Special Topics in Diabetes

Evaluation of Diabetes Patient-education Programs

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SUMMARY

Patient education is generally regarded as an essential component of the clinical management of diabetes. However, analysis of the role of patient education in diabetes control has been limited. Formal patient teaching programs at several medical centers range in operation from merely providing knowledge about diabetes to integrating patient education into the chronic health care system. Improvements in knowledge about diabetes have been demonstrated with patients who have been given questionnaires before and after instruction, but changes in diabetes control and other clinical parameters have not necessarily followed. In those cases in which patient education has been a part of a comprehensive improvement in the entire clinical management of diabetes, significant decreases in rates of hospitalization and acute complications have occurred. Guidelines for future evaluations are discussed. DIABETES *26*:61-64, January, 1977.

Patient education has been generally accepted as a vitally important component of the clinical management of dibetic patients, but objective evaluation of its role and effectiveness has been limited. In order to manage effectively on a day-to-day basis at home, patients should have a firm understanding of diabetes. This includes knowledge about the pathophysiology of diabetes, the technique of insulin injection, urine testing, prevention of ketoacidosis, prevention and management of hypoglycemia, foot care and personal hygiene, and diet.[1,2]

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I *Background of Diabetes Patient-education Programs*

The technique of providing education to patients has varied from piecemeal instruction by physicians, nurses, and dietitians in physicians' offices, hospitals, clinics, and health departments to comprehensive patient-education programs. Many large clinics and hospitals have provided a systematic education program for diabetic patients for several years. More recently, diabetes-education programs have been developed in several communities in response to local needs and the particular resources available to meet those needs.[3,4] Most of these programs operate through a team approach in which physicians, nurses, dietitians, and other health professionals collaborate in a formal curriculum. Examples of some of the organized programs include the Joslin Clinic in Boston, Massachusetts; the Virginia Mason Clinic in Seattle, Washington; the Diabetes Education Center in Minneapolis, Minnesota; the Diabetes Education Program in Nashville, Tennessee; the Diabetes Day Care Center at Grady Memorial Hospital in Atlanta, Georgia; instruction programs at Los Angeles County Hospital and other large municipal hospitals; a network of diabetes-teaching nurses throughout the state of North Carolina; and numerous other clinics and hospitals, whose programs resemble or vary from the above-noted schemes.

Some of these programs, such as the ones in Minneapolis and Nashville, are purely educational in that the educating team presents information about diabetes to the patient and his family but does not provide ongoing clinical management. Long-term clinical care remains within the scope of the patient's personal physician. In contrast, at some clinics and hospi-

tals, the educating staff also participates in the patient's long-term care—that is, both education and clinical management are performed by the same persons.

The Diabetes Day Care Center at Grady Memorial Hospital in Atlanta has been designed to serve the large population of patients, most of whom are in low economic groups, who receive their medical care at the county hospital. In this program a team of health professionals provides intensive education and comprehensive reëvaluation for diabetic patients in a single day. The one-day visit to the Diabetes Day Care Center is a supplement to the regularly scheduled Diabetes Clinic visits. During a typical day-long visit to this center, the patient eats two meals under the supervision of a dietitian, administers his insulin under nursing supervision, and has three plasma-glucose determinations. The clinical history is reviewed, physical examination is performed by a physician or a nurse, and individual counseling is provided by a staff nurse and a dietitian. Teaching is both on an individual basis and through group use of audio-visual aids.

At Los Angeles County Hospital the program includes intensive instruction to hospitalized patients by nurses; a 24-hour-a-day answering service to deal with questions about diabetes whenever they occur, in an effort to eliminate unnecessary visits to the emergency room; and a walk-in clinic that also operates 24 hours a day. Therefore, all programs provide information to patients, but the educational systems vary from the strict provision of knowledge without continuing care to the inclusion of education in the setting of comprehensive ongoing clinical care.

II *Techniques of Evaluation and Their Limitations*

The educational process can be evaluated in many ways, including questionnaire scores that measure changes in knowledge, measures of day-to-day control, such as blood and urine glucose values, numbers of episodes of ketoacidosis, indices of patients' performance at home, frequency of hospitalization, and costs of health care. Williams and associates measured patients' knowledge with questionnaires, assessed patient performance in day-to-day management systems by observing their activities at home, and evaluated their control by criteria that included measurement of urine and blood sugars, body weight, and frequency of hypoglycemic reactions and ketoacidosis.[5-7] They found that poor adherence to dietary instruction and widespread errors in insulin administration, foot care, and urine testing were the rule rather than the exception. Their studies showed that indices of knowledge correlated well with indices of performance, but knowledge did not necessarily correlate with the degree of day-to-day control.

At the Diabetes Education Center in Minneapolis, Minnesota, Etzwiler and associates have shown that patients' scores on questionnaires improved significantly after completion of a week-long intensive course in diabetes self-management. When a third quiz was given at least three months later, the improvement in knowledge was retained. However, these workers were unable to demonstrate improvement in metabolic control in these same patients.[8]

A standardized 40-item questionnaire, given before and after instruction, showed similar findings in a program developed at Vanderbilt Medical Center in Nashville. The scores on the second test showed a mean increase of nine correct answers over the initial test, or a mean improvement of 23.7 per cent. The same questionnaire was used to evaluate diabetes-education programs in collaborating hospitals in Chattanooga and Oak Ridge, Tennessee, and Hopkinsville, Kentucky. The educational materials and the format used in these smaller hospitals were similar to those used in the Vanderbilt program, but the duration of the course was usually shorter. The scores obtained both before and after instruction were virtually identical to those obtained at Vanderbilt, regardless of whether the course material was presented over two, three, or five days. This experience suggested that the observed improvement in knowledge was more closely related to the content and format of the educational program than to the amount of time actually spent in formal teaching sessions.

A questionnaire designed to measure knowledge is administered at the Diabetes Day Care Center in Atlanta, Georgia, both at the beginning of the day and again at the end of the day. The questionnaire results show a striking similarity to those obtained at Minneapolis and Nashville. The knowledge scores (for a total of 32 questions) increased from an average of 17.5 correct answers beforehand to 23.6 correct answers after instruction. Correlation of the test scores with the patients' compliance, as reflected by weight loss in the obese and/or return of plasma-glucose levels to normal, has shown no consistent trends.

When parameters other than knowledge are used for evaluation, one notes that the frequency of admissions to Grady Memorial Hospital for diabetic ketoacidosis has decreased markedly in the past seven years (from over 500 cases per year to less than 100 per year). However, the decline in the rate of admissions for diabetic coma actually antedated the establishment

of the Diabetes Day Care Center, so it was probably related to over-all improvement in the clinical management of diabetic patients, of which the establishment of the education program at the Diabetes Day Care Center was only a part. Likewise, during the first year of the multifaceted program that improved comprehensive care for the diabetic patients at Los Angeles County Hospital, the diabetes-related emergency-room visits were almost eliminated, resulting in a saving of almost $100,000 per year.[9] The number of hospital admissions for diabetic keoacidosis-coma and for severe hypoglycemic reactions was sharply reduced, and the number of inpatient admissions to the Diabetic Service dropped to less than half the previous rate, a savings of over 1.7 million dollars yearly in hospital costs. In analyzing this improvement, however, it is not possible to separate the effects of the patient education program from other improvements in the health-care system, such as the 24-hour answering service and the walk-in clinic.

III *Guidelines for Evaluating Patient-education Programs*

The patients being educated should be classified for several characteristics. For example, results obtained from educating diabetic children should be analyzed separately from those of adults. Newly diagnosed patients must be distinguished from those with known long-term diabetes. Adult patients who acquired diabetes in childhood must be differentiated from those who developed diabetes as an adult. Insulin-dependent patients must be considered separately from those whose disease is not strictly dependent on insulin for avoidance of ketoacidosis. The patients' social and educational background must be noted.

The type of data that can be analyzed depends on the patient-care setting. Therefore, it is necessary to distinguish between pure patient education and education integrated into the patient-care system. Pure patient education consists of providing the proper information in appropriate context and making sure that it is assimilated by the patient. The knowledge gained by the patient can be measured. If this type of program operates independently of the system for ongoing patient care, such as at the Minneapolis Diabetes Education Center and the Nashville Diabetes Education Program, more complex evaluations of performance and day-to-day control status are extremely difficult. In fact, knowledge change may be the only measurable data from a program in this setting.

If one provides an ongoing system for giving information at the time it is needed by the patient, e.g., the 24-hour telephone answering service at Los Angeles County Hospital, then the patient-education program begins to merge into the system for care of the patient with chronic disease. Evaluation of this system solely in terms of improved knowledge would be insufficient, because immediate changes in behavior can be anticipated, particularly if the patient is having immediate difficulties. If a patient takes refresher courses at yearly intervals and undergoes periodic comprehensive reëvaluations, as typified by the Grady Memorial Hospital Diabetes Day-Care Center, then patient education and patient care become virtually inseparable. In these situations, data that measure the patient's knowledge would be only a starting point; more complex criteria, such as performance at home, day-to-day control status, days missed from work, etc. should be sought.

Comprehensive clinical management for groups of diabetic patients, including patient education, continuous ambulatory care, and inpatient care when needed, all performed by a coordinated health-care team of physicians, nurses, dietitians, and other professionals, provides the opportunity to develop an on-going, individualized health-education program purposely integrated into the continuing health care of each patient. Evaluation of this type of system could well include measurements relating to the entire population being served, such as rates of hospital utilization and total health-care costs.

Measurement of the patients' knowledge should be considered a starting point for evaluating an educational program. Gains in knowledge do not really pay dividends, however, until patients can apply knowledge in day-to-day management and improve some of the aspects of lives compromised by diabetes. In future studies, then, additional clinical, social, or economic parameters must also be assessed. In addition to measuring knowledge gained and retained, one can measure indices of performance in following a prescribed regimen (compliance), metabolic indicators of diabetic control, frequency of acute complications and hospitalizations, rate of development of chronic complications, rate of school and work absenteeism, economic productivity, health-care costs, or any combination of these criteria.

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