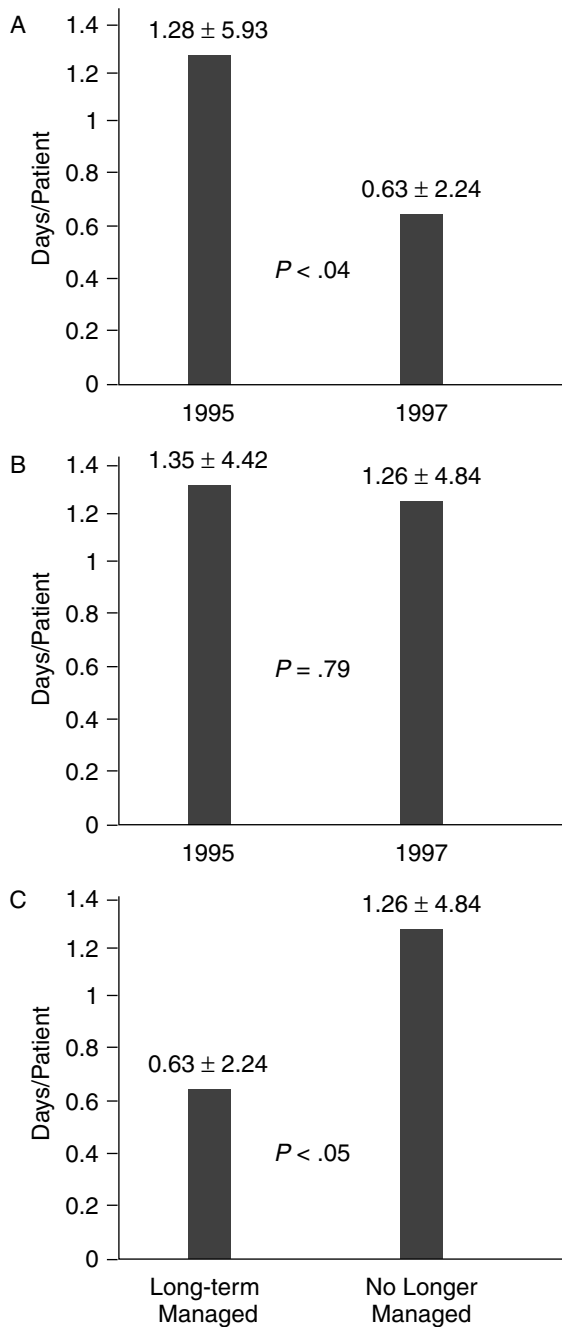
Proving that an intervention decreases inpatient utilization is challenging. The biases in selecting patients based on self-motivation, gender, age, and stage of illness must be considered. In the comparison of inpatient utilization and screening in long-term managed versus no longer managed patients, the long-term managed population had a higher ratio of females and patients were, on average, slightly older. It is possible that some gender and age bias existed for the patients who responded to proactive care efforts directed at screening and reducing inpatient utilization. It may be argued that patients who stayed active in the DCS long-term managed scope of care may also have been self-motivated in a variety of other ways that optimized or improved their own health, ultimately resulting in lower rates of hospitalization and more successful screening status than those of their no-longer-managed, possibly less self-motivated counterparts. Nevertheless, supporting patients who are in a state of mind ready for healthful change—in the action stage of change<sup>16</sup>—is in itself a valid end-point.

**Table 2.** Baseline Clinical Characteristics of Long-term Managed and No Longer Managed Patients

|                                           | Long-term Managed | No Longer Managed | P     |
|-------------------------------------------|-------------------|-------------------|-------|
| No. of patients                           | 386               | 287               | —     |
| Age (y)                                   | 60.5 ± 12.3       | 57 ± 15.9         | < .01 |
| Gender (M/F)                              | 162/224           | 150/137           | < .01 |
| 1995 inpatient utilization (days/patient) | 1.28 ± 5.93       | 1.35 ± 4.42       | .85   |

P value for gender is by chi-square test; others by unpaired 2-tailed t test.

**Figure 3.** Inpatient Utilization Comparison (1997 Versus 1995) Between Long-term Managed Patients (A) and no longer managed patients (B). Inpatient Utilization Comparison (1997 only) Between the Same Long-term Managed Patients and No Longer Managed Patients (C).\*



\*Long-term managed patients, n = 386; no longer managed patients, n = 287.

Additionally, although the long-term managed and no longer managed patients were matched in terms of 1995 utilization, they may not have been matched in terms of motivation, known complications, duration of disease, or coexistent conditions. Therefore, it is possible that the no longer managed patients were actually more difficult to treat and less likely to show the more favorable outcomes found in the long-term managed patients. If future research focusing on health outcomes in better matched subsets proves to have a favorable cost benefit, additional resources may be dedicated to recapturing appropriate no longer managed patients, such as those lost to follow-up. In the current study period, funding was insufficient to pursue re-enrollment of patients even though the data suggest improved inpatient and outpatient outcomes for long-term managed individuals.

Glycemic control improved in both the currently managed patients and the usual-care patients with a recent primary care visit. In both subsets, the expectation is that such an improvement in glycemic control may translate directly into decreased morbidity.<sup>10</sup> Many currently managed DCS patients with improved glycemic control also had improved follow-up blood pressure measurements (data not shown), and our expectation is that this subgroup will have even less subsequent morbidity.<sup>10</sup> There was a strong trend for better GHb control in the usual-care patients. Finding this trend was not surprising as the DCS patients are referred mostly from usual-care providers for out-of-the-ordinary problems, utilization, or phase of illness. The referral process appropriately selects the more challenging patients for DCS oversight. However, the currently managed patients had significantly more follow-up testing when GHb was initially found to be elevated, supporting the hypothesis that computer-based tracking and team management may improve follow-up and focus provider efforts on higher-risk patients.

Blood pressure improvement in the currently managed patients was highly significant. Lack of improvement in hypertensive usual-care patients is not surprising, considering a recent report<sup>17</sup> that physicians in general are not sufficiently aggressive in hypertension management. In our blood pressure comparison, there were more males in the usual care than in the currently managed group. However, separate analysis of the hypertensive individuals in the usual-care group showed no gender-related differences in follow-up blood pressures (data not shown).



Future analysis for cost effectiveness will require longer-term follow-up and inclusion of costs of personnel, laboratory testing, and medications. Nevertheless, specialty or primary care providers can probably effect significant improvements in the care of patient populations when they are supported by computer database tracking, dedicated software, and dedicated ancillary staff. For example, the Cochrane Collaboration meta-analysis showed that well-developed computer-based support for providers results in less patient mortality, better follow-up, and better glycemic control in diabetic patients.<sup>18</sup>

...CONCLUSION...

Management of diabetes carries a great expense in both morbidity and healthcare dollars. The results of this study suggest that computer-supported proactive diabetes team care management may be effective in reducing inpatient utilization, increasing adherence to screening recommendations, increasing follow-up testing in patients with hyperglycemia, improving glycemic control, and improving blood pressure control. Computerized tracking is elemental to effective care management as it leverages the efforts of dedicated team members. Local ownership and administration of the computer software and database maximize computer support.

...ACKNOWLEDGMENTS...

The author gratefully acknowledges the assistance of Fadi N. Hendee, MD, and Paula M. Marchica-Szalla, RN, in preparation of this manuscript and the dedicated patient care given by the Harbor City Diabetes Care System team: Fadi N. Hendee, MD, Kathleen M. O'Neil, RN, Suzanne E. Barrett, PA, Judy L. Kuhlman, RNP, Linda Fahey, RNP, Paula M. Marchica-Szalla, RN, Dorothy J. Lopez, RN, Laura A. Stratton, RN, Joan M. Fredella, PharmD, Sheri Y. Loke, PharmD, Peter D. Benardis, PharmD, Doral C. Maxey, PharmD, Tonya L. Maekawa, PharmD, Elena M. Rodrigues, LVN, Naida J. Harewood, LVN, Tamara A. Holden, LVN, Melissa A. Benedict, CA, Dawn K. Thompson, CA, Dorothy E. McCloud, CA, Rena M. Thunderbird-Brown, CA, Luz M. Medrano, and Sandra L. Lusky.

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