

# Management of Diabetes Mellitus in the Lovelace Health Systems' EPISODES OF CARE® Program

**OBJECTIVE.** To design and implement the Lovelace Diabetes EPISODES OF CARE® program in a managed care setting. This program is intended to address the complex needs of patients with type 2 diabetes mellitus by using specific physician–provider and patient interventions.

**DESIGN.** Observational study.

**SETTING.** Lovelace Health Systems, the second-largest and most fully integrated health care delivery system in New Mexico. The main facility is located in Albuquerque.

**PARTICIPANTS.** Lovelace Health Plan members with type 2 diabetes.

**INTERVENTIONS.** Physician–provider interventions included practice guidelines, medical profile screens, and provider support reports. Patient interventions included diabetes education; improved access to care, with focused diabetes clinic visits and “Diabetes Days”; and reminder systems.

**MAIN OUTCOME MEASURES:** Glycohemoglobin values, dilated eye examination rates, and access to education.

**RESULTS.** Significant lowering of glycohemoglobin values, dilated eye examination rates exceeding benchmark measures, and increases in educational access rates have occurred since the Lovelace Diabetes EPISODES OF CARE® program was implemented.

**CONCLUSIONS.** An integrated health care delivery system with a comprehensive, diabetes disease management program can substantially improve outcomes.

**D**iabetes mellitus is a widespread chronic disease that affects approximately 15 000 000 persons in the United States (1). Approximately \$100 billion, two thirds of which is hospitalization costs, is reported to be spent annually to care for diabetic persons in the United States (2). To meet the challenge of delivering efficient health care that fulfills the complex needs of patients while containing costs for such illnesses as diabetes mellitus, dramatic organizational restructuring is frequently necessary.

In the early 1990s, Lovelace Health Systems in Albuquerque, New Mexico, shifted its structure from a group practice with an HMO to an integrated health care delivery system with a staff model and network delivery system. Since that time, Lovelace Health Systems has developed a population-based health approach based on the following four strategic initiatives:

1. Assessment of health status: implementing disease prevention efforts that use initial health risk assessments, designing patient care according to immediate or future high-risk categories, and creating a plan member database for employers and primary care providers
2. Care management: secondary prevention efforts to preserve and improve patient function for chronically ill patients at the least resource-intensive levels

## CHRONIC DISEASE MANAGEMENT

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3. Disease management: health care delivery services that use optimal processes, resulting in the best clinical, process, patient satisfaction, and cost outcomes for a specific disease

4. Network management: systems that assure consistency and accountability by staff and private physicians who deliver care at remote clinic sites within and outside of Albuquerque.

At the core of the disease management program has been the development of the Lovelace Diabetes EPISODES OF CARE® programs. These programs consist of all services provided to a patient with a discrete diagnosis within a specific period across the continuum of care. They are developed by multidisciplinary teams and encompass quality improvement and quality assurance components, such as practice guidelines, and clinical and process outcome measures.

In 1993, Lovelace Health Systems identified 30 disorders that accounted for approximately 80% of their resource utilization (3). These disorders included many of those found on priority lists of other managed care institutions. Prominent on the Lovelace Health Systems list was diabetes mellitus. The Lovelace Diabetes EPISODES OF CARE® program illustrates how this complex, chronic disease has been addressed by using disease management principles, including specific physician–provider and patient interventions that have influenced specific outcome measures.

### Methods

The Lovelace Diabetes EPISODES OF CARE® program began with the goal that all patients with diabetes in the Lovelace Health Systems would become skilled and responsible diabetes management participants to achieve the best possible outcomes. Provision of high-quality, cost-effective diabetes care has involved equipping physicians and patients for improved glycemic control, thereby reducing acute and chronic complications (4, 5). For these purposes, a multidisciplinary EPISODES OF CARE® team was formed to facilitate collaboration among all professionals who participate in the care of diabetic patients.

With an endocrinologist and a primary care provider as co-leaders, the team consists of diabetes educators, registered dietitians, a pharmacist, a quality consultant, a case manager, an administrator, and patients. The team meetings, which have been held twice monthly since 1994, involve review of the most recent data, review of ongoing programs, and planning for future implementation efforts. To accomplish the team's vision and goals, several physician–provider and patient inter-

ventions have been developed, tested, revised, and implemented by the Lovelace Diabetes EPISODES OF CARE® program.

### Physician–Provider Interventions

#### Practice Guidelines

Strategies for assisting primary care providers with the management of type 2 diabetes mellitus have included the development of clear, concise, and usable practice guidelines. To prepare for guideline development, we first conducted an extensive literature review of current recommendations for diabetes care. The reviewed information, including the standards of care of the American Diabetes Association (6), was condensed into clinical practice guidelines suitable for Lovelace Health Systems. The guidelines address the following key components of diabetes care (7):

- Diagnosis and initial therapy of type 2 diabetes mellitus
- Noninsulin management of type 2 diabetes mellitus
- Insulin management of type 2 diabetes mellitus
- Diabetic nephropathy screening and follow-up
- Angiotensin-converting enzyme inhibitor therapy for proteinuria
- Diabetic retinopathy screening and follow-up
- Diabetic neuropathy screening
- Impotence therapy in diabetic men.

Pertinent indicators from the practice guidelines were then incorporated into provider tools and reports.

The Lovelace Diabetes EPISODES OF CARE® team recently revised the guidelines for the prescription of oral hypoglycemic medication at Lovelace Health Systems because of cost concerns related to medication use. In 1993, it was discovered that 36% of prescribed sulfonylurea medication doses exceeded the maximum effective level for lowering glycohemoglobin values (7). However, this cost issue became less important when these expensive medications were replaced by generic substitutes. The team consequently began to concentrate their efforts on training primary care providers in pharmacoeconomic issues, such as comparing the cost-effectiveness of various oral hypoglycemic agents in lowering glycohemoglobin values by 1%. Results from the revised guidelines and training sessions related to medication use are being carefully monitored.

Traditional educational activities, such as continuing medical education seminars and distribution of reports and guidelines to providers, have been used to implement practice guidelines. However, these activities alone are rarely effective in influencing changes in physician–provider clinical practices (8). Other educational and follow-up techniques are needed to address the various preferences of providers and to assist with guideline implementation. Repeated exposure to practice guidelines in various formats reinforces messages and influences positive adherence. For example, when information is threaded into specific intervention tools and forms developed by the Lovelace Diabetes EPISODES OF CARE® program, guidelines become more accessible and usable (7).

### Medical Profile Screens

Medical profile screens are part of computerized medical records that have been used at Lovelace Health Systems for several years to provide on-line access to patient treatment summaries. Computer terminals in physician offices and patient examination rooms make such information as demographic characteristics, medical histories, laboratory values, radiology reports, and dictated progress notes conveniently accessible to physicians during patient visits. Although medical profile screens were initially designed to assist physicians with decision making, the medical profiles are now used by physicians during appointments for patient education purposes.

The Diabetes Patient Profile Screen has Lovelace Diabetes EPISODES OF CARE® practice guidelines and quality indicators built into its design. The profile consists of the following three main parts:

1. Treatment Summary (Figure 1): an overview screen showing the required tests, the latest results of each of these required tests, the frequency of dilated eye examinations and educational sessions, reminders for angiotensin-converting enzyme inhibitors when microalbuminuria is present, and reminders for foot examinations
2. Diabetes Guideline Synopsis: an outline that includes key components of a focused diabetes clinic visit (see next page); goals for acceptable and tight glycemic control; and complications screening for retinopathy, nephropathy, hyperlipidemia, and hypertension
3. The “Footunlocker Exam”: a summary of the criteria that a primary care provider should follow when examining the feet of diabetic patients, with recommendations for foot inspections every 3 months and annual clinical evaluation of the nerve and vascular status of feet.

#### Profile Screen Example

##### DIABETES CARE – TREATMENT SUMMARY

	Glycohemoglobin	Microalbumin	Eye Exam	Edu	Chol	HDL	LDL	TRG
DUE						X	X	X
3/13/96	9.6 Min.	32 High			150			
9/23/95	9.4 Int.				185			
8/24/95			X					
9/14/94				X				

REMEMBER FOOT EXAM

If Microalbumin is High Consider ACE!

**FIGURE 1. Diabetes Patient Profile Screen. ACE = angiotensin-converting enzyme inhibitor; Chol = cholesterol; Edu = educational session; Eye Exam = dilated eye examination; HDL = high-density lipoprotein cholesterol; Int. = intensive goal for the glycohemoglobin value; LDL = low-density lipoprotein cholesterol; Min. = minimal goal for the glycohemoglobin value; TRG = triglycerides.**

The Diabetes Patient Profile Screen is especially useful for reminding physicians of all monitoring activities involved in diabetes care at the time of appointments for the patient’s other health problems or concerns.

### Diabetes Provider Support Report

The Lovelace Diabetes Provider Support Report is another valuable implementation tool that assists primary care providers with patient monitoring (Figure 2). This quarterly report summarizes a provider’s performance in ordering and giving critical tests, examinations, and education on a periodic basis. It conveniently illustrates on one page how a physician’s performance on these criteria compares with that of his or her Lovelace professional peers and at his or her specific practice site. The bottom portion of the report lists patients who did not receive necessary tests, examinations, or services in the specified period or who had test results above the recommended standards. This provides physicians with meaningful, timely feedback to assist them with patient management and process improvement. The reports are used for quality improvement purposes only and are not linked in any way to physician reimbursements or salaries to avoid implications by inspection or judgment by individual providers.

### Patient Interventions

#### Focused Diabetes Clinic Visits

Clinic visits for diabetic patients are designed to help primary care providers focus on issues related to diabetes care instead of on several other primary care issues.

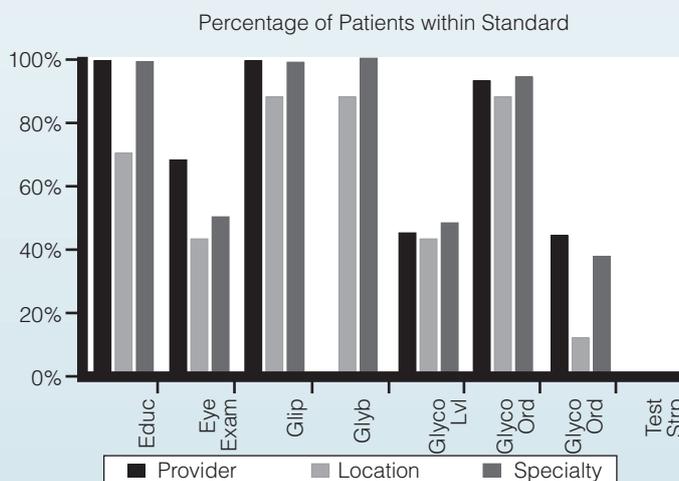
## EOC Provider Summary

## Diabetes

Susan Cure

09/01/96

Criteria	Standards	Total Pts w/ Diabetes	Total Pts Tested	# Within Standard	% Within Standard
Education	Rolling 2 yr	22	22	22	100.00
Eye Exams	Rolling 1 yr	22	15	15	68.18
Glipizide	≤20 mg/day	1	1	1	100.00
Glyburide	≤15 mg/day	0	0	0	0.00
GlycoHb Level	≤10.5%	22	20	9	45.00
GlycolHb Ordered	Within 1 yr	22	20	20	90.91
Microalbumin Ordered	Within 1 yr	22	10	10	45.45
Test Strips	Twice Within 1 yr	22	0	0	0.00



### PATIENTS OUTSIDE OF STANDARDS

Name	MRN	Educ	Eye Exams	Glipizide	Glyburide	Glycohemoglobin Level	Ordered	Microalbumin Ordered	Test Strips
John Doe	XXXXXXXX							N	N
Jane Doe	XXXXXXXX					13.2		N	N
Juan Diaz	XXXXXXXX		N			13.8		N	N
Maria Diaz	XXXXXXXX		N			10.6			N
Bill Jones	XXXXXXXX		N					N	N
Betsy Smith	XXXXXXXX								N

FIGURE 2. Lovelace Diabetes EPISODE OF CARE® (EOC) Provider Summary Report. MRN = medical record number; N = normal. Reprinted with permission from Byrnes JJ. Does disease management really work? The Lovelace Health Systems experience. *Disease Management*. [In press].

The key components of a focused diabetes clinic visit are summarized in the medical profile screen and include the following categories:

- Diet counseling
- Insulin administration and oral agent use
- Exercise and education
- Testing and evaluation of glycemic control
- Complications screening
- Insulin reactions and hypoglycemia
- Assessment of attitudes and barriers to care
- Medical care plan.

### Patient Education

Any health care provider can initiate a referral to the Lovelace Regional Diabetes Education program. All patients are encouraged to participate in comprehensive

educational programs to learn effective self-management skills. The teaching protocol for diabetes education consists of the following nine components:

1. Understanding Diabetes: a description of normal glucose metabolism, the need for insulin, and the signs and symptoms of insulin deficiency
2. Psychological Adjustments: a discussion of normal emotional responses to the diagnosis of diabetes and the willingness to follow appropriate treatments
3. Monitoring Control: a demonstration of testing serum glucose and urine ketones for home self-monitoring with explanations of when and why to record results
4. Nutrition: individualized medical nutrition guidelines developed by a registered dietitian to achieve target glucose levels, glycohemoglobin values, lipid levels, blood pressure, and body weight
5. Insulin Therapy and Dose Adjustments: prescribed doses, concentrations, sources, and types of

insulin; insulin injection techniques; guidelines for dose changes; and possible side effects

6. Oral Hypoglycemic Agents: an explanation of the types and doses of oral glucose-lowering agents and possible drug side effects

7. Insulin Reactions: a video that presents signs, symptoms, and treatment measures for insulin reactions

8. Emergencies: a discussion of appropriate actions for overdose or missed insulin doses

9. Exercise: an individualized exercise program, including the ideal frequency, intensity, and timing of exercise, and advice on avoiding postexercise hypoglycemia.

Diabetes educators travel to primary care sites to provide convenient educational opportunities for the patients instead of scheduling all appointments at the main Lovelace facility.

### **Diabetes Days**

Inconvenient access to health care and education is a major barrier to achieving self-management of diabetes and glycemic control. To overcome this obstacle, Lovelace Diabetes Days, held quarterly at two pilot clinics, provide “one-stop shopping” for patients with type 2 diabetes. The primary care providers at the pilot clinics identify diabetic patients who have not made routine appointments and mail invitations to these patients. The special family practice diabetes clinics consist of comprehensive 2.5-hour programs that include individual patient visits with physicians, blood tests, dilated eye examinations, diabetes education classes, and group sessions with other patients with type 2 diabetes. Diabetes Day attendance has ranged from 10 to 70 patients depending on the size of the pilot clinic. Patient surveys have demonstrated that the strongest attendance motivations have been to prevent amputations and blindness.

### **Reminder Systems**

A primary goal of the Lovelace Diabetes EPISODES OF CARE<sup>®</sup> program has been to detect and treat retinopathy in the early stages of development to prevent more serious eye damage. As part of the population-based health approach, in addition to providing routine appointments and assessing treatment plan adherence, primary care providers mail eye examination reminder letters annually to patients who have had no annual eye examinations. Pilot projects involving eye department personnel were tested; these projects involved directly calling patients who were overdue for their eye examinations and who required routine appointments.

## **Results**

The Health Plan Employer Data Information Set (HEDIS) diabetic population is between 31 and 64 years of age and includes Lovelace Health Plan members who have been continuously enrolled for the previous year. Among several outcome measures, glycohemoglobin values, dilated eye examination rates, and educational access rates have been selected to demonstrate the effectiveness of interventions and the value of the Lovelace Diabetes Episodes of Care program.

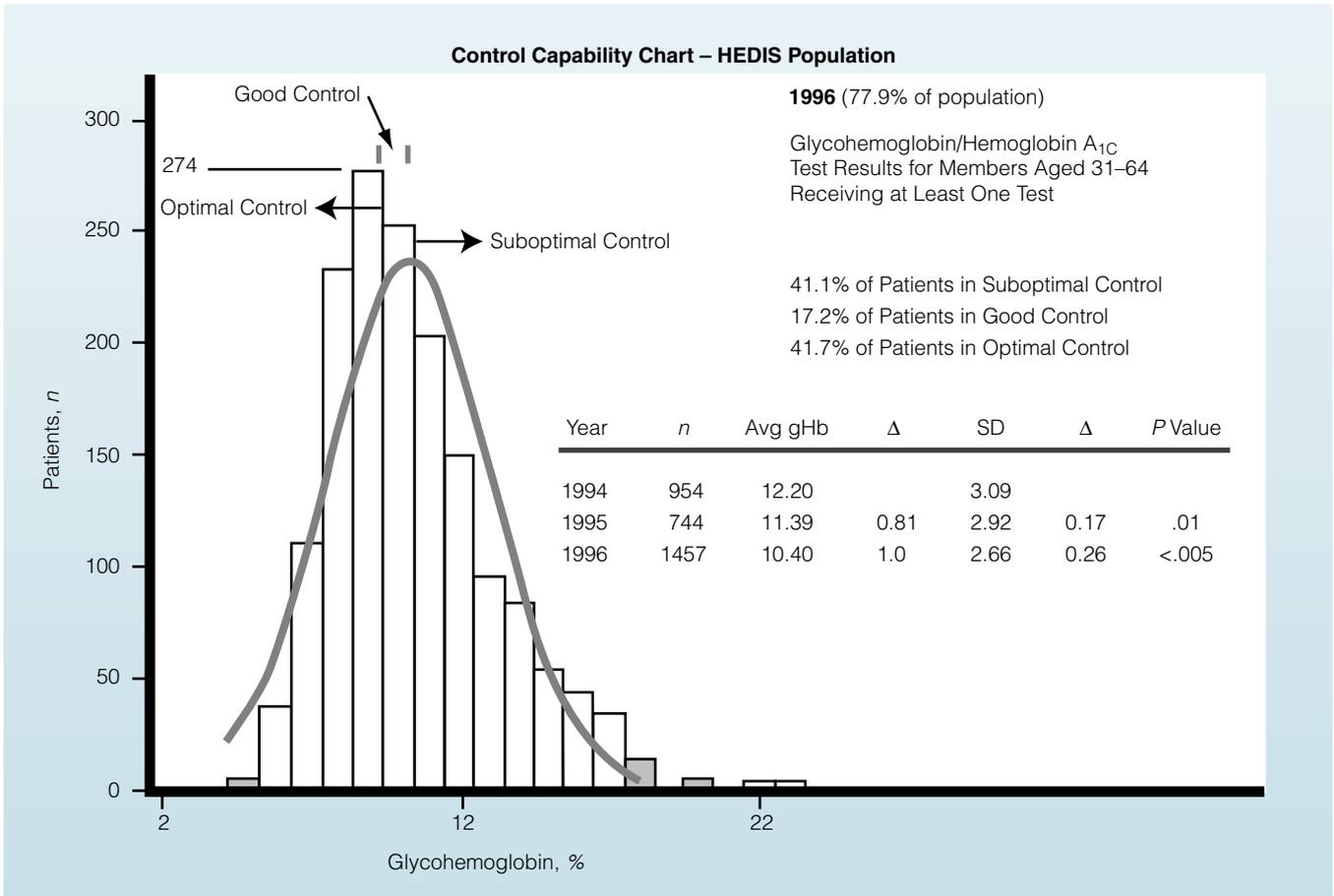
### **Glycohemoglobin Values**

Since 1994, the glycohemoglobin values of adult diabetic patients at Lovelace Health Systems have been carefully tracked, starting with measurements for the HEDIS diabetic population. Total glycohemoglobin values (normal range, 4.7% to 8.1%) are measured in the Lovelace laboratory (IMX, Abbott Diagnostics, North Chicago, Illinois), whereas hemoglobin A<sub>1c</sub> values (normal range, 5.0% to 6.2%) are measured in the Department of Endocrinology/Diabetes (DCA 2000, Bayer, Elkhart, Indiana). All results are converted to total glycohemoglobin values for Lovelace Information Systems measurement uniformity.

For the HEDIS population, mean glycohemoglobin values decreased from 12.2%±3.09% in 1994 to 11.39%±2.92% in 1995 ( $P<0.01$ ) and 10.4%±2.66% in 1996 ( $P<0.005$ ) (Figure 3). Glycohemoglobin values in the 1996 HEDIS population ( $n=1457$ ) and the total known diabetic population ( $n=3015$ ) were 10.4%±2.66% and 9.9%±2.44%, respectively, and did not differ significantly. In addition, the SDs associated with decreases in average glycohemoglobin values have decreased and the percentage of patients with good or optimal control of their condition has increased each year. In 1996, 77.9% of the HEDIS population and 89.9% of the total diagnosed diabetic population had at least one glycohemoglobin test result (Figure 3).

### **Dilated Eye Examinations**

Dilated eye examination rates for the HEDIS population have improved from 47.3% in 1994 to 52.6% in 1995 to 53.2% in 1996 (Figure 4). Of the patients receiving reminder letters, 17% to 20% subsequently had dilated eye examinations. This was considered to be a good response to an unsolicited mailing but not a substantial improvement in eye examination rates. However, these annual eye examination rates exceed all published benchmarks, such as those advanced by the National Committee for Quality Assurance (47%), Towers-Perrin Health Maintenance Organization (43.6%), and Towers-Perrin Point of Service (34.9%). Of note, the



**FIGURE 3. Glycohemoglobin/hemoglobin A<sub>1c</sub> test results for the Health Plan Employer Data Information Set (HEDIS) population in 1996. Avg gHb = average glycohemoglobin.**

examination rate in the Medicare managed care population was higher than that in the commercial population.

### Education Access

The proportion of the HEDIS population that received diabetes education has also been assessed. Since the “carving in” of the diabetes education program, the percentage of patients seen by the diabetes educators has increased from 52% in 1993 to 78% in 1995 (Unpublished data).

### Discussion

Diabetes mellitus is an illness that lends itself uniquely to disease management. It is a chronic condition that is best treated through a collaborative effort between the patient and the health care system. Primary care providers deliver and will continue to deliver care to most diabetic patients. The role of a disease management program is to support these providers with intervention tools and feedback about the health status of individual patients in their diabetic patient panels.

We believe that the combination of multiple interventions implemented by the Lovelace Diabetes

EPISODES OF CARE<sup>®</sup> program has influenced the substantially decreased average glycohemoglobin values and variability of glycohemoglobin values and increased the percentage of Lovelace Health Systems diabetic patients with good and optimal glycemic control. Because the program instituted many interventions simultaneously, it is difficult to detect the individual contributions of each intervention. It is also difficult to evaluate the effectiveness and efficiency of a disease management program by using the gold standard of randomized, controlled clinical trials because of the use of multiple interventions across the continuum of care. Discrete or surrogate outcomes, such as measurement of glycohemoglobin values, monitoring of longitudinal changes of these values, and comparison of these values with external benchmarks, are necessary and useful measures to assess the effectiveness of diabetes disease management programs.

Several important lessons have emerged regarding the monitoring of dilated eye examination rates. When the rates for the HEDIS population were initially measured, the results were disappointing. After evaluation of possible reasons for the low eye examination rates, it was

determined, on the basis of patients who were individually tracked, that coding for eye examinations varies widely from practitioner to practitioner in the eye department. Several interventions have increased the eye examination rates, but not by as much as was hoped. One important barrier identified in the commercial managed care population is the difficulty of getting time away from work for “yet another examination.” Several system redesigns are being developed to overcome this barrier.

The improvements in clinical outcome measures, such as center-wide glycohemoglobin values, can partially be attributed to increased referrals to the Lovelace Regional Diabetes Education program. Even though this has increased utilization of diabetes educators, no additional staff has been added because of concomitant improvements in the education program.

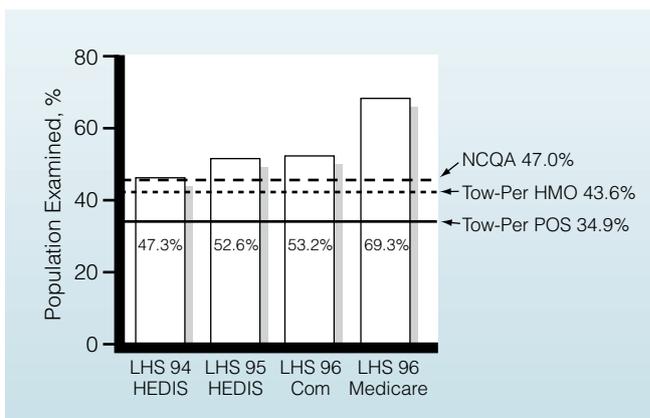
Team and systems approaches must include members from the primary care and endocrinology departments and any available diabetes educators. The diabetes multidisciplinary team needs the support of the health care delivery information systems and the health plan to provide data that can help identify areas of need and to document successes. The population with diabetes must be identified and profiled, and the status of diabetic patients must be reported to the primary care providers. Patients must receive consistent, comprehensible information so that they can help themselves in self-management techniques. The disease management team must work with the delivery system and the health plan to optimize the use of preventive measures and the cost-effective prescribing of new medications. Monitoring these performance measures and feeding this information back to providers will improve the health of the population.

## Conclusions

The Lovelace Diabetes EPISODES OF CARE<sup>®</sup> program was intended to provide high-quality diabetes care that would improve glycemic control for its patient population. Measurement of glycohemoglobin values, rates of dilated eye examination, and rates of educational access have improved the outcomes for diabetic patients. An integrated health care delivery system with a comprehensive diabetes disease management program, such as the Lovelace Diabetes EPISODES OF CARE<sup>®</sup> program, can substantially improve these outcome measures.

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**FIGURE 4. Comparison of Lovelace Health Systems' rates of diabetic dilated eye examination with those of three well-known benchmarks. Com = Commercial; HEDIS = Health Plan Employer Data Information Set; LHS = Lovelace Health Systems; NCQA = National Committee for Quality Assurance benchmark; Tow-Per HMO = Towers and Perrin HMO benchmark; Tow-Per POS = Towers and Perrin Point of Service benchmark.**

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