From The American Association of Diabetes Eduators

# An Effective Model of Diabetes Care and Education

## Revising the AADE7 Self-Care Behaviors®

American Association of Diabetes Educators

From the American Association of Diabetes Educators, Chicago, Illinois.

Correspondence to Leslie Kolb, RN, BSN, MBA, American Association of Diabetes Educators, 200 W. Madison Street, Suite 800, Chicago, IL 60606. (lkolb@aadenet.org).

*Funding:* None.

*Conflict of Interest:* None.

*Acknowledgments:* The AADE gratefully acknowledges the following individuals for their role in creating this document: Carolé Mensing, RN, MA, CDE, FAADE (Co-Chair); Donna Tomky, MSN, RN, C-NP, CDE, FAADE (Co-Chair); Lois Moss-Barnwell, MS, RD, LDN, CDE; Sheri R. Colberg, PhD, FACSM; Patricia Davidson, DCN, RDN, LDN, CDE, FAND; Kim Coy DeCoste RN, MSN, CDE, MLDE, FAADE; Nancy D'Hondt, RPh, CDE, FAADE; Paulina N. Duker, MPH, RN, CDE; Eliot LeBow, LCSW, CDE; Melinda D. Maryniuk, MEd, RD, CDE; Molly McElwee-Malloy, RN, CDE; David K. Miller, RN, BSN, MSEd, CDE, FAADE; Malinda Peeples, RN, MS, CDE, FAADE; Joanne Rinker, MS, RDN, CDE, LDN, FAADE; Cecilia Sauter, MS, RDN, CDE, FAADE; Michael B. See, MS, RCEP, CDE; Evan Sisson, PharmD, MSHA, BCACP, CDE, FAADE.

AADE gratefully acknowledges the following individuals for their role in reviewing this document: Martha Funnell, RN, MS, CDE, FAADE, FAAN; Barb Schreiner, PhD, RN, CDE, BC-ADM; Jane K. Dickinson, RN, PhD, CDE; Healthy Eating: Hope Warshaw, MMSc, RD, CDE, BC-ADM, FAADE; Being Active: Gary Scheiner, MS, CDE; Monitoring: Janice MacLeod, MA, RD, LD, CDE; Taking Medications: Geoffrey Twigg, PharmD, CDE, BCACP; Problem Solving: Leigh Gemmell, PhD; Reducing Risk: Lucille Hughes, DNP, MSN/Ed, RN, CDE, BC-ADM, FAADE; Healthy Coping: Mary de Groot, PhD, HSPP; AADE Team Members: Matthew Eaton and Kirsten Yehl, MS, MLIS; Medical Writer: Lauren Bronich-Hall, MS, RD, LDN, CDE (Health Illuminations, LLC).

This is an official statement of the American Association of Diabetes Educators (AADE). AADE is a multidisciplinary professional membership organization of health care professionals dedicated to integrating successful self-management as a key outcome in the care of people with diabetes and related conditions.

DOI: 10.1177/0145721719894903



perspectives in practice

## Purpose

The AADE7 Self-Care Behaviors® (AADE7) is a robust framework for self-management of diabetes and other related conditions, such as prediabetes and cardiometabolic diseases. It is the position of the American Association of Diabetes Educators (AADE) that, at the cornerstone of diabetes self-management education and support, the AADE7 is the framework for achieving behavior change that leads to effective self-management through improved behavior and clinical outcome measures. The AADE7 model guides the health care team in effective person-centered collaboration and goal setting to achieve health-related outcomes and improved quality of life. Continued research and evidence are critical to expand this model and broaden its application to other chronic conditions. Given the advances in the science of diabetes management, as well as in diabetes self-management education and support, AADE has evaluated the AADE7 within the framework of these advances, including the digital and dynamic health care landscape.

## Conclusion

This revised position statement blends the updates in research and AADE's vision and expansion beyond diabetes to refresh the AADE7 framework. This revision reflects the perspectives of all members of the health care team as they problem solve with individuals who are at risk for or who have diabetes and related conditions to achieve healthier outcomes.

## Introduction

The American Association for Diabetes Educator's (AADE's) AADE7 Self-Care Behaviors® (AADE7) framework provides an evidence-based model for assessment, intervention, and evaluation of individuals and populations living with diabetes and other cardiometabolic conditions.[1] Using the AADE7 framework, diabetes care and education specialists partner with people living with diabetes and related conditions to support informed decision making. Diabetes care and education specialists embrace a person-centered philosophy, incorporating a strengths-based approach and acknowledging the whole person in the context of the person's life and relationships. The diabetes care and education specialist focus includes not only diabetes care, education, and ongoing support of self-management but related conditions such as obesity, prediabetes, diabetes-related complications, and cardiometabolic disease as well. Given the advances in the science of diabetes management, as well as in diabetes self-management education and support, AADE has evaluated the AADE7 within the framework of these advances, including the digital and dynamic health care landscape. This revised position statement blends research updates and AADE's vision and expansion beyond diabetes to revise the AADE7 framework and encompasses the varied perspective of the health care team.

## AADE7 Revision

Aligned with AADE's vision of "optimal health and quality of life for persons with, affected by, or at risk for diabetes and chronic conditions,"[2] the AADE7 Self-Care Behaviors® are as follows:

- *Healthy Coping*
- *Healthy Eating*
- *Being Active*
- *Taking Medication*
- *Monitoring*
- *Reducing Risk*
- *Problem Solving*

### Background

To conduct this "AADE7 Revision," AADE assembled a task force to review the literature and previous documents,[3-9] in an effort to update the AADE7 framework while preserving its original intent.

AADE was challenged by the Centers for Medicare & Medicaid Services (CMS) in 1997 to identify the unique outcome measures of diabetes self-management education.[10] AADE convened a taskforce to determine what to measure, when to monitor, and how to manage chronic disease over its continuum as it related to diabetes education and care.[11] This taskforce defined the unique outcomes of diabetes education as "behavior change"[11] and identified 7 self-care behaviors that promote successful and effective diabetes self-management, known as the AADE7. The work of the original taskforce included mapping the original 15 content areas of the 1995 National Standards for Diabetes Self-Management Education (NSDSME),[10] developing and testing tools to capture outcomes,[12] and reaching a consensus on diabetes self-management education (DSME) outcome measures using the AADE7 Self-Care Behaviors®.[5] This framework shifted the focus away from educational content delivery to an outcome-driven practice using person-centered and self-determined goals.[9,13] Effective diabetes education needed to go beyond knowledge transfer; it needed to address and support behavior change and affect clinical and health-related outcomes.

The NSDSME continues to include the AADE7 framework in its updates,[14-16] and the AADE7 has provided standardized nomenclature for assessment, identification of self-care related problems and barriers, goal setting, problem solving, documentation, measurement, evaluation, quality improvement, and policy making.[9] Based on additional research and practice, diabetes self-management education and support has evolved beyond knowledge and behavior change to focus on quality of life and person-centered approaches to management, education, and care. These gains in knowledge, along with innovative technologies, have changed some of the demands of self-care.

#### Role of technology

The use of technology has transformed the approach to diabetes self-care and implementation of the AADE7 framework. Technology developed to support self-care includes medical devices such as glucose meters, insulin pumps, and continuous glucose monitors; digital therapeutics such as mobile apps, text messaging, electronic communications, and videoconference platforms; and wearable technologies such as Fitbits and Apple watches. People with diabetes and other related conditions can receive health care services virtually, outside of the clinic/

office with the capabilities of the Internet and mobile devices. This alleviates barriers such as transportation or cost of travel. Technology has the power to synthesize information into a digestible format, resulting in simplified interpretation and application to self-management. When designed with the user in mind, these tools can also serve to engage, encourage, and motivate self-care. Diabetes care and education specialists help with technology selection, device training, data downloads, data evaluation, troubleshooting, and backup plans for times when technology fails.[17] By collaborating with diabetes care and education specialists, people with diabetes and related conditions can learn how to use these technological tools effectively, when available, to improve their clinical and quality-of-life outcomes.

Although long-term studies are needed to evaluate sustainability,[18] technology-enabled health care delivery can help people with diabetes and related conditions optimize their outcomes.[19] Diabetes care and education specialists can provide the element of human touch to identify appropriate candidates and tools, provide training, and facilitate ongoing use of these tools and the information they offer. Research shows the use of electronic health records and wearables, along with the resulting patient-generated health data, can improve clinical outcomes and engagement.[20-23] Mobile health interventions for obesity and diabetes have promoted behavior change,[24] and technology-enabled diabetes support has demonstrated clinically significant results in clinical settings.[4,25] In people with type 1 diabetes, studies have validated that the use of continuous glucose monitoring can increase time in range and lower risk for severe hypoglycemia.[26]

Accompanying these benefits, technology also brings new challenges to the health care team. To stay current with the accelerated growth of technology, the members of the health care team must familiarize themselves with the technologies, learn the intricacies of new devices, and overcome their technology phobias. People living with or affected by diabetes and related conditions, along with their diabetes care and education specialists, must be able to prioritize data surplus from technologies to minimize time and resource burdens.

***New AADE7 image.*** Although originally presented in a list format, the AADE7 Self-Care Behaviors® overlap in nature, specifically the knowledge and skills to master them, the barriers associated with their mastery, and associated outcome measures. Accordingly, AADE has revised the image associated with the AADE7 to underscore the interrelatedness of these behaviors.

Advances in the science of diabetes self-management education and support (DSMES) emphasize the independent effect of the emotional burden of diabetes on metabolic and quality of life outcomes. Because ***Healthy Coping*** must begin before learning can occur, this behavior is centrally located at the core to symbolize its significance in sustainable diabetes self-management. The inner ring contains ***Healthy Eating***, ***Being Active***, and ***Taking Medication***. These behaviors often serve as the basis for care plans since they comprise what individuals with diabetes and related conditions undertake regularly as they self-manage their condition. The next ring, ***Monitoring***, encircles these 4 self-care behaviors. By collecting personalized data, ***Monitoring*** helps convert some of the intangible components of diabetes into perceptible ones. The knowledge gained and the ability to use the information from ***Monitoring*** can drive behavior change. Equally important, the outer ring contains the less tangible self-care behaviors of ***Reducing Risk*** and ***Problem Solving***, which greatly influence motivation, goal setting, and the ability to transform goals into action. The updated image of the AADE7 depicts this interconnectivity (see Figure 1).

## Examination and Validation of the AADE7

### Healthy Coping

Healthy coping, defined as "a positive attitude toward diabetes and self-management, positive relationships with others, and quality of life,"[27] is critical for mastery of the other 6 behaviors. Psychosocial factors that interfere with a person's ability to self-manage the disease and achieve desired metabolic outcomes greatly influence diabetes and other related conditions.[28-32] Person-centered care contributes to positive health outcomes and psychological well-being.[33] Conversely, diabetes-related distress negatively affects the physical and emotional well-being of the person living with diabetes.[34] Diabetes-related distress, described as the emotional burden of diabetes, the constant demands from diabetes self-management, the possibility of developing complications, and the lack of support and access to care,[29,34-36] hinders self-care. People living with diabetes are also more prone to depression and anxiety,[32,37] as well as disordered eating and cognitive impairment.[37] These psychosocial factors

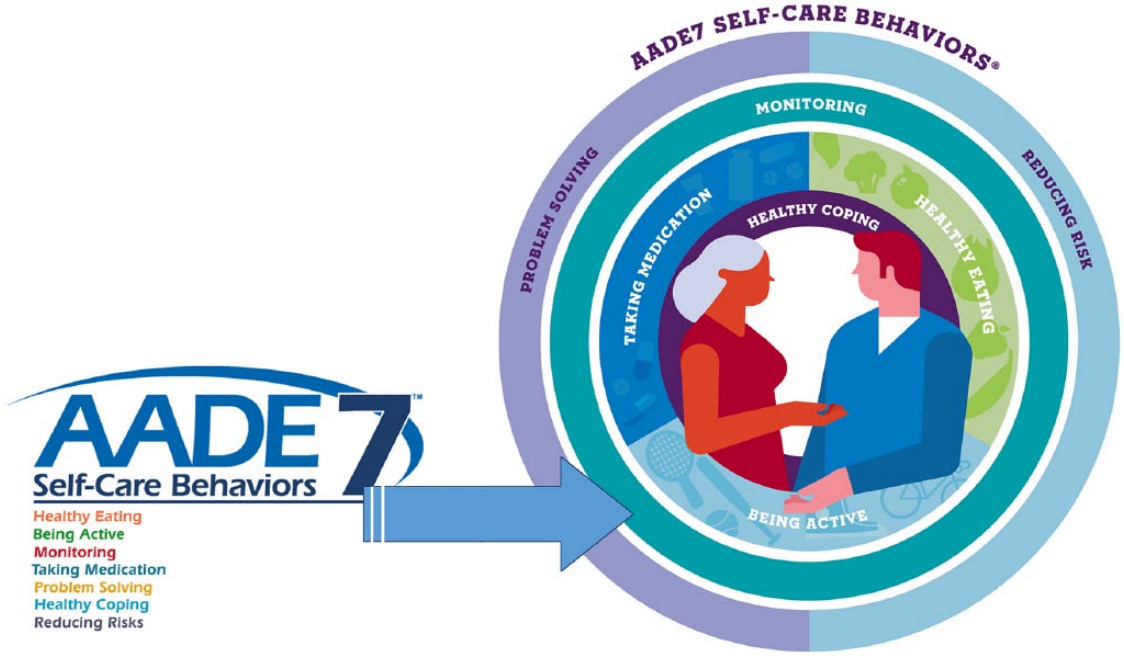


**Figure 1.** Transformation of the AADE7 image.

reduce the ability to self-manage. An evaluation by a diabetes care and education specialist and other members of the health care team and appropriate referrals to behavioral specialists are necessary to support people living with diabetes and related conditions. Ongoing evaluation and support are key components to making sustainable behavior changes, as reinforced by the term change from *diabetes self-management education* to *diabetes self-management education and support*. Table 1 includes immediate and intermediate outcomes, methods and frequency of measurement, and examples of implementation within the healthy coping behavior.

## Behaviors That Contribute to Healthier Outcomes

### Increase self-efficacy

Self-efficacy, described as an individual's belief in his or her own ability,[38] is critical to self-care. Both depression and diabetes-related distress influence self-efficacy in people living with diabetes.[39,40] Research has shown that higher levels of positive emotions, self-efficacy, and increased social support and attitudes toward self-care behaviors are associated with improved self-care in diabetes and cardiovascular disease.[32,41-44] Indicators of psychological well-being, including optimism, positive affect, self-efficacy, and gratitude, are associated with better health outcomes in many chronic diseases.[35] People with mild to moderate symptoms of diabetes-related distress can benefit from a referral to DSMES.[45] Those with more severe distress should be referred to mental health professionals prior to diabetes education.

### Address cognitive impairment

Any impairment to learning, memory, attention, mental flexibility, and executive function can decrease the ability to perform self-care behaviors, resulting in inconsistent diabetes self-management and associated glycemic outcomes.[30,46-50] Cognitive impairment is associated with type 1 and type 2 diabetes.[50] Mental health issues, such as diabetes distress, attention-deficit/hyperactivity disorder (ADHD), depression, and addiction, also cause cognitive impairment. Cognitive impairment affects knowledge and skill transfer, as well as the ability to learn and apply new information (***Problem Solving***).[51]

### Gather support

Diabetes care and education specialists, trained community health workers, family, and friends can provide support to people living with diabetes and related

conditions. Together, people with diabetes and related conditions and their team members can identify effective support networks to assist with changes in diabetes and life that occur over time. This support can also be virtual; technology has introduced options such as online peer support and telehealth support to help people share their concerns and feelings around diabetes self-management. Peer support has shown benefits, including social, emotional, and cultural support.[52-55] Various models of peer support exist with the potential to improve self-efficacy, positive mood, understanding of self-care, and perception of social support, as well as improve health-related outcomes.[56] People living with chronic disease are not the only ones who may require this support; family members, caregivers, and partners of people with diabetes can experience diabetes distress.[29,57,58] Diabetes care and education specialists play a critical role in this process by assessing individuals' support network, reinforcing the importance of this aspect of diabetes self-care, and providing training for peers and community health workers to promote accurate and appropriate messages.

## Healthy Eating

Healthy eating refers to "a pattern of eating a wide variety of high quality, nutritionally-dense foods in quantities that promote optimal health and wellness."[59] The behaviors surrounding when to eat, what to eat, and how much to eat are influenced by a complex set of factors, including food and cultural preferences, food security, health beliefs, and eating habits.[60] This complexity intensifies with the additions of dynamic nutrition recommendations, health literacy challenges, varied wellness goals, and changing health status. Consequently, customization of meal plans and eating patterns based on age, activity level, health status, food preferences, and medical and nutritional management of multiple conditions, among other factors, becomes vital to effective behavior change. Table 2 includes immediate and intermediate outcomes, methods and frequency of measurement, and examples of implementation within the healthy coping behavior.

## Behaviors That Contribute to Healthier Outcomes

### Develop and use a personalized meal plan

Both the Academy of Nutrition and Dietetics (AND) and the American Diabetes Association (ADA) support an evidence-based approach to individualized meal planning.[59,61-63] In partnership with registered dietitian-nutritionists, individuals with diabetes can develop meal plans that focus on macronutrient quality, healthy eating patterns, metabolic goals, and personal food preferences.[59] Accordingly, the ADA Medical Standards of Care in Diabetes identifies diabetes-specific medical nutrition therapy (MNT) as an essential component of an overall diabetes plan.[59] Strategies such as carbohydrate counting, the plate method, and weight management exchange lists have been effective in achieving cardiometabolic and weight management goals.[64,65] These techniques empower people to make choices based on their food preferences, while maintaining an energy intake and macronutrient composition focused on their metabolic and health goals.

### Establish healthy eating patterns

As defined by the Dietary Guidelines 2015-2020, a healthy eating pattern contains an assortment of colorful vegetables, fruits, whole grains, low-fat dairy, a variety of protein sources, and oils while minimizing sodium, added sugars, saturated fat, and *trans* fat.[62] Through discussion and problem solving with their health care team, individuals with diabetes and related conditions can learn how to integrate healthy and safe eating patterns into their daily lives, which often requires small increments of change to achieve sustainability.[63]

### Measure portions and monitor intake

Tracking the amount of food and beverages consumed for total calories, as well as for individual nutrients such as carbohydrates, plays a role in achieving weight and wellness goals. Individuals can use scales, measuring cups, apps that evaluate photo images of meals, and household measurements or hands to estimate amounts[66] and receive feedback on how their portions compare to established serving sizes. When health goals include weight loss, portion-controlled eating plans can improve weight, low-density lipoprotein (LDL) cholesterol, and A1C.[67] In addition, research shows that self-monitoring of intake may predict dietary change over the long term.[68] Combining measurement and monitoring (***Monitoring***) within the behavior of ***Healthy Eating*** leads to ***Problem Solving*** amounts and types of food and beverages to consume to meet personalized plans.

### Understand and use the Nutrition Facts Label

Comprehension of the Nutrition Facts Label and associated *health literacy and numeracy* skills are essential to

the behavior of ***Healthy Eating*** for management of prediabetes, diabetes, and cardiometabolic conditions. The ability to read the Nutrition Facts label and calculate portions (***Healthy Eating***) can promote healthy eating and drinking decisions that lower cardiovascular risk, improve glycemia (***Reducing Risk***), and aid in decision making during special circumstances, such as restaurant dining or special occasions (***Problem Solving***).

## Being Active

Being Active is inclusive of all types, durations, and intensities of daily physical movement, which equates to bouts of aerobic or resistance exercise training (structured or planned "exercise"), as well as unstructured activities. The benefits of regular physical activity on cardiometabolic health are widely known.[69]

With a few exceptions, recommendations for physical participation are similar for individuals with and without diabetes. Most people with diabetes can safely begin physical activity that is no more vigorous than their usual activities of daily living without a medical checkup, which removes some barriers to their participation in increased activity.[70] When an individual with diabetes and higher cardiometabolic risk is unaccustomed to vigorous physical activity, guidelines suggest obtaining medical clearance and possibly preparticipation exercise stress testing. Comorbid health issues may require individualization of physical activity choices (eg, avoidance of weightbearing physical activity with unhealed plantar ulcers), which serves as an opportunity for shared decision making (***Problem Solving***) within the health care team. In collaboration with individuals with diabetes and related conditions, diabetes care and education specialists can provide this individualized assessment, monitor activity levels (***Monitoring***) as vital signs, and tackle barriers to encourage physical activity in daily lifestyles. Table 3 includes immediate and intermediate outcomes, methods and frequency of measurement, and examples of implementation within the healthy coping behavior.

## Behaviors That Contribute to Healthier Outcomes

The behavior changes that contribute to healthier outcomes include aerobic exercise, resistance and balance training, engaging in unstructured or daily living activities, and decreasing the amount of time spent sitting.[70-75] The diabetes care and education specialist can have a particular impact in helping people identify and address barriers.

### Address barriers

Since frequent and consistent physical activity often requires sustained behavior change, combatting potential barriers with appropriate strategies and goals is of significant importance.[76,77] Most adults discontinue regular physical activity due to a perceived lack of time, injuries, inappropriate starting intensity, and a lack of enjoyment. Other barriers may relate to the environment, such as a lack of safe places for physical activity[78,79]; social factors, such as a lack of social support for regular physical activity[80]; and work or home situations that lead to more sedentary behaviors.

Diabetes and its related conditions present additional challenges to participation. For instance, proliferative retinopathy requires limitation of activities that cause rapid blood pressure swings, cardiac autonomic neuropathy requires extensive warm-up and cool-down phases, peripheral neuropathy requires frequent foot inspections and possibly limiting weightbearing activity, and peripheral vascular disease requires limiting intensity to a tolerable pain threshold.[81] Individuals with diabetes, especially those who use insulin or insulin secretagogues, report fear of hypoglycemia as a significant barrier.[82] In collaboration with the health care team, people living with diabetes can develop strategies to reduce risk for or avoid hypoglycemia, such as reductions in insulin or medication prior to physical activity and inclusion of rapid-acting carbohydrate prior to and during activity (***Reducing Risk*** and ***Problem Solving***). In addition, a lack of self-efficacy or self-esteem appears related to being active,[83] which links to the need for ***Healthy Coping***.

## Taking Medication

Medications remain an essential component in the prevention and management of chronic disease. Insufficient treatment interventions, therapeutic inertia, and/or skipping/missing medication doses[84-86] continue to be barriers to reaching therapeutic goals and contribute to higher health care costs, adverse outcomes, and inferior quality of life for persons with chronic disease.[86,87] Medication-taking behaviors include following the day-to-day prescribed treatment with respect to timing, dosage, and frequency, as well as continuing treatment for the prescribed duration.[88] The reasons for not taking medications as prescribed are multifactorial.[86,89] Given that

diabetes has been recognized as a multisystem disorder with several associated comorbidities,[90,91] treatment follows a multifaceted and individualized approach that includes cardiovascular risk mitigation.[90]

Advances in the scientific understanding of diabetes have resulted in a spectrum of new oral and injectable agents targeting multiple disease mechanisms.[91-94] The focus has shifted from solely an A1C reduction to a more comprehensive approach that includes consideration of time-in-range (TIR), cardiovascular disease prevention, and quality-of-life measures.[95-97] Adding the dynamics of an aging population, changing demographics, social and environmental influences, access to health care, predictive medicine, and technological innovation further increases the complexities of treatment approaches and the need for both individualization and coordination of the care plan.[85,93,98-101] Table 4 includes immediate and intermediate outcomes, methods and frequency of measurement, and examples of implementation within the healthy coping behavior.

## Behaviors That Contribute to Healthier Outcomes

### Keep a current, accurate medication list and history

A medication list provides valuable information for the individual managing health conditions and the other members of the health care team. An accurate and complete list that includes complementary therapies and over-the-counter medications can lead to collaborative discussions to address optimal selection of agents, possible conversion to newer agents with additional health benefits, deprescribing as needed, and avoidance of prescribing medications already determined to be ineffective or to cause adverse effects for this individual (***Problem Solving***). The medication list also serves as a mechanism to communicate medication changes within the health care team and prevent medication discrepancies from occurring, especially among various health care sites.[102] Medication reconciliation among the members of the health care team, especially the individual taking the medication, may reduce the frequency of hospitalizations and emergency room visits.[103]

### Fill the prescription

Filling the initial prescription, having support such as reminder prompts, and having uninterrupted and convenient prescriptions promote medication-taking behavior.[84] It can be challenging to navigate the health care system to fill a prescription,[104] but an understanding of the roles on the health care team and influencers of cost and coverage can facilitate the process. For instance, a person with diabetes may find that the newly prescribed medication is too expensive to fill. This problem involves ***Taking Medication***, but it also necessitates active discussion and collaboration among members of the health care team to examine the benefits and costs for this particular individual. These factors may include (1) whether the medication's value outweighs its cost due to additional cardiometabolic benefits (***Reducing Risk***), (2) whether the medication results in a noticeable improvement in this individual's blood glucose level (***Monitoring***), and (3) whether the benefits of adding another medication to the treatment plan offset potential financial and emotional stressors (***Healthy Coping***).

### Take medication as prescribed and at the right time

To maximize benefits and minimize side effects, individuals may need to take medications at specific times, in relation to food, or in response to blood glucose levels. Medications may also require appropriate spacing with or from other meds. Nonoral medications (eg, injectables or inhaled insulin) or medication delivery systems (eg, insulin pumps and closed-loop systems) have additional requirements to maximize effectiveness and safe use. When actual use of medications differs from prescribed plans, the members of the health care team can conduct further ***Problem Solving***.

### Share medication beliefs and concerns

Health and cultural beliefs about medications are important discussion points when deciding upon appropriate therapeutic options and navigating health plans for coverage for individuals with diabetes and related conditions.[92] Taking medication as prescribed is more likely when individuals perceive medication is efficacious (ie, when they see or feel that the medication has brought a positive and immediate outcome).[105] Consequently, individuals may discontinue therapy when they do not experience a noticeable change. Similarly, even a single episode of hypoglycemia can affect medication-taking behavior.[106] As active listeners, diabetes care and education specialists can be vital to eliciting these conversations with individuals with diabetes and related conditions.[107] This collaboration can then lead to evaluating and addressing person-centered medication concerns, such as side effects, efficacy, cost,

personal preference and lifestyle, acceptable risk of hypoglycemia, weight goals, and appropriate complexity of plan.[92] Shared decision making (***Problem Solving***) around medication use enhances engagement, promotes prevention and risk reduction, and improves outcomes.[108-110]

## Monitoring

Monitoring has expanded beyond self-monitoring of blood glucose to include monitoring of blood pressure, activity, nutritional intake, weight, medication, feet/skin, mood, sleep, symptoms like shortness of breath, and other aspects of self-care. Although monitoring can still include the use of paper and pencil to record data, new methods of data collection are available that enable individuals to more easily record data[111] and are less vulnerable to misreporting.[112] Furthermore, tracking lifestyle data with notes adds context to metabolic data, aiding in interpretation and more informed decision making. With connected devices and other technologies, remote patient monitoring and virtual collaborative care are possible. Encounters are no longer time bound; these encounters can be data driven, and with the right timing and appropriate touchpoints, they can be influential in behavior change and in building self-management capability. Continuous glucose monitoring[113] has transformed intermittent monitoring to monitoring in real time, providing insight into measures such as time in range (TIR) and glucose management indicator (GMI) in its continuous data delivery.

The behavior of Monitoring acts as a springboard into the other 6 self-care behaviors; the behavior itself produces data, and knowing how to use these data supports change. As an example, glucose monitoring may reveal episodes of hypoglycemia. When the data are collected (***Monitoring***) and shared with the health care team, they fuel discussions to find solutions (***Problem Solving***). Solutions may span multiple self-care behaviors, such as adjusting the time of physical activity to after a meal (***Being Active***), having a snack with carbohydrate (***Healthy Eating***), transitioning from a sulfonylurea to a glucagon-like peptide 1 (***Taking Medication***), maintaining a positive outlook when results are out of range (***Healthy Coping***), and carrying glucose gel as a precautionary measure (***Reducing Risk***). Table 5 includes immediate and intermediate outcomes, methods and frequency of measurement, and examples of implementation within the healthy coping behavior.

## Behaviors That Contribute to Healthier Outcomes

### Track appropriate and accurate information

The self-care behavior of ***Monitoring*** for diabetes and cardiometabolic conditions includes both metabolic and lifestyle tracking.[114] With the ability to track more variables, the health care team must agree upon which information to track and evaluate, as well as the frequency with which to track these measures to prevent data overload and decrease time burdens associated with interpretation. Devices may require calibrations, maintenance, special instructions, and other care to capture data accurately.

### Maintain and share organized records

The presentation of data, whether done manually or automatically, must make sense to the individual(s) using it. Organized records simplify interpretation and improve goal setting and shared decision making among the members of the health care team, which can equate to medication adjustments between visits (***Reducing Risks*** and ***Problem Solving***).[115] Technology can facilitate monitoring, record-keeping, and sharing data within the health care team.

### Identify trends

Structured self-monitoring of blood glucose, such as obtaining a 7-point profile of blood glucose values at fasting, preprandial and 2 hours postprandial at each meal, and bedtime, provides an opportunity to identify trends over consecutive days and improve outcomes.[116] The revolutionary change from self-monitoring of blood glucose to continuous glucose monitoring has also underscored the value of trending data and its impact on quality of life.[117] Closer examination of multiple data points can yield more meaningful information than an isolated value; the identification of these patterns further spurs behavior change. This overarching approach (rather than single values) may also help relieve the emotional triggers, such as pride, embarrassment, disappointment, or anger, associated with unexpected values (***Healthy Coping***).

### Be empowered and engaged

The ability to see cause and effect through monitoring makes it an effective motivation tool. Engagement in self-monitoring can result in clinical improvements, such as

improved blood pressure.[118] Patient-generated health data (PGHD) also have the potential of improving safety, quality, care coordination, and shared decision making.[119] Individuals living with diabetes and related conditions actively contribute to data creation and gathering in ***Monitoring***, empowering people to share their valuable expertise in self-care.

## Reducing Risks

Reducing risk refers to identifying risks and implementing behaviors to minimize and/or prevent complications or adverse outcomes. These include hypoglycemia, hyperglycemia, diabetes-related ketoacidosis (DKA), hyperosmolar hyperglycemic state (HHS), retinopathy, nephropathy, neuropathy, and cardiovascular complications.[120,121] The ADA's Standards of Medical Care in Diabetes provide standards and evidence to promote health and decrease risk for people with diabetes.[120] Table 6 includes immediate and intermediate outcomes, methods and frequency of measurement, and examples of implementation within the healthy coping behavior.

## Behaviors That Contribute to Healthier Outcomes

### Act early

Awareness of prediabetes is positively associated with engaging in risk reduction behaviors.[122] The National Diabetes Prevention Program provides an evidence-based approach focused on preventing or delaying the onset of type 2 diabetes for those with prediabetes or risk factors for diabetes.[123,124] This program, focused on lifestyle interventions, has shown clinically meaningful cardiometabolic health improvements related to weight, A1C, fasting blood glucose, systolic and diastolic blood pressure, and total and high-density lipoprotein (HDL) cholesterol.[125,126] These lifestyle modifications tie to the self-care behaviors of ***Healthy Eating*** and ***Being Active***, in addition to ***Taking Medications***.

### Participate in DSMES

Research has demonstrated that participating in DSMES can lower A1C by as much as 1%[127] and that A1C improvements are associated with a decrease in microvascular and potentially macrovascular complications.[128-130] Research also reveals that this participation has decreased acute care visits, hospitalizations, and readmissions,[131] which contributes to cost savings within the health care system. Participation in DSMES can increase utilization of primary care and preventive services, such as laboratory testing, eye and dental exams, and screenings for complications, aligning with best practice treatment measures over time.[132-134]

### Aim for adequate sleep

People with diabetes are more likely to sleep poorly due to sleep apnea, restless legs syndrome, peripheral neuropathy, depression, hypoglycemia, and hyperglycemia. This lack of or poor quality of sleep contributes to elevated blood glucose and A1C levels, weight gain, and an increased risk of heart disease and obesity. Lifestyle measures and other treatments are available to promote sleep and lower the risk of complications resulting from inadequate rest.[135]

### Plan and do

Individualized risk reduction practices, such as receiving vaccines for flu, pneumonia, and hepatitis B, and participating in behavior change programs related to tobacco use have the potential to improve health across populations.[136] A seemingly simple recommendation to obtain a dilated eye exam requires individuals to complete several steps and make decisions. In this example, obtaining a dilated eye exam requires ***Problem Solving*** to determine which provider to use and at what cost; to schedule the appointment; to handle the logistics of getting to the appointment; and then to actively participate in the visit (***Reducing Risk***). Being able to plan an activity and divide it into achievable tasks fosters success in this behavior.

### Engage in health

Information gathered from self-monitoring (***Monitoring***) or from labs ordered by a provider (such as A1C, lipids, or kidney function tests) can serve as the basis for interest in improving self-care behaviors. Using data from self-monitoring of blood pressure and of blood glucose can contribute to effective self-management, lowering diabetes and cardiometabolic complications.[137-139] Individuals become engaged in their health when they take a more active role, such as preparing questions in advance for their appointments, sharing their health records, or inquiring about their lab results. Active participation in health also relies on an individual's skills in ***Healthy Coping*** to be able to (1) acknowledge the value in preventing health problems that are not yet tangible and (2) recognize the power of individual behavior to change health outcomes.

Table 1

Diabetes Self-Management Education and Support (DSMES) Core Outcome Measures: Healthy Coping.

| | Outcomes Measurement Process | | | |
|---|---|---|---|---|
| | Measurement/Assessment | | Monitoring | Management |
| **DSMES Core Outcome Measures (Diabetes Self-Care Behaviors)** | **Immediate Outcome Learning and Barrier Resolution** | **Intermediate Outcome/Behavior** | **Recommended Interval Between Measurement** | **Outcomes Information Used to Drive Decision Making and the Delivery of Care** |
| **Healthy Coping** | **Knowledge**<br>• Internal and external motivators<br>• Benefits of solution-focused problem solving<br>• Active self-management<br>• Value of nurturing support system (peers, online, family, friends)<br>• Individual empowerment<br>• Role as partner with other members of health care team<br>**Skills**<br>• Goal setting<br>• Problem solving<br>• Coping strategies<br>• Self-efficacy<br>**Barriers**<br>• Physical<br>• Financial<br>• Emotional<br>• Competing priorities<br>• Lack of support network<br>• Psychosocial distress including diabetes distress<br>• Cognitive including mental health disorders | **Measures**<br>• Depression score<br>• Stress level<br>• Quality of life (perceived self-efficacy, perceived disease severity, perceived interference of chronic disease)<br>• Functional measurement<br>• Treatment self-efficacy<br>• Level of empowerment<br>• Absenteeism<br>• Presence of support<br>**Methods of measurement**<br>• Self-report<br>• Skills, Confidence, and Preparedness Index (SCPI)<br>• Problem Areas in Diabetes (PAID)<br>• Quality-of-life (QOL) tools, such as SF-36 or SF-12 with Appraisal of Diabetes Scale (ADS)<br>• Depression/diabetes distress tools, such as Diabetes Distress Scales (DDS), Parents-DDS, Partners-DDS, T1-DDS, or DDS; Beck Depression Inventory (BDI); Patient Health Questionnaire 9<br>• Cognitive impairment tools, such as Saint Louis University Mental Status (SLUMS); Mini-Mental Status Exam (MMSE) | **Learning outcomes**<br>• Evaluated with each encounter<br>**Behavioral outcomes**<br>• Baseline<br>• 2 to 4 weeks<br>• Every 3 to 6 months<br>• During transition periods, such as development of complications or life cycle changes | **Behavior** (infrequent or inconsistent self-monitoring blood glucose and medication taking) The diabetes specialist notes a change in Mark's blood glucose records. Mark appears frustrated with himself for not performing self-monitoring of blood glucose and not taking medication as recommended.<br>**Barrier identification** (depression, feeling overwhelmed) Mark explains feeling overwhelmed and depressed most of the time. The diabetes specialist acknowledges his feelings and asks if Mark would be willing to take a short survey to evaluate these symptoms. Mark agrees to take the PHQ-9, which yields a result of mild to moderate depression.<br>**Barrier resolution** (follow-up for depression recommended) The diabetes specialist and Mark discuss the PHQ-9 results. Mark agrees to see a behavioral health specialist and primary care provider for treatment.<br>**Behavior change** (increased/more consistent self-monitoring of blood glucose and medication taking) At the 3-month follow-up, Mark reports a greater interest in taking charge of his health after starting an antidepressant and behavior therapy. Mark shares his monitoring records and is proud of the changes he has made. |

## Problem Solving

Problem solving is defined as "a learned behavior that includes generating a set of potential strategies for problem resolution, selecting the most appropriate strategy, applying the strategy, and evaluating the effectiveness of the strategy."[5] It is an essential skill for effectively self-managing diabetes and successfully implementing desired behaviors.[5,140] In fact, DSMES uses problem solving as a strategy to facilitate goal setting, goal achievement, and skill attainment. The National Standards for Diabetes Self-management Education and Support[16] recommend curricula designs that address

Table 2

Diabetes Self-Management Education and Support (DSMES) Core Outcome Measures: Healthy Eating.

| | Outcomes Measurement Process | | | |
|---|---|---|---|---|
| | Measurement/Assessment | | Monitoring | Management |
| **DSMES Core Outcome Measures (Diabetes Self-Care Behaviors)** | **Immediate Outcome Learning and Barrier Resolution** | **Intermediate Outcome/Behavior Change** | **Recommended Interval Between Measurement** | **Outcomes Information Used to Drive Decision Making and the Delivery of Care** |
| **Healthy Eating** | **Knowledge**<br>• Effect of foods/beverages on metabolic parameters (including blood glucose, lipids, blood pressure, weight, etc)<br>• Sources and distribution of nutrients (nutrient-dense carbohydrates, lean proteins, healthy fats)<br>• Eating patterns (frequency of meals, timing, portions, etc)<br>• Resources to assist in food choices<br>• Macronutrient composition (quality, quantity, combination, substitutions)<br>**Skills**<br>• Meal planning<br>• Portion awareness and management<br>• Planning strategies (Carb Counting, Exchanges, Plate Method, Mindful Eating)<br>• Nutrition Facts Label comprehension<br>• Special situations and problem solving (planning, shopping, meal delivery/kits, eating away from home at work/school/ restaurants)<br>**Barriers**<br>• Environmental factors<br>• Cultural and family influences<br>• Food and health beliefs<br>• Financial (food security)<br>• Cognitive<br>• Health literacy and numeracy<br>• Emotional<br>• Meal pattern sustainability | **Measures**<br>• Types of food choices<br>• Amounts consumed<br>• Timing of meals and snacks<br>• Alcohol (with or without food, amount, frequency)<br>• Fluids (adequate hydration)<br>• Effect of food/beverages on metabolic parameters<br>• Progress toward goal achievement<br>**Methods of measurement**<br>• Observation<br>• Self-report (24-hour recall, typical day, food frequency, food diaries)<br>• Monitoring tools with associated records<br>• Goal setting | **Learning outcomes**<br>• Evaluate with each encounter<br>• Ongoing self-evaluation and adjustments with life cycle events and secondary diseases<br>**Behavioral outcomes**<br>• Baseline<br>• 2 to 4 weeks<br>• Every 3 to 6 months<br>• Annual follow-ups<br>• When lifestyle or health status changes | **Behavior** (inconsistent food intake) Suzy shares her food and blood glucose records. The diabetes specialist praises Suzy for her self-monitoring efforts and reviews her records. They discuss eating behaviors, such as skipped meals and overeating.<br>**Barrier identification** (ineffective problem solving) Suzy does not plan for eating meals/snacks when away from home (for work or school); risks include food availability and timing issues.<br>**Barrier resolution** (increased knowledge regarding importance of meal planning) The diabetes specialist and Suzy work together to identify potential healthy eating patterns, identify Susie's strengths, and set a realistic goal to apply those strengths for change. Suzy becomes more aware of her eating when away from home. She considers options to improve meal planning for meals/ snacks at home and away. She reports increased energy and positive feeling of successful self-management when she participates in these behaviors.<br>**Behavior change** (consistent food intake, improved blood glucose, cardiometabolic parameters, weight management) Suzy now plans, shops, and packs meals/ snacks in advance. She also reviews menus of other food options for purchase. Blood glucose levels and labs more consistently in the target range are evident at 6-month follow-up. |

Table 3

Diabetes Self-Management Education and Support (DSMES) Core Outcome Measures: Being Active.

| DSMES Core Outcome Measures (Diabetes Self-Care Behaviors) | Outcomes Measurement Process | | | |
|---|---|---|---|---|
| | Measurement/Assessment | | Monitoring | Management |
| | Immediate Outcome Learning and Barrier Resolution | Intermediate Outcome/Behavior | Recommended Interval Between Measurement | Outcomes Information Used to Drive Decision Making and the Delivery of Care |
| **Being Active** | **Knowledge**<br>• Planned exercise (type, duration, intensity, frequency, progression)<br>• Daily movement<br>• Breaking up sedentary time<br>• Safety precautions, such as obtaining preparticipation medical clearance and/or exercise stress testing prior to unaccustomed vigorous activity<br>• Special considerations, such as appropriate footwear<br>**Skills**<br>• Appropriate daily movement and physical activity plan<br>• Adjustment of activity with food and medication to maintain glycemic balance<br>• Monitoring of cardiometabolic parameters, data stream, and feedback<br>**Barriers**<br>• Physical (health conditions, injuries)<br>• Perceived lack of time<br>• Environment, facilities<br>• Fear (hypoglycemia)<br>• Self-efficacy<br>• Lack of enjoyment<br>• Lack of social support | **Measures**<br>• Type, frequency, duration, and intensity of planned activities<br>• Daily movement<br>• Progress toward goal achievement<br>• Quality of life, health improvement<br>**Methods of measurement**<br>• Self-report<br>• Goal setting<br>• Monitoring tools and their associated records including digital health tracking and wearable technologies<br>• Quality of life and health assessments<br>• Exercise Vital Sign (EVS) to evaluate whether weekly goals for physical activity have been met:<br>  • On average, how many days per week do you engage in moderate to strenuous exercise (like a brisk walk)?<br>  • On average, how many minutes do you engage in exercise at this level?<br>• Physical Activity Vital Sign (PAVS) when individual is physically active for at least 30 minutes per day<br>  • How many days during the past week have you performed physical activity where your heart beats faster and your breathing is harder than normal for 30 minutes or more?<br>  • How many days in a typical week do you perform activity such as this? | **Learning outcomes**<br>• Evaluate with each encounter<br>**Behavioral outcomes**<br>• Baseline<br>• 2 to 4 weeks<br>• Every 3 to 6 months | **Behavior** (lack of physical activity) When prompted by her diabetes specialist, Jill discusses/shares that she's had little success in her goal of increasing physical activity over the last 6 weeks.<br>**Barrier identification** (environment) The diabetes specialist and Jill discuss barriers and discover previous success at an exercise facility years ago. Jill currently does not feel comfortable attending due to her increased weight and perceived body image.<br>**Behavior resolution** (environment changed) Through discussion and problem solving with the diabetes specialist, Jill agreed to try a women's-only exercise club near work that was convenient and nonthreatening.<br>**Behavior change** (increased activity) At 1-month follow-up, Jill reports performing aerobic exercise (planned) 3 to 5 days per week. She increased her total daily movement and already lost 5 pounds.<br>**Behavior** (lack of physical activity): At her virtual appointment with her diabetes specialist, Sarah shares her desire to be more active but is unsure how to get started.<br>**Barrier Identification** (financial): The diabetes specialist and Sarah discuss options. Sarah discloses that she cannot afford a gym membership but is willing to purchase a wearable. The diabetes specialist and Sarah review basics of a wearable and strategies to stay engaged.<br>**Barrier resolution (**try wearable): Sarah purchases a wearable for activity tracking and joins a weekly virtual contest on the associated mobile app. She wants to win the weekly contest by getting the most steps and agrees upon an initial goal of 4000 steps per day on most days of the week.<br>**Behavior change** (increase activity): At a 1-month follow-up, Sarah shares her activity tracker report with the diabetes specialist, which reveals an average step count of 3000 to 5000 on most days of the week. The diabetes specialist praises Sarah for her commitment to physical activity and encourages Sarah to increase her goal. Sarah feels confident in setting a goal for 7000 steps for 5 days per week within the next month. |

Table 4

Diabetes Self-Management Education and Support (DSMES) Core Outcome Measures: Taking Medication.

| | Measurement/Assessment | | Monitoring | Management |
|---|---|---|---|---|
| **DSMES Core Outcome Measures (Diabetes Self-Care Behaviors)** | **Immediate Outcome Learning and Barrier Resolution** | **Intermediate Outcome/Behavior** | **Recommended Interval Between Measurement** | **Outcomes Information Used to Drive Decision Making and the Delivery of Care** |
| **Taking Medication** | **Knowledge**<br>• Name, dose, frequency, and optimal timing of medications<br>• Medication mechanism of action<br>• Common side effects, toxicity<br>• Action for adverse effects<br>• Action for missed dose<br>• Storage, travel, safety, and disposal<br>• Recognition of efficacy, optimal outcomes, and therapeutic goals<br>**Skill**<br>• Maintenance of a medication list<br>• Preparation, technique, administration<br>• Safe handling, disposal of equipment<br>• Dose adjustment<br>• Recognition, treatment, prevention of common adverse effects<br>**Barriers**<br>• Plan complexity (greater than 1 medication or dose daily)<br>• Physical (vision or dexterity)<br>• Financial (medication cost, copay)<br>• Health beliefs (skeptical of benefit, worried about side effects)<br>• Health literacy and numeracy<br>• Cognitive (dose recall, refill initiation)<br>• Psychological (depression, fear, or embarrassment)<br>• Change in schedule or work status | **Measures**<br>• Medication taking<br>• Prescription filling<br>• Dose accuracy<br>• Glycemic trends<br>• Metabolic trends<br>• Emergency department and hospital utilization<br>• Weight change<br>**Methods of measurement**<br>• Self-report and medication records<br>• Review of pharmacy refill history<br>• Pill count<br>• Return demonstration (observation, role-playing)<br>• Labs (A1C, total cholesterol, LDL cholesterol, etc)<br>• Monitoring tools with associated records (such as records for blood glucose, blood pressure, weight, medication use, etc) | **Learning outcomes**<br>• Evaluated with each encounter<br>**Behavioral outcomes**<br>• Baseline<br>• 2 to 4 weeks (may be earlier in cases such as new to insulin therapy)<br>• Every 3 to 6 months, or if medication concerns are suspected | **Behavior** (adapting to new medication/dose) The diabetes specialist and Jack review his current medication list. The diabetes specialist identifies a new dose of medication listed in the electronic health record that does not match with Jack's list. The diabetes specialist asks about the new dose and Jack reports that he has not picked it up at the pharmacy.<br>**Barrier identification** (lack of understanding) The diabetes specialist and Jack review the medication list and discuss the new dose. After asking a few questions, the diabetes specialist uncovered that Jack did not understand the dose change instructions at the last visit. The diabetes specialist and Jack update his medication list together and discuss his concerns about the new medication regimen.<br>**Barrier resolution** (increased knowledge of medication plan) By the end of the visit, Jack can accurately describe the new plan and reports feeling more comfortable with the change. They outline a plan for Jack to obtain the new dose of medication.<br>**Behavior change** (medication-taking behavior) The diabetes specialist contacts Jack through an electronic message in a web portal that links to the electronic health record. Jack reports taking the new dose of medication as prescribed. Jack uploads his blood glucose records to the portal for review by the diabetes specialist and other members of the health care team. The diabetes specialist replied with an electronic message to congratulate Jack for an increase in time in range and encouraged him to continue with his medication-taking behavior. |

Abbreviation: LDL, low-density lipoprotein.

decision-making and problem-solving skills. At the most basic level, problem solving is a process that involves 3 steps: (1) identify the problem, (2) develop alternative solutions, and (3) select, implement, and evaluate the solutions.[141]

The use of problem-solving skills has been associated with positive clinical outcomes, specifically an improvement in A1C.[142,143] Problem-solving models have proven effective among low-income urban[144,145] and rural underserved populations.[146] The ability to problem solve is affected by self-efficacy (***Healthy Coping***). When individuals succeed in solving their self-identified problems, they gain confidence in their ability to handle future challenging situations,[147] enhancing their self-efficacy.

Table 5

Diabetes Self-Management Education and Support (DSMES) Core Outcome Measures: Monitoring.

| | Outcomes Measurement Process | | | |
|---|---|---|---|---|
| | Measurement/Assessment | | Monitoring | Management |
| **DSMES Core Outcome Measures (Diabetes Self-Care Behaviors)** | **Immediate Outcome Learning and Barrier Resolution** | **Intermediate Outcome/Behavior** | **Recommended Interval Between Measurement** | **Outcomes Information Used to Drive Decision Making and the Delivery of Care** |
| **Monitoring** | **Knowledge**<br>• Monitoring plan/schedule (structured, episodic, continuous, etc)<br>• Appropriate lifestyle data to track<br>• Target values<br>• Safety issues including disposal of lancets<br>• Use of data for decision making<br>• Awareness of body's symptoms (eg, blurred vision, shortness of breath) and/or physical changes (eg, teeth, skin, gums)<br>**Skills**<br>• Equipment use and technical care (blood glucose meter, continuous glucose monitor, blood pressure cuff, wearable, mobile app, etc)<br>• Recordkeeping with note taking<br>• Tracking and reporting body symptoms and physical changes<br>• Interpretation of patient-generated health data<br>**Barriers**<br>• Physical<br>• Financial<br>• Cognitive<br>• Emotional<br>• Time<br>• Inconvenience<br>• Treatment burden<br>• Health literacy and numeracy<br>• Limited understanding of value of data and how to use them<br>• Lack of interest/ability to use equipment and other tools for self-monitoring | **Measures**<br>• Frequency of self-monitoring<br>• Schedule of monitoring<br>• "Unscheduled" monitoring (triggered by symptoms, etc)<br>• Number of devices/apps used to support monitoring<br>• Blood glucose values<br>• Time in range (TIR)<br>• Glucose management indicator (GMI)<br>• Blood pressure values<br>• Hours of sleep<br>• Mood status<br>• Amount of time performing physical activity, number of steps<br>• Medication use/insulin doses<br>• Amount of carbohydrate consumed, meal size<br>• Presence of notes that add context to tracked data<br>• Presence of organized data that allows for decision making<br>**Methods of measurement**<br>• Monitoring tools and their associated records (log book, device memory review, printouts)<br>• Self-report responses to questions/surveys | **Learning outcomes**<br>• Evaluate with each encounter<br>(Review of automated data provides insights into knowledge and use of monitoring device(s))<br>**Behavioral outcomes**<br>• Baseline<br>• 2 to 4 weeks<br>• Every 3 to 6 months<br>(May do more often based on virtual care/remote monitoring program guidelines) | **Behavior** (minimal self-monitoring of blood glucose [SMBG]) Tyler shares his blood glucose records with his diabetes specialist. The diabetes specialist identifies sporadic monitoring on weekdays.<br>**Barrier identification** (treatment burden) The diabetes specialist praises Tyler for his recordkeeping and asks about the gaps. Tyler reports that he avoids checking blood glucose at work.<br>**Barrier resolution** (use of continuous glucose monitoring [CGM]) The diabetes specialist reviews other options to capture blood glucose with Tyler. Tyler is curious about the continuous glucose monitor and agrees to try it.<br>**Behavior change** (obtaining blood glucose data through SMBG and CGM) After instruction on the equipment and calibrations, Tyler felt ready to wear a CGM for a trial of 1 week. He continues to prefer this method of monitoring blood glucose and provides these records to his health care team for shared decision making regarding his insulin plan.<br>**Behavior** (monitoring blood pressure) While at her appointment with the diabetes specialist, Kaitlyn acknowledges the importance of managing her blood pressure and feels frustrated that she can only see her blood pressure measurements during office visits.<br>**Barrier identification** (financial/health literacy) The diabetes specialist and Kaitlyn discuss the possibility of taking blood pressure measurements at home. Kaitlyn is concerned about the cost of a blood pressure cuff.<br>**Barrier resolution** (health insurance navigation and equipment training) The diabetes specialist works with Kaitlyn to help her obtain a blood pressure cuff through her health insurance plan. The diabetes specialist teaches Kaitlyn how to use it to produce accurate results.<br>**Behavior change** (additional monitoring for hypertension) Kaitlyn now tracks her blood pressure outside of office visits and generates a report to share with her health care team for collaboration and treatment adjustments. |

Table 6

Diabetes Self-Management Education and Support (DSMES) Core Outcome Measures: Reducing Risks.

| DSMES Core Outcome Measures (Diabetes Self-Care Behaviors) | Outcomes Measurement Process | | | |
|---|---|---|---|---|
| | Measurement/Assessment | | Monitoring | Management |
| | Immediate Outcome Learning and Barrier Resolution | Intermediate Outcome/Behavior | Recommended Interval Between Measurement | Outcomes Information Used to Drive Decision Making and the Delivery of Care |
| **Reducing Risks** | **Knowledge**<br>• Safety (sick day plan, driving/ machine operation precautions, emergency preparedness)<br>• Standards of care<br>• Therapeutic goals<br>• Symptoms that require attention or follow-up (hypoglycemia, hyperglycemia, rapid weight fluctuation, stroke, heart attack, bleeding gums, vision changes, skin changes)<br>• How to decrease risks/prevent harm (prepregnancy counseling, smoking cessation, etc)<br>**Skills**<br>• Planning<br>• Monitoring of blood glucose (self, continuous)<br>• Maintaining personal care record<br>• Performing self-foot exam<br>• Performing self-skin exam<br>• Self-monitoring of blood pressure<br>• Use of health apps and web portals<br>• Ability to adjust food, medication, and activity (to increase the amount of time glucose is in range)<br>• Recognition of concerning symptoms or changes in health<br>• Ability to determine when health requires care from health care team (emergency vs nonemergency)<br>**Barriers**<br>• Financial (lack of personal resources; insurance barriers such as high deductible, underinsured, step therapy requirements; insufficient monitoring supplies; food insecurity)<br>• Unawareness of disease process and its seriousness<br>• Lack of access to diabetes self-management education services or health care providers<br>• Therapeutic inertia<br>• Physical (hypoglycemia unawareness)<br>• Cognitive<br>• Emotional<br>• Lack of self-efficacy and coping strategies<br>• Poor support network including lack of rapport with provider<br>• Perceived lack of time | **Measures**<br>• Glycemic trends<br>• Frequency of low or high blood glucose<br>• Frequency of contact with health care provider for problem resolution<br>• Missed days from work, school, or related activities<br>• Number of visits to the emergency department or hospitalizations<br>• A1C<br>• Lipids<br>• Blood pressure<br>• Kidney tests (urine albumin excretion and serum creatinine for estimated glomerular filtration rate, urine albumin creatinine ratio)<br>• Weight and body mass index (BMI)<br>• Scheduled vs attended visits with health care team<br>• Dilated eye exam<br>• Immunization status (flu vaccine, pneumonia vaccine, hepatitis B)<br>• Screening for hearing loss<br>• Dental exam<br>• Sleep study<br>• Smoking status<br>• Frequency of foot self-exam<br>• Comprehensive foot exam<br>• Screening for sexual dysfunction<br>• Neuropathy<br>• Aspirin therapy<br>• Frequency of medication adjustment<br>• Sick day plan<br>**Methods of measurement**<br>• Self-report<br>• Chart or exam code audit<br>• Review of monitoring records<br>• Demonstration of self-care activities | **Learning outcomes**<br>• Evaluated with each encounter<br>**Behavioral outcomes**<br>• Baseline<br>• 2 to 4 weeks<br>• Every 3 to 6 months<br>• Annual follow-ups | **Behavior** (frequent hypoglycemia) During her visit with the diabetes specialist, Samantha reports 5 episodes of hypoglycemia in the past month. Samantha notes that these episodes occurred after doing extra work in her vegetable garden.<br>**Barrier identification** (knowledge deficit) After discussion with the diabetes specialist about hypoglycemia, Samantha realized she had not considered gardening as physical activity. In addition, she had not realized that her medication (sulfonylurea) increased the likelihood of hypoglycemia.<br>**Barrier resolution** (information provided) The diabetes specialist reviewed signs, symptoms, and treatment of hypoglycemia. The diabetes specialist and Samantha discussed scenarios with increased risk of hypoglycemia and then problem solved how to balance food, activity, and medication to reduce risk for hypoglycemia.<br>**Behavior change** (decrease in hypoglycemia) During her 1-month follow-up, Samantha reported only 1 episode of hypoglycemia. She was able to detect signs ("starting to feel shaky") after taking a walk with a neighbor. Samantha reports now carrying a source of glucose with her, treating low values with approximately 15 g of carbohydrate and rechecking blood glucose until a return to a safe blood glucose level.<br>**Behavior** (no eye exam) The diabetes specialist asked Cathy about her preventive exams this year. Cathy reports that her most recent dilated eye exam was 3 years ago.<br>**Barrier identification** (knowledge deficit) Cathy does not believe she needs a dilated eye exam since she is not experiencing visual disturbances. She is content with the magnifying glasses she uses.<br>**Barrier resolution** (knowledge of importance provided) Cathy reports that she had not known that her eyes were affected by diabetes. The diabetes specialist and Cathy discussed the rationale of preventive dilated eye exams and recommended frequency. Cathy agreed to make an appointment after confirming that this was a covered benefit under her insurance plan.<br>**Behavior change** (dilated eye exam done) Cathy sent a message to her diabetes specialist through her portal to let her know that she had completed her dilated eye exam. Cathy obtained a copy of her report and shared it with the rest of her health care team through the portal. |

Table 7

Diabetes Self-Management Education and Support (DSMES) Core Outcome Measures: Problem Solving.

| | Outcome Measurement Process | | | |
|---|---|---|---|---|
| | Measurement/Assessment | Monitoring | Management | |
| **DSMES Core Outcome Measures (Diabetes Self-Care Behaviors)** | **Immediate Outcome Learning Barrier Resolution** | **Intermediate Outcome/ Behavior** | **Recommended Interval Between Measurement** | **Outcomes Information Used to Drive Decision Making and the Delivery of Care** |
| **Problem Solving** | **Knowledge**<br>• Complexity and challenges of diabetes<br>• Changes in diabetes throughout the life cycle<br>• Changes in diabetes as it progresses<br>• Relevant diabetes self-management education and support knowledge items (see other behaviors)<br>**Skills**<br>• Relevant diabetes self-management education and support skill items<br>• Ability to recognize/identify problem<br>• Ability to generate potential solutions<br>• Ability to transfer past experience(s)<br>• Ability to finalize solution<br>• Ability to measure/monitor results<br>**Barriers**<br>• Cognitive<br>• Health literacy and numeracy<br>• Lack of self-efficacy and coping strategies<br>• Financial<br>• Time<br>• Emotional<br>• Lack of or limited support network<br>• Physical | **Measures**<br>• Glycemic trends including time in range (TIR) and glucose management indicator (GMI)<br>• A1C<br>• Other health indicators (weight, blood pressure, etc)<br>• Frequency of phone calls/visits to provider<br>• Quality-of-life indicators (missed days of work/school, frequency of hypoglycemia, etc)<br>• Confidence level (in situational problem solving)<br>• Progress toward goal achievement<br>• Level of diabetes distress<br>• Frequency of acute complications<br>• Problem Areas in Diabetes (PAID) score<br>• Frequency of medication adjustment<br>**Methods of measurement**<br>• Self-report<br>• Return demonstration/ teach-back<br>• Goal setting<br>• Monitoring tools and associated records (data from meter, continuous glucose monitor, device, app, lab)<br>• Health Problem Solving Scale (HPSS)<br>• Summary of Diabetes Self-Care Activities scale (SDSCA) | **Learning outcomes**<br>• Evaluated with each encounter<br>**Behavioral outcomes**<br>• Baseline<br>• 2 to 4 weeks<br>• Every 3 to 6 months<br>• When perceived problems arise | **Behavior** (lack of blood glucose monitoring) Dan reports frequent hypoglycemia in the past month but did not have any blood glucose records to share. The diabetes specialist probed further to uncover that all of these episodes of hypoglycemia occurred at work.<br>**Barrier identification** (coping) The diabetes specialist and Dan review his workday, medication-taking behaviors, eating, and activity habits. Dan pinpoints that he has had an increased workload and sometimes skips lunch.<br>**Barrier resolution** (problem solving) The diabetes specialist and Dan work together to clarify the problem and identify potential solutions. Dan does not feel comfortable approaching his supervisor about taking lunch. However, he is willing to talk with human resources to identify appropriate breaks at work. The diabetes specialist and Dan discuss the plan and role-play the discussion.<br>**Behavior change** (decrease in hypoglycemia) After confirming his allowed breaks, Dan chooses to make time for lunch at work. He reports 1 episode of hypoglycemia in the past month, unrelated to work. Dan agrees to share his blood glucose records with his diabetes specialist for additional follow-up. |

Table 7 includes immediate and intermediate outcomes, methods and frequency of measurement, and examples of implementation within the healthy coping behavior.

## Behaviors That Contribute to Healthier Outcomes

Unlike the other 6 self-care behaviors, a foundation of knowledge and skills in the other 6 behaviors is helpful for effective ***Problem Solving*** in diabetes self-management.

### Ask for clarification and disclose challenges

The language and terms used in health care can be confusing and difficult to understand. The Centers for Disease Control and Prevention estimate the challenge of *health literacy and numeracy* affects 9 out of 10 adults.[148] Moreover, cognitive ability is strongly associated with literacy skills; these abilities include storage of knowledge (crystallized abilities) and the ability to learn and apply new information (fluid abilities).[51] Due to the complexity of problem solving, this self-care behavior

requires a sustained partnership between individuals, diabetes care and education specialists, and health care providers. This implies that individuals need to openly share their concerns and discuss their limitations, and the other members of the health care team need to listen closely and thoroughly assess individuals' knowledge, skills, and barriers; this teamwork encourages proper problem identification and effective self-management.

#### Participate in shared decision making and collaborative goal setting

Various approaches exist to support shared decision making, including transferring information, prioritizing decisions, and discussing the advantages and disadvantages of available choices.[149] Goal setting is also an essential component of collaborative care; it creates a sense of purpose while increasing positive solution-based thinking.[150] Research shows that goal setting is positively associated with A1C levels.[151,152] Since self-identified problems or goals are most relevant to the individual with diabetes or related conditions, these problems are appropriate starting points for collaboration and shared decision making among the members of the health care team.

#### Create an environment that promotes health

Many factors, such as economic stability, employment, education, social and community context, health care systems, and neighborhoods, influence health and therefore affect the ability of an individual to self-manage a health condition. These social determinants of health are defined as "conditions in the environments in which people live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks."[153] A positive physical and social environment can reduce or eliminate barriers within each self-care behavior, facilitating the development of problem-solving skills.

#### Be a lifelong learner and learn from choices

An individual's health, as well as advancements in science and health care, change over time, creating the need for lifelong learning. People at risk for and with diabetes and related conditions, as well as their health care teams, benefit from being active learners who seek out information and are assertive in their pursuit to understand new information. Learning from previous choices and then revising plans based on information gained facilitates behavior change and mastery of problem-solving skills, creating a cycle of continual improvement in self-management.[154]

## AADE7: Self-Care + Care TEAM = OPTIMAL Outcomes

The AADE7 model provides a plan for individuals living with diabetes and related conditions to support self-care. It also guides clinical, behavioral, and educational assessment for the health care team. The AADE7 framework serves as a benchmark in continuous quality improvement (CQI) activities, in an effort to measure, monitor, and manage behavior change. Moreover, the AADE7 framework enables individualized, comprehensive care[155] by health care providers using a person-centered[14] and team-based approach.[156] Team-based care has the potential to improve satisfaction, decrease costs, lower readmission rates, and improve health.[157]

For individuals living with diabetes and related conditions, diabetes care and education specialists are key contributors to team-based care. Using the AADE7 framework, diabetes care and education specialists address educational, clinical, psychosocial, and behavioral needs and customize strategies[27] to attain "optimal health and quality of life for persons with, affected by, or at risk for diabetes and other chronic conditions."[2] Their expertise spans therapy optimization, care coordination, care plan development, and integration of new technologies to help achieve the Institute for Healthcare Improvement's Quadruple Aim to (1) improve the health of the population, (2) enhance experiences and outcomes of individuals receiving care, (3) decrease per capita costs, and (4) improve the work life of health care providers.[158]

## Conclusion

It is the position of the American Association of Diabetes Educators (AADE) that, at the cornerstone of diabetes self-management education and support (DSMES), the AADE7 is the framework for achieving behavior change that leads to effective self-management through improved behavior and clinical outcome measures. The AADE7 Self-Care Behaviors® provides a practical model that informs decision making among individuals living with diabetes and related conditions and the members of their health care team in their shared drive for improved health and quality of life. The use of technology has transformed the approach to diabetes self-care and implementation of the AADE7 framework. With the practical framework integrating technology, diabetes care and education specialists have the professional expertise to lead and optimize health care delivery. The AADE7

Self-Care Behaviors® demonstrate that learning, behavioral modification, clinical management, and use of technology effectively improves the clinical and quality of life outcomes for people with diabetes, cardiometabolic, related conditions, and beyond.

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