

# Case Study: A Patient With Uncontrolled Type 2 Diabetes and Complex Comorbidities Whose Diabetes Care Is Managed by an Advanced Practice Nurse

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The specialized role of nursing in the care and education of people with diabetes has been in existence for more than 30 years. Diabetes education carried out by nurses has moved beyond the hospital bedside into a variety of health care settings. Among the disciplines involved in diabetes education, nursing has played a pivotal role in the diabetes team management concept. This was well illustrated in the Diabetes Control and Complications Trial (DCCT) by the effectiveness of nurse managers in coordinating and delivering diabetes self-management education. These nurse managers not only performed administrative tasks crucial to the outcomes of the DCCT, but also participated directly in patient care.<sup>1</sup>

The emergence and subsequent growth of advanced practice in nursing during the past 20 years has expanded the direct care component, incorporating aspects of both nursing and medical care while maintaining the teaching and counseling roles. Both the clinical nurse specialist (CNS) and nurse practitioner (NP) models, when applied to chronic disease management, create enhanced patient-provider relationships in which self-care education and counseling is provided within the context of disease state management. Clement<sup>2</sup> commented in a review of diabetes self-management education issues that unless ongoing management is part of an education program, knowledge may increase but most clinical outcomes only minimally improve. Advanced practice nurses by the very nature of their scope of practice effectively combine both education and management into their delivery of care.

Operating beyond the role of educator, advanced practice nurses holistically assess patients' needs with the understanding of patients' primary role in the improvement and maintenance of their own health and wellness. In conducting assessments, advanced practice nurses carefully explore patients' medical history and perform focused physical exams. At the completion of assessments, advanced practice nurses, in conjunction with patients, identify management goals and determine appropriate plans of care. A review of patients' self-care management skills and application/adaptation to lifestyle is incorporated in initial histories, physical exams, and plans of care.

Many advanced practice nurses (NPs, CNSs, nurse midwives, and nurse anesthetists) may prescribe and adjust medication through prescriptive authority granted to them by their state nursing regulatory body. Currently, all 50 states have some form of prescriptive authority for advanced practice nurses.<sup>3</sup> The ability to prescribe and adjust medication is a valuable asset in caring for individuals with diabetes. It is a crucial component in the care of people with type 1 diabetes, and it becomes increasingly important in the care of patients with type 2 diabetes who have a constellation of comorbidities, all of which must be managed for successful disease outcomes.

Many studies have documented the effectiveness of advanced practice nurses in managing common primary care issues.<sup>4</sup> NP care has been associated with a high level of satisfaction among health services consumers. In diabetes, the role of advanced practice nurses has significantly contributed to improved outcomes in the management of type 2 diabetes,<sup>5</sup> in specialized

diabetes foot care programs,<sup>6</sup> in the management of diabetes in pregnancy,<sup>7</sup> and in the care of pediatric type 1 diabetic patients and their parents.<sup>8,9</sup> Furthermore, NPs have also been effective providers of diabetes care among disadvantaged urban African-American patients.<sup>10</sup> Primary management of these patients by NPs led to improved metabolic control regardless of whether weight loss was achieved.

The following case study illustrates the clinical role of advanced practice nurses in the management of a patient with type 2 diabetes.

### Case Presentation

A.B. is a retired 69-year-old man with a 5-year history of type 2 diabetes. Although he was diagnosed in 1997, he had symptoms indicating hyperglycemia for 2 years before diagnosis. He had fasting blood glucose records indicating values of 118–127 mg/dl, which were described to him as indicative of “borderline diabetes.” He also remembered past episodes of nocturia associated with large pasta meals and Italian pastries. At the time of initial diagnosis, he was advised to lose weight (“at least 10 lb.”), but no further action was taken.

Referred by his family physician to the diabetes specialty clinic, A.B. presents with recent weight gain, suboptimal diabetes control, and foot pain. He has been trying to lose weight and increase his exercise for the past 6 months without success. He had been started on glyburide (Diabeta), 2.5 mg every morning, but had stopped taking it because of dizziness, often accompanied by sweating and a feeling of mild agitation, in the late afternoon.

A.B. also takes atorvastatin (Lipitor), 10 mg daily, for hypercholesterolemia (elevated LDL cholesterol, low HDL cholesterol, and elevated triglycerides). He has tolerated this medication and adheres to the daily schedule. During the past 6 months, he has also taken chromium picolinate, gymnema sylvestre, and a “pancreas elixir” in an attempt to improve his diabetes control. He stopped these supplements when he did not see any positive results.

He does not test his blood glucose levels at home and expresses doubt that this procedure would help him improve his diabetes control. “What would knowing the numbers do for me?” he asks. “The doctor already knows the sugars are high.”

A.B. states that he has “never been sick a day in my life.” He recently sold his business and has become very active in a variety of volunteer organizations. He lives with his wife of 48 years and has two married children. Although both his mother and father had type 2 diabetes, A.B. has limited knowledge regarding diabetes self-care management and states that he does not understand why he has diabetes since he never eats sugar. In the past, his wife has encouraged him to treat his diabetes with herbal remedies and weight-loss supplements, and she frequently scans the Internet for the latest diabetes remedies.

During the past year, A.B. has gained 22 lb. Since retiring, he has been more physically active, playing golf once a week and gardening, but he has been unable to lose more than 2–3 lb. He has never seen a dietitian and has not been instructed in self-monitoring of blood glucose (SMBG).

A.B.’s diet history reveals excessive carbohydrate intake in the form of bread and pasta. His normal dinners consist of 2 cups of cooked pasta with homemade sauce and three to four slices of Italian bread. During the day, he often has “a slice or two” of bread with butter or olive oil. He also eats eight to ten pieces of fresh fruit per day at meals and as snacks. He prefers chicken and fish, but it is usually served with a tomato or cream sauce accompanied by pasta. His wife has offered to make him plain grilled meats, but he finds them “tasteless.” He drinks 8 oz. of red wine with dinner each evening. He stopped smoking more than 10 years ago, he reports, “when the cost of cigarettes topped a buck-fifty.”

The medical documents that A.B. brings to this appointment indicate that his hemoglobin A<sub>1c</sub> (A1C) has never been <8%. His blood pressure has been measured at 150/70, 148/92, and 166/88 mmHg on separate occasions during the past year at the local senior center screening clinic. Although he was told that his blood pressure was “up a little,” he was not aware of the need to keep his blood pressure ≤130/80 mmHg for both cardiovascular and renal health.<sup>11</sup>

A.B. has never had a foot exam as part of his primary care exams, nor has he been instructed in preventive foot care. However, his medical records also indicate that he has had

no surgeries or hospitalizations, his immunizations are up to date, and, in general, he has been remarkably healthy for many years.

### Physical Exam

A physical examination reveals the following:

- Weight: 178 lb; height: 5'2"; body mass index (BMI): 32.6 kg/m<sup>2</sup>
- Fasting capillary glucose: 166 mg/dl
- Blood pressure: lying, right arm 154/96 mmHg; sitting, right arm 140/90 mmHg
- Pulse: 88 bpm; respirations 20 per minute
- Eyes: corrective lenses, pupils equal and reactive to light and accommodation, Fundi-clear, no arteriovenous nicking, no retinopathy
- Thyroid: nonpalpable
- Lungs: clear to auscultation
- Heart: Rate and rhythm regular, no murmurs or gallops
- Vascular assessment: no carotid bruits; femoral, popliteal, and dorsalis pedis pulses 2+ bilaterally
- Neurological assessment: diminished vibratory sense to the forefoot, absent ankle reflexes, monofilament (5.07 Semmes-Weinstein) felt only above the ankle

### Lab Results

Results of laboratory tests (drawn 5 days before the office visit) are as follows:

- Glucose (fasting): 178 mg/dl (normal range: 65–109 mg/dl)
- Creatinine: 1.0 mg/dl (normal range: 0.5–1.4 mg/dl)
- Blood urea nitrogen: 18 mg/dl (normal range: 7–30 mg/dl)
- Sodium: 141 mg/dl (normal range: 135–146 mg/dl)
- Potassium: 4.3 mg/dl (normal range: 3.5–5.3 mg/dl)
- Lipid panel
  - Total cholesterol: 162 mg/dl (normal: <200 mg/dl)
  - HDL cholesterol: 43 mg/dl (normal: ≥40 mg/dl)
  - LDL cholesterol (calculated): 84 mg/dl (normal: <100 mg/dl)
  - Triglycerides: 177 mg/dl (normal: <150 mg/dl)
  - Cholesterol-to-HDL ratio: 3.8 (normal: <5.0)
- AST: 14 IU/l (normal: 0–40 IU/l)
- ALT: 19 IU/l (normal: 5–40 IU/l)
- Alkaline phosphatase: 56 IU/l (normal: 35–125 IU/l)
- A1C: 8.1% (normal: 4–6%)
- Urine microalbumin: 45 mg (normal: <30 mg)

## Assessment

Based on A.B.'s medical history, records, physical exam, and lab results, he is assessed as follows:

- Uncontrolled type 2 diabetes (A1C >7%)
- Obesity (BMI 32.4 kg/m<sup>2</sup>)
- Hyperlipidemia (controlled with atorvastatin)
- Peripheral neuropathy (distal and symmetrical by exam)
- Hypertension (by previous chart data and exam)
- Elevated urine microalbumin level
- Self-care management/lifestyle deficits
  - Limited exercise
  - High carbohydrate intake
  - No SMBG program
  - Poor understanding of diabetes

## Discussion

A.B. presented with uncontrolled type 2 diabetes and a complex set of comorbidities, all of which needed treatment. The first task of the NP who provided his care was to select the most pressing health care issues and prioritize his medical care to address them. Although A.B. stated that his need to lose weight was his chief reason for seeking diabetes specialty care, his elevated glucose levels and his hypertension also needed to be addressed at the initial visit.

The patient and his wife agreed that a referral to a dietitian was their first priority. A.B. acknowledged that he had little dietary information to help him achieve weight loss and that his current weight was unhealthy and "embarrassing." He recognized that his glucose control was affected by large portions of bread and pasta and agreed to start improving dietary control by reducing his portion size by one-third during the week before his dietary consultation. Weight loss would also be an important first step in reducing his blood pressure.

The NP contacted the registered dietitian (RD) by telephone and referred the patient for a medical nutrition therapy assessment with a focus on weight loss and improved diabetes control. A.B.'s appointment was scheduled for the following week. The RD requested that during the intervening week, the patient keep a food journal recording his food intake at meals and snacks. She asked that the patient also try to estimate portion sizes.

Although his physical activity had increased since his retirement, it was fairly sporadic and weather-depen-

dent. After further discussion, he realized that a week or more would often pass without any significant form of exercise and that most of his exercise was seasonal. Whatever weight he had lost during the summer was regained in the winter, when he was again quite sedentary.

A.B.'s wife suggested that the two of them could walk each morning after breakfast. She also felt that a treadmill at home would be the best solution for getting sufficient exercise in inclement weather. After a short discussion about the positive effect exercise can have on glucose control, the patient and his wife agreed to walk 15–20 minutes each day between 9:00 and 10:00 a.m.

A first-line medication for this patient had to be targeted to improving glucose control without contributing to weight gain. Thiazolidinediones (i.e., rosiglitazone [Avandia] or pioglitazone [Actos]) effectively address insulin resistance but have been associated with weight gain.<sup>12</sup> A sulfonylurea or meglitinide (i.e., repaglinide [Prandin]) can reduce postprandial elevations caused by increased carbohydrate intake, but they are also associated with some weight gain.<sup>12</sup> When glyburide was previously prescribed, the patient exhibited signs and symptoms of hypoglycemia (unconfirmed by SMBG).  $\alpha$ -Glucosidase inhibitors (i.e., acarbose [Precose]) can help with postprandial hyperglycemia rise by blunting the effect of the entry of carbohydrate-related glucose into the system. However, acarbose requires slow titration, has multiple gastrointestinal (GI) side effects, and reduces A1C by only 0.5–0.9%.<sup>13</sup> Acarbose may be considered as a second-line therapy for A.B. but would not fully address his elevated A1C results. Metformin (Glucophage), which reduces hepatic glucose production and improves insulin resistance, is not associated with hypoglycemia and can lower A1C results by 1%. Although GI side effects can occur, they are usually self-limiting and can be further reduced by slow titration to dose efficacy.<sup>14</sup>

After reviewing these options and discussing the need for improved glycemic control, the NP prescribed metformin, 500 mg twice a day. Possible GI side effects and the need to avoid alcohol were of concern to A.B., but he agreed that medication was necessary and that metformin was his best option. The NP advised him to take the medication with food

to reduce GI side effects.

The NP also discussed with the patient a titration schedule that increased the dosage to 1,000 mg twice a day over a 4-week period. She wrote out this plan, including a date and time for telephone contact and medication evaluation, and gave it to the patient.

During the visit, A.B. and his wife learned to use a glucose meter that features a simple two-step procedure. The patient agreed to use the meter twice a day, at breakfast and dinner, while the metformin dose was being titrated. He understood the need for glucose readings to guide the choice of medication and to evaluate the effects of his dietary changes, but he felt that it would not be "a forever thing."

The NP reviewed glycemic goals with the patient and his wife and assisted them in deciding on initial short-term goals for weight loss, exercise, and medication. Glucose monitoring would serve as a guide and assist the patient in modifying his lifestyle.

A.B. drew the line at starting an antihypertensive medication—the angiotensin-converting enzyme (ACE) inhibitor enalapril (Vasotec), 5 mg daily. He stated that one new medication at a time was enough and that "too many medications would make a sick man out of me." His perception of the state of his health as being represented by the number of medications prescribed for him gave the advanced practice nurse an important insight into the patient's health belief system. The patient's wife also believed that a "natural solution" was better than medication for treating blood pressure.

Although the use of an ACE inhibitor was indicated both by the level of hypertension and by the presence of microalbuminuria, the decision to wait until the next office visit to further evaluate the need for antihypertensive medication afforded the patient and his wife time to consider the importance of adding this pharmacotherapy. They were quite willing to read any materials that addressed the prevention of diabetes complications. However, both the patient and his wife voiced a strong desire to focus their energies on changes in food and physical activity. The NP expressed support for their decision. Because A.B. was obese, weight loss would be beneficial for many of his health issues.

Because he has a sedentary lifestyle, is >35 years old, has hypertension and peripheral neuropathy, and is being treated for hypercholesterolemia, the NP performed an electrocardiogram in the office and referred the patient for an exercise tolerance test.<sup>11</sup> In doing this, the NP acknowledged and respected the mutually set goals, but also provided appropriate pre-exercise screening for the patient's protection and safety.

In her role as diabetes educator, the NP taught A.B. and his wife the importance of foot care, demonstrating to the patient his inability to feel the light touch of the monofilament. She explained that the loss of protective sensation from peripheral neuropathy means that he will need to be more vigilant in checking his feet for any skin lesions caused by poorly fitting footwear worn during exercise.

At the conclusion of the visit, the NP assured A.B. that she would share the plan of care they had developed with his primary care physician, collaborating with him and discussing the findings of any diagnostic tests and procedures. She would also work in partnership with the RD to reinforce medical nutrition therapies and improve his glucose control. In this way, the NP would facilitate the continuity of care and keep vital pathways of communication open.

### Summary

Advanced practice nurses are ideally suited to play an integral role in the education and medical management of people with diabetes.<sup>15</sup> The combination of clinical skills and expertise

in teaching and counseling enhances the delivery of care in a manner that is both cost-reducing and effective. Inherent in the role of advanced practice nurses is the understanding of shared responsibility for health care outcomes. This partnering of nurse with patient not only improves care but strengthens the patient's role as self-manager.

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