

# Improving Medical Adherence in Women With Gestational Diabetes Through Self-Efficacy

Michael S. Cardwell, MD

**M**edical adherence is an important goal in the management of diseases and conditions that necessitates complex therapeutic regimens.<sup>1</sup> Pregnant women with gestational diabetes mellitus (GDM) are among the more challenging patients in terms of medical adherence that health care teams must deal with on a daily basis.<sup>2</sup> Not only is the therapeutic regimen complex, but also two patients are involved: mother and baby.

The care of pregnant women with GDM is usually provided by a multidisciplinary team consisting of a high-risk obstetrician (maternal fetal medicine specialist), an endocrinologist, a certified diabetes educator (CDE) nurse, a CDE nutritionist, a perinatal case manager, a social worker, and other medical subspecialists that may be consulted from time to time.<sup>3</sup> All members of the health care team provide instructions and treatment plans to pregnant women with GDM, which adds to the complexity of the management from the patients' perspective.

GDM occurs in ~ 17.8% of all pregnant patients.<sup>4</sup> It is defined as the presence of carbohydrate intolerance that begins or is first recognized during pregnancy.<sup>5</sup> Women at risk for developing GDM may have a personal history of GDM with a previous pregnancy, a family history of diabetes, advanced maternal age ( $\geq 35$  years), obesity

(BMI  $> 30$  kg/m<sup>2</sup>), or non-white ethnicity.<sup>6</sup>

In the past, only pregnant women with risk factors were screened for GDM. However, the American College of Obstetricians and Gynecologists<sup>7</sup> and the American Diabetes Association (ADA)<sup>8</sup> recommend routine screening or testing for GDM for all pregnant patients. The International Association of Diabetes and Pregnancy Study Groups Consensus Panel and the ADA recommend an oral glucose tolerance test consisting of a 75-g glucose load to be administered between 24 and 28 weeks of gestation.<sup>8,9</sup> Tests are positive and patients are diagnosed with GDM if one of the three values is equal to or greater than the established threshold values (fasting blood glucose 92 mg/dl, 1-hour post-load 180 mg/dl, or 2-hour post-load 153 mg/dl).

## IN BRIEF

Adherence to the prescribed medical regimen is crucial to preventing complications to mothers and babies in pregnancies complicated by gestational diabetes mellitus (GDM). Self-efficacy, a conviction that one has the ability to reach one's goals, is predictive of adherence. In patients with GDM, for whom self-care is the central component of the medical regimen, self-efficacy is essential if medical adherence is to be achieved.

Summarizing the management of patients with GDM elucidates the complexity of their treatment. Newly diagnosed patients with GDM are placed on a designated diet by a nutritionist. The diet consists of three regular meals and three snacks, all on a prescribed schedule.<sup>8</sup> Patients maintain a food log for later review by the nutritionist. A diabetes nurse educator instructs patients in self-monitoring of blood glucose (SMBG) using a glucose meter with memory capabilities.

Five or more fingerstick blood glucose tests per day are necessary to monitor the response of patients' blood glucose to dietary manipulation.<sup>5</sup> Most patients will respond to dietary changes alone and will demonstrate normalization of blood glucose levels. However, a significant number (9–40%) will continue to have elevated blood glucose despite dietary adjustment.<sup>7</sup> Many of these patients were most likely glucose intolerant before diagnosis during pregnancy. These patients will require multiple daily insulin injections or a scheduled administration of oral hypoglycemic agents to normalize their blood glucose levels.<sup>10</sup>

The use of oral hypoglycemic agents for treating GDM is controversial because of concerns about placental transfer, adequate glyce-mic control, and lack of long-term outcomes.<sup>11</sup> However, recent studies indicate that such agents, especially glyburide, provide adequate glyce-mic control during pregnancy.<sup>12</sup>

Patients with GDM are classified as high-risk obstetrical patients. Perinatal complications associated with GDM include intrauterine fetal death, overgrowth of the fetus (macrosomia), and an increased risk for cesarean delivery.<sup>5</sup> More frequent office visits are required, and patients with GDM must undergo additional testing for fetal well-being, including multiple ultrasound examinations and other testing that requires additional visits to the hospital or an outpatient testing facility.

Even for the most motivated patients, adherence to treatment may be difficult. Cerkoney and Hart<sup>13</sup> reported only a 7% compliance rate on 45 of 61 points considered necessary for insulin-treated patients with diabetes 6–12 months after the patients had completed diabetes education classes at a community hospital. More than 30 years ago, Richardson<sup>14</sup> characterized this difficulty in achieving compliance in patients with diabetes as “the real world of diabetic noncompliance.”

### Self-Efficacy: A Construct of the Social Cognitive Theory

Albert Bandura, the recognized father of the social cognitive theory, was the first to address the nature and importance of self-efficacy in the determination of behavior.<sup>15</sup> He defined self-efficacy, or an efficacy expectation, in his original social learning theory as “the conviction that one can successfully execute the behavior required to produce the [expected] outcomes.”<sup>16</sup> A decade later, after further refinement, he made self-efficacy one of the central constructs of his newly cast social cognitive theory.<sup>17</sup> He expanded the self-efficacy definition as “a generative capability in which cognitive, social, and behavioral subskills must be organized into integrated courses of action to serve innumerable purposes.”

Schwarzer and Fuchs<sup>18</sup> concluded after a review of health behaviors that self-efficacy was determinative in the adoption of health-promoting behaviors and the elimination of health-impairing behaviors. Self-efficacy influenced not only the decision-making process, but also the initiation and maintenance processes.

The importance of self-efficacy was made paramount by Bandura with his publication of *Self-Efficacy: The Exercise of Control*.<sup>19</sup> Bandura opined that self-efficacy affected the three basic processes of personal change: the adoption of new behavior patterns, the generalization of these behavior patterns, and the long-term maintenance of these behavior patterns.

Nowhere was personal change more important than in establishing and maintaining health-promoting behaviors. Bandura viewed his self-efficacy theory of health-protective behaviors as providing a more unified theory of health-protective behavior than other models such as the health belief model and the theory of reasoned action, which were mainly concerned with predicting, rather than changing, health-protective behaviors. The successful management of GDM, which relies on self-care, is dependent on patients' self-efficacy.

### Self-Efficacy and Self-Care of Patients With GDM

GDM management is based primarily on patient self-care.<sup>20</sup> After receiving dietary instruction by a nutritionist, patients must arrange their diet to be consistent with the meal plan and be aware of calorie counts, food exchanges, carbohydrate content, and the importance of rigid scheduling of meals and snacks. Patients must also perform SMBG at least five times daily. This requires producing blood samples with fingersticks and recording the results, along with

food consumption records. Health care providers (HCPs) may also ask patients with GDM to monitor their urine for ketones using a dipstick. For patients who require insulin, there are many complex regimens to consider. They will give themselves two to four or more injections per day. These patients must draw up the insulin and choose an appropriate site for injection, keeping in mind that the sites must be rotated. They must also attend visits to multiple HCPs.<sup>3</sup>

A high degree of self-efficacy is essential for carrying out these self-care tasks. Williams and Bond<sup>21</sup> reported the results of a survey given to 94 adults with diabetes concerning the importance of self-efficacy, outcome expectancies, social support, and diabetes self-care. High self-efficacy was associated with self-care in the areas of diet, exercise, and SMBG. Self-efficacy was a better predictor of self-care than social support. The authors concluded that programs designed to enhance self-efficacy by increasing patients' confidence in their self-care abilities are likely to be effective. Self-efficacy was predictive of 26.2% of the variance of self-care behavior.

One of the most studied areas of the impact of self-efficacy on diabetes self-care is that of SMBG. As noted previously, patients with GDM must check their blood glucose at least five times daily. Intensive training by a CDE nurse is necessary before patients can perform SMBG. Because of the complex nature of SMBG, many clinicians have predicted that the process of carrying out SMBG would adversely affect patients' self-efficacy. However, a study by Homko et al.<sup>22</sup> concluded that self-efficacy was not adversely affected by SMBG in women with GDM.

In this study, 58 women with GDM were randomly assigned to either a group who performed

SMBG four times daily or a group who did not self-monitor but instead had blood drawn at weekly visits for a determination of their blood glucose level. Self-efficacy was assessed using the Diabetes Empowerment Scale. There was no difference in reported self-efficacy between the two groups at 37 weeks' gestation, 8 weeks after initiation of the study.

Home glucose meters with memory chips have also brought about an increase in medical adherence among patients with diabetes. Before the advent of installed memory chips for glucose meters, patients would record their SMBG results in a paper logbook, to be reviewed by HCPs at their scheduled visits. Independent verification could not be performed. However, modern glucose meters with memory chips allow downloading of blood glucose results (usually the most recent 100 or so values) along with timing notations. This fact is communicated to patients at their first visit for GDM treatment. These meters have not adversely affected patients' self-efficacy, but rather have enhanced self-care and medical adherence.<sup>22</sup>

Senecal et al.<sup>23</sup> designed a study to determine whether self-efficacy and autonomous self-regulation (adjusting insulin doses without consulting an HCP) were competing or complementary constructs when considering motivation and dietary self-care in adults with diabetes. The study included 638 people with diabetes between the ages of 20 and 70 years. None of the participants had had any major modifications in their diabetes treatment regimen for the previous 6 months. The participants were administered a series of questionnaires consisting of a 34-item scale of self-efficacy in dietary care, the Therapy Motivation Scale that measures autonomous self-regulation of dietary self-care activities, the Summary of Diabetes Self-Care

Activities questionnaire, and the Life Satisfaction Scale.

The authors concluded that both self-efficacy and autonomous self-regulation were positively correlated with dietary adherence and life satisfaction. However, self-efficacy was more associated with adherence than autonomous self-regulation. Both self-efficacy and autonomous self-regulation were found to be complementary constructs.

#### **Self-Efficacy and Illness Beliefs: Impact on Adherence**

Patients with longstanding diseases or conditions must cope with their situation by modifying their lifestyle, emotional balance, and social relationships while maintaining their self-esteem.<sup>24</sup> All of these factors relate to patients' perceived quality of life. Women with newly diagnosed GDM must reassess their status. Their pregnancy is no longer routine or normal. They are faced with a complex regimen of medical care and are at risk for complications such as unexplained stillbirth, fetal growth abnormalities, and a nearly 50% chance of delivery by cesarean section.<sup>7</sup> Their perceived quality of life for the remainder of their pregnancy is disrupted. In addition, women with a history of GDM are more likely to develop type 2 diabetes later in life.<sup>5</sup>

Kuijjer and De Ridder,<sup>24</sup> using a questionnaire, studied the role of self-efficacy in achieving desired health outcomes. The study included 117 patients with chronic illnesses, including asthma, diabetes, and heart failure. Self-efficacy was found to be a mediating factor in the discrepancy between illness-related goal importance and attainability. Higher self-efficacy not only decreased the discrepancy, but also was associated with a higher perceived quality of life, psychological well-being, and greater adherence.

Rapley and Fruin<sup>25</sup> viewed self-efficacy from the perspective of general and regimen-specific efficacy. General self-efficacy refers to patients' personal efficacy beliefs that they have the ability to make lifestyle changes and learn new behaviors to reach a desired goal. Regimen-specific efficacy or task-specific efficacy is patients' perceived ability to complete a designated task or achieve a specific goal. From the general self-efficacy perspective, patients may have the motivation and the expectation of reaching an illness-related goal such as medical adherence to their prescribed medical treatment for GDM. However, they will be unable to achieve their overall goal unless they have the requisite regimen-specific efficacy. For patients with GDM, regimen-specific efficacy is necessary for dietary adherence, SMBG, insulin administration, and attendance at required health care visits and scheduled tests. Rapley and Fruin concluded that regimen-specific efficacy directly affects general self-efficacy in the setting of chronic illness.

From this discussion, it is apparent that self-efficacy has a direct impact on adherence. However, self-efficacy may also be modulated by adherence.<sup>26</sup> This is consistent with the triadic reciprocal determinism concept of Bandura's social cognitive theory.<sup>17</sup> Behavior, cognitive and other personal factors, and environmental influences all interact to produce observable behavior. Self-efficacy is a cognitive or personal factor that is primarily viewed as a mediating influence on medical adherence, but medical adherence also mediates self-efficacy.

In a study by Sacco et al.,<sup>26</sup> 56 adults with type 2 diabetes were evaluated for behavioral adherence using the Summary of Diabetes Self-Care Activities Questionnaire and for depression assessed by the

Patient Health Questionnaire: Nine Symptom Depression Checklist. Their BMI was also determined. Self-efficacy was found to be a mediating influence between the association of medical adherence and depression and between BMI and depression. High self-efficacy was associated with increased adherence and decreased depression, even in patients with high BMIs. The authors stressed the clinical significance of their findings; negative reactions to nonadherence by medical providers may increase depression and lower self-efficacy, thereby creating a cycle of medical nonadherence. However, measures that are directed toward enhancing self-efficacy may increase adherence and decrease clinical depression, thereby creating a cycle of adherence.

#### **Influence of Self-Efficacy in Promoting Adherence in Special Groups**

Bandura<sup>19</sup> identified four information sources that are used by individuals in forming and modifying their self-efficacy: 1) performance experiences, 2) vicarious experiences, 3) verbal persuasion, and 4) physical and emotional reactions. These sources are culture-specific and are further affected by developmental factors such as age. In some societies, the sources may differ significantly and may take unique forms.<sup>27</sup> Individualism prevails in Western cultures. However, in other cultures, such as those in the Far East, collectivism is the norm. The influence of self-efficacy in promoting medical adherence in GDM differs among ethnic groups and among age categories.

#### **Effect of ethnicity on the association of self-efficacy and adherence**

Skaff et al.<sup>28</sup> studied the relationship between control beliefs and diabetes management behaviors affecting diet and exercise in Latino and European Americans with type 2 diabetes. Specific diabetes self-efficacy and

global mastery were the control beliefs that were measured. Specific diabetes self-efficacy was defined as individuals' confidence in their ability to follow a prescribed regimen to manage their diabetes. Global mastery was denoted by individuals' feelings of control over their life in general. Seventy-four Latino Americans and 115 European Americans with type 2 diabetes participated in the study. Self-efficacy was measured on a diabetes self-efficacy scale and global mastery was assessed by the 7-item Pearlin Mastery Scale.

Diabetes management behaviors were influenced more by self-efficacy than global mastery for European Americans. For Latino Americans, global mastery influenced diabetes management behaviors more than self-efficacy.

A different conclusion was reached by Sarkar et al.<sup>29</sup> In a study that included Asian Americans (18%), African Americans (42%), Latino Americans (42%), and whites (15%), the associations between self-efficacy and self-management were consistent among all ethnic groups. The authors concluded that measures that increase self-efficacy were effective in improving diabetes self-management and adherence regardless of race or ethnicity. Skaff et al.<sup>28</sup> opined that fatalism, a cultural feature of Latinos, might be the factor responsible for the lack of association between self-efficacy and diabetes management behaviors.

#### **Self-efficacy and medical adherence in adolescents with diabetes**

Adolescent women with GDM face the same challenges as older women in managing their condition and pregnancy. However, because of their inexperience and developmental issues, adolescents may be particularly vulnerable to factors that culminate in medical nonadherence.

Littlefield et al.<sup>30</sup> tested the hypothesis that nonadherence in adolescents with diabetes was related to four variables associated with self-concept: self-esteem, self-efficacy, depression, and binge-eating. The study included 193 adolescents, aged 13–18 years, with type 1 diabetes. Participants were assessed with the Rosenberg Self-Esteem Scale, the Children's Depression Inventory, a questionnaire about binge-eating, an adapted adherence scale, and a specially developed self-efficacy scale.

Lower adherence was associated with lower self-esteem, lower self-efficacy, more depressive symptoms, and more binge-eating. The four tested variables were responsible for 50% of the variance in adherence. The sample included both boys and girls. Interestingly, girls had lower adherence rates than boys. The authors opined that specific behavioral and cognitive interventions that increase self-efficacy and self-esteem might be effective in enhancing medical adherence in adolescents.

Ott et al.<sup>31</sup> studied the role of self-efficacy as a mediator variable in the relationship between adherence and two methods thought to enhance self-efficacy—mastery experience and social persuasion. One hundred forty-three adolescents with insulin-dependent diabetes participated in the study. Variables were measured using the Diabetes Family Responsibility Questionnaire, the Diabetes Family Checklist, the Self-Efficacy for Diabetes Scale, and the Summary of Self-Care Activities.

The authors performed regression analysis and found that self-efficacy was a mediator variable for the relationship between mastery experience and adherence. They also found that self-efficacy was a mediator variable for the relationship between non-supportive parental behaviors and nonadherence in SMBG by the adolescents. The authors surmised that

measures to increase self-efficacy, such as mastery experiences, influence adherence positively. However, they also cautioned that mastery experiences may have a direct influence on adherence without necessarily involving self-efficacy, and they conceded that perceived self-efficacy may be a better predictor of adherence than self-efficacy enhancement procedures.

Negotiated telephone support is a simple method that increases self-efficacy in young people with type 1 diabetes. Making insulin adjustments over the telephone after communicating blood glucose levels to an HCP decreases the need for clinic visits.

Howells et al.<sup>32</sup> used negotiated telephone support to increase self-efficacy in adolescents with type 1 diabetes. Seventy-nine participants, aged 12–25 years, were enrolled in a 1-year study using primarily negotiated telephone support for diabetes management. Self-efficacy was assessed with the Self-Efficacy for Diabetes Scale, a psychometric tool that is valid and reliable.<sup>33</sup> Self-efficacy was significantly increased with the use of negotiated telephone support. The authors concluded that negotiated telephone support was a simple psychological intervention to increase self-efficacy and encouraged its widespread use.

One measure of adherence in people with GDM or other types of diabetes is the A1C test.<sup>34</sup> A1C represents the average blood glucose control during the 2–3 months before the test is performed.<sup>4</sup> Clinicians routinely order A1C tests as a proxy for medical adherence.<sup>8</sup>

Griva et al.<sup>35</sup> studied 64 people, aged 15–25 years, to determine whether diabetes self-efficacy predicted medical adherence. A modified Self-Efficacy for Diabetes Scale was used to determine self-efficacy. Normal A1C levels from the

reference laboratory ranged from 4.5 to 5.5 mg/dl. Multiple regression analysis showed that 30.8% of the variance in A1C was explained by patients' self-efficacy. The authors concluded that A1C, a physiological measure of adherence, is influenced by patients' self-efficacy.

#### Measures to Enhance Self-Efficacy to Improve Adherence

Bandura<sup>19</sup> suggested that the most influential source of self-efficacy is enactive mastery experiences. He based this on the observation that mastery experiences are the most authentic evidence regarding whether one will achieve expected goals. Acquiring subskills is essential if the enactive mastery experiences are to lead to self-efficacy.

The team approach to treating women with GDM encourages the development of subskills that patients need to successfully navigate their high-risk pregnancy.<sup>3</sup> SMBG, the ability to select and prepare a meal plan in accordance with a prescribed diet, and the self-administration of insulin or oral hypoglycemic agents are examples of subskills needed for the successful management of GDM.

Specific behavioral and cognitive interventions have been suggested to improve adherence in individuals who lack confidence in their ability to perform necessary subskills.<sup>29</sup> Modeling has been used to teach skills and instill confidence.<sup>17</sup> Modeling using congruent models (same age or ethnicity) might be particularly advantageous when dealing with adolescents with GDM and members of minority ethnic groups. Tailoring treatment to meet individuals' needs is another effective technique to enhance self-efficacy. The negotiated telephone support method reported by Howells et al.<sup>32</sup> is illustrative of this approach.

Self-care and diabetes knowledge directly affect diabetes self-efficacy.<sup>20</sup>

Measures to enhance self-care include teaching patients to perform SMBG and to adjust their dietary intake and insulin doses according to their glucose level or physical activity within pre-set parameters and giving them the prerogative to call for assistance as needed. Self-care measures may be particularly successful in adolescents with GDM and Latino Americans whose control beliefs are centered on global mastery and environmental control.<sup>28</sup>

#### Conclusion: Using Self-Efficacy to Improve Adherence in GDM

GDM affects ~ 250,000 pregnancies each year in the United States.<sup>5</sup> Complications of GDM may result in death or injury to the baby and subject the mother to an increased risk of cesarean delivery.<sup>7</sup> Adherence to the medical regimen will reduce the risks to both mother and baby.<sup>36</sup> Self-efficacy, a central psychological construct of the social cognitive theory, has been shown to be a reliable predictor of medical adherence in patients with GDM. In particular, diabetes-specific self-efficacy was shown to influence adherence.

The modulating effects of age and ethnicity on self-efficacy and adherence were demonstrated by examining youths and people from various ethnic groups. Among these special groups, self-efficacy was a reliable predictor of adherence.

Clinicians should encourage the development of self-efficacy rather than negative reactions to nonadherence that may increase depression and lower self-efficacy. The present psychometric instruments used to measure diabetes-specific self-efficacy—the Diabetes Self-Efficacy Scale and the SE-Type 2 Scale—were found to be valid and reliable.<sup>37</sup> Methods to enhance self-efficacy were discussed, including mastery experiences, the teaching of diabetes sub-skills, modeling, and self-care

techniques. HCPs should be aware of the association between self-efficacy and adherence when treating patients with GDM.

Specific behavioral and cognitive interventions may increase self-efficacy and self-esteem. Teaching self-mastery of SMBG and autonomous self-regulation might be helpful. Phone or e-mail support may also increase self-efficacy in patients with GDM. Internet-based resources may have a profound effect on the future management of GDM. Downloading glucose levels through an Internet program would allow almost instantaneous feedback from HCPs and would eliminate the need for frequent clinic visits, thereby increasing medical adherence and self-efficacy.

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Michael S. Cardwell, MD, is an associate professor in the Department of Obstetrics and Gynecology at the Texas Tech University Health Sciences Center Paul L. Foster School of Medicine in El Paso, Tex.