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Effective strategies for encouraging behavior change in people with diabetes



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Practice points

- Consider the five characteristics of effective messaging for behavior change recommendations. They are clarity, personal meaningfulness, frequency of feedback, active guidance and support, and patient interpretation. Messages conveyed to people with diabetes (PWD) that consider these key characteristics will increase the chances of effective implementation of behavior change.
- Also work to promote trust with PWD by facilitating discussions about the personal side of living with diabetes and barriers to change that may not be offered without direct questioning.
- Consider teaching problem solving in all clinical encounters. Problem solving is a learned skill with documented benefits on behavioral management of diabetes and health outcomes. Teach a simple method of identifying problems, goal setting, brainstorming solutions and implementing and evaluating a solution.
- Go beyond education and consider multiple components to behavior change recommendations. These include bringing in other caregivers and individuals from the community, and ensuring health literacy and numeracy have been considered and addressed.
- Rarely provide a 'one-size-fits-all' recommendation, but instead offer a recommendation that considers the age, gender, ethnicity, community infrastructure and perceptions about diabetes in PWD.
- Screen for psychological factors that may complicate PWD's ability to implement and sustain behavior change recommendations. These include consideration of disordered eating or eating disorder, depressive symptoms and diabetes distress, and worries and fears related to diabetes (immediate and long term).

Behavioral management of diabetes leads to better health outcomes. This paper reviews the available literature on facilitators of behavior change in people with diabetes and highlights approaches and strategies diabetes care providers can utilize. The research and clinical evidence points to the critical nature of considering the content and structure of recommendations, and utilizing problem solving and teamwork approaches. Furthermore, close attention to individual and community factors will optimize behavior change. These

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factors include health literacy, community infrastructure, support within the family, and whether there are co-occurring eating and mood issues. Recommendations are provided to optimize communication and embed behavior change approaches in clinical and community encounters.

Diabetes management is complex and demanding. It is also dynamic with changing medications, technologies and approaches. One constant of diabetes management is behavior; behaviors are involved whether people with diabetes (PWD) is implementing a new treatment regimen task, getting to an appointment or attempting to reduce distress associated with having diabetes. Behaviors common to PWD include remembering and administering a medication, calculating doses based on available information and data, talking with others about diabetes, taking supplies and being prepared for unexpected events, and making appointments and ordering supplies. Behavioral transactions around diabetes management often include several key components – PWD and her/his immediate surroundings, and the diabetes care provider suggesting behavior change. The degree to which recommendations from the diabetes care provider are applied in the daily life of PWD depends on a number of factors including knowledge, past experiences, feelings and beliefs. The premise of this paper is that the implementation of recommendations cannot be achieved without some form of behavior change on the part of PWD. The aims of this paper are to provide a brief context for the focus on behavior change; illustrate what typically does not work and what we can learn from this; and detail what does work to encourage behavior change in PWD.

Brief review

In his 2007 Shattuck Lecture, Schroeder [1] highlighted a number of factors that contribute to premature death in the USA. Among these contributors were behavioral patterns, which in his estimate accounted for 40% of the cases of premature death. Behavioral patterns were more robust contributors than type of healthcare, genetic influences and social factors. While the article had a global focus to improve the health of the American people, the examples of behavioral patterns such as weight management are applicable to people with diabetes and their diabetes care providers. Behaviors executed (or not executed) as part of diabetes management are the driving force behind health outcomes for people with diabetes.

There is no shortage of evidence from clinical practice and research studies that behavior is critical to improved and optimal health outcomes in PWD [2–6]. These findings cut across youth and adults, and Type 1 and Type 2 diabetes. The presence of a hard, biologic marker of diabetes control, the hemoglobin A1c value, was solidified after the findings of the Diabetes Control and Complications Trial (DCCT) [7] were published for people with Type 1 diabetes, and the United Kingdom Prospective Diabetes Study (UKPDS) [8] findings were published for people with Type 2 diabetes. As A1c is now considered the sentinel outcome for diabetes management, multiple studies and reviews have examined how behavior is linked to the A1c value.

Of note, there are numerous influences on A1c in addition to behavioral diabetes management. Much of the A1c value, designating overall diabetes control, can be attributed to behavioral management. Data from multiple studies cutting across types of diabetes and the age span highlight that 30–50% of overall control can be attributed to changes in behavior [9–12]. Other contributors are contextual variables such as family structure and involvement, access to healthcare, psychosocial variables and social support. Thus, A1c is not considered a proxy indicator of behavior; rather, behavioral interventions typically aim to directly impact diabetes management behaviors, which can influence A1c and other health outcomes (e.g., hypoglycemia events, diabetic ketoacidosis events, hospitalizations).

Various terms have been used to designate how closely someone follows the suggested management regimen, but some may be perceived as more evaluative and judgmental (e.g., compliance). Adherence has also been used, but its typical reference to rates of taking medications may not be comprehensive enough to represent the numerous behaviors and actions required for diabetes management. At the core of these terms is a focus on the conduct of behaviors for the purpose of managing diabetes. For the purposes of this paper, to encompass all of the relevant health behaviors and to reduce the risk for a judgmental tone, we call this behavioral management of diabetes.

What can theories of behavior change teach us?

Much of our understanding of why people engage in behavior change, or do not, is tied to theories about health and human behavior. There are volumes dedicated to these theories and each has demonstrated added value to understanding why people behave in certain ways with regard to their health, and how clinician behavior is linked [13]. Several theories are highlighted below, but this is by no means an exhaustive review of all theories nor their components. One of the theories, social cognitive theory, focuses on the reciprocal relationships between behavior, cognitive and social processes [14]. A new behavior can be learned through cognitive processes and modeling and observation are key to the behavior being carried out. Self-efficacy is a key term that grew out of this theoretical framework. Self-efficacy is the degree to which an individual believes she can execute certain behaviors to produce a certain outcome.

Two other theories, the theory of planned behavior [15] and the self determination theory [16], have also been shown to be associated with diabetes management and outcomes. The degree to which someone perceives an ability to control the factors that facilitate or impede the conduct of a behavior shapes their intentions and actual behaviors (theory of planned behavior). The self determination theory is centered on the belief that people have ‘inherent growth tendencies’ to behave in healthy and effective ways and that autonomy, competence and relatedness in their social setting will impact their performance, persistence and creativity.

There are also a number of developmental theories and frameworks that highlight cognitive and emotional changes across the lifespan. In addition, family-focused studies and treatments based on theoretical frameworks (e.g., Robin and Foster’s Behavioral Family Systems model) [17] demonstrate changes across childhood in the extent to which the behavioral management of diabetes is largely performed by the parent/caregiver (early childhood) to an older developmental framework with management being performed largely by the older adolescent or young adult [18,19]. All of these theories noted in this section informed aspects of what is known to be effective in promoting behavior changes. These theories and their components appear in various forms of interventions.

As appropriate, the theoretical link to suggestions for encouraging behavior change will be highlighted in the following sections.

Many other theories delineate the impact of personal health beliefs, expectations, intentions, habits, resources, supports and skills on the uptake and maintenance of health behaviors (e.g., Health Belief Model, Transtheoretical Model, Model of Interpersonal Behavior). While a thorough review of all of the potentially relevant health behavior models is beyond the scope of this paper, it is important to consider the numerous and multilevel influences on behavior change for a complex chronic condition such as diabetes.

What does not work

Most studies and clinical experiences are aimed at optimizing a health outcome through some type of intervention. During this process of testing strategies and interventions with PWD, much is learned about what does not work or what is not sufficient for behavior change. These strategies have been largely examined from the perspectives of the diabetes care provider or the system within which diabetes care is provided. The following themes have been described in more detail, along with alternative approaches, in a host of studies [20–22].

Efforts at promoting behavior change by the diabetes care provider tend to be ineffective or insufficient when they are strictly educational or focus largely on ‘you should’ approaches. There is no doubt that diabetes education is necessary to build foundational knowledge about diabetes management, both initially upon diagnosis and over time as management demands and preferences change [23]. Indeed, some evidence suggests that high-quality diabetes education related to health behaviors may link to cost savings and health benefits for some people [24]. However, various studies including the large-scale diabetes education trial DAFNE in the United Kingdom have concluded that interventions focused on didactic education to improve disease knowledge alone are not sufficient to change behavior and sustain behavioral management of chronic conditions, including diabetes; rather, integration with counseling or behavior change strategies is necessary for longer, lasting impact [4,25–26]. The concept of necessary, but insufficient largely holds true for diabetes education or didactics aimed at pointing out to PWD what should be done.

Similarly, approaches that do not pay attention to personal barriers to behavior change and the context within which behavior change needs to happen will fail more often than not. The contextual barriers to be considered in delivering an intervention range from the degree of health literacy in the individual to the community infrastructure for carrying out behavior change. For example, an individual may not engage in a behavior if he lacks the ‘health literacy’ of how that particular behavior is connected to an important health outcome. Contextual barriers include difficulty carrying out a target health behavior in one’s environment (e.g., no safe places to walk in one’s neighborhood, limited access to fresh fruits/vegetables in a ‘food desert’). If these areas are not addressed while the intervention is recommended or put in to place, there is low likelihood the behavior change will happen and if it does happen initially, it will likely not be maintained over time. To address these challenges, several interventions have been developed to reduce literacy and numeracy burden for individuals with Type 2 diabetes; although benefits are modest, this is critical area for continued work to improve health outcomes in underserved populations [27,28].

What does work

Much of what follows is the result of focused work on optimizing health outcomes, but is also supported by findings of what is not sufficient for behavior change noted in the previous section. Two key areas are covered from the diabetes care provider’s vantage point: how to convey recommendations about desired behavior change in PWD, and the content of those recommendations. Specific suggestions within each area are provided.

• How to convey recommendations

Encouragement of behavior change starts with properly and sufficiently conveying information about the desired behavior change. Below, we discuss key considerations for delivery of health behavior advice from providers to patients, based largely on recent work from Polonsky and Fisher [29]. There is also a substantial body of work by Rankin and Lawton [30,31] that focuses on the perspective of PWD in diabetes care visits and discussions, as well as optimizing self-management strategies via effective communication and social support strategies within family networks. PWD in those studies indicate similar experiences and needs as noted next.

Focusing on clarity in communication addresses misunderstandings between providers and patients as major barrier to behavior change. Strategies to facilitate accurate understanding of recommendations include: simplify the message, focusing on a single recommendation at a time with small chunks of information, and provide information in multiple formats (e.g., spoken, written) and at the literacy level of the individual. It can also be helpful to use examples and comparators that are relevant to the individual’s community. This requires asking questions about that community and having cultural- and language-competent individuals available in the clinic to speak with the individual. Clarity in messaging will ensure the recommendation is at least heard and understood.

Related, patient comprehension and interpretation of the health information are important to assess in order to adapt messages to ensure comprehension. Schillinger [32] and colleagues developed the ‘teach me back’ method for providers of PWD with low health literacy. This approach allows providers to assess patient comprehension by asking patients to tell the provider the key information they absorbed. In addition to literacy, providers should also consider the patient’s affective state while receiving the recommendation, as acute distress can interfere with comprehension and is likely of greater importance to the patient than health behavior change.

Another key aspect of conveying behavior change messages is personal relevance and meaningfulness. Rather than providing a one-size-fits-all recommendation, providers are encouraged to tailor the health advice to fit personal characteristics, including gender, ethnicity, age and resources. The recommended behavior should be linked to relevant health consequences to the individual PWD, not just to all people with diabetes. To effectively tailor recommendations, providers must understand patients’ health beliefs – often asking open-ended questions in a nonjudgmental way can open the door to important conversations about patients’ experiences, views, expectations and beliefs about health and behavior. Motivational interviewing is one clinical strategy that provides health behavior advice in the context of individual beliefs and preferences, with potential applications and benefit in diabetes [33,34].

Frequency or timing of health information and feedback focuses on when health behavior messages are delivered. Because diabetes care

visits typically occur quarterly, patient–provider encounters may occur months away from desired behaviors, making it difficult to provide timely behavioral prompts or reinforcement. Thus, the likelihood that behavior change will be implemented and sustained over that time period is very low. It is helpful to work with patients to identify opportunities to implement health behaviors very soon after a recommendation is made and to pair the recommended behavior with a specific existing routine (e.g., blood glucose monitoring with morning and evening tooth brushing) [35]. It may also be helpful to identify an upcoming event that can sustain motivation during the interim between clinic visits (e.g., wanting to lose weight to be more able to enjoy a grandchild’s sporting event at which a lot of walking is required). Early feedback that is temporally linked to a specific behavior is typically beneficial. Thus, we recommend that providers work with patients to identify supports (e.g., family, friends, clinic staff) who can provide regular reinforcement when diabetes management behaviors are completed. The feedback should also fit in to the schedule of PWD and if possible, provided in a format that is most accessible to PWD (e.g., phone call or text message).

Finally, provider compassion and supportiveness are essential components of conversations about diabetes self-management. The recommendation for behavior change should be encouraging versus discouraging with the emotional tone of the provider being empathic and supportive. Shaming, guilt trips and scare tactics rarely work to implement and sustain behavior, thus these nonsupportive strategies should be avoided. Identifying goals for their health and health behavior in a collaborative way not only communicates empathy and support, but also increases the relevance and likelihood of implementation.

• **Content & structure of behavior change recommendations**

In addition to the manner in which the messages are delivered, content and structure should also be considered. A large literature exists on problem solving interventions that include goal setting and specific strategies for successfully navigating the daily challenges of diabetes management. Some of the formative work on these types of interventions, delivered in hospital and tertiary outpatient diabetes centers across

Type 1 and Type 2 diabetes, was conducted by Muhlhauser and Berger [36]. Their work highlighted a synthesis of diabetes education and behavior change strategies. In addition to this early work, several reviews exist on the effectiveness of problem solving interventions [3,37] and those papers can be accessed for complete information on the findings. Problem solving interventions are popular with children and adults, and people with Type 1 or Type 2 diabetes. One example of an evidence-based problem-solving intervention for adults with diabetes comes from the work of Fisher, Glasgow and colleagues [38]. Their work offers several suggestions for the content and structure of problem solving that can be carried out in diabetes care practices.

This work is often targeting a decrease in diabetes distress (or burnout) but the skills are generalizable even if distress is not present. This intervention has been shown to effectively decrease diabetes distress, increase coping skills and minimize the likelihood of similar problems re-occurring in the future. A live diabetes counselor first educates about the impact of distress and burnout on diabetes (and vice versa). Then a list of problems associated with diabetes and distress is generated and the problems are prioritized. Across several sessions, they are taught an eight-step process to identify and define diabetes distress/burnout, establish realistic goals, generate ways to meet these goals, weigh the pros and cons of each, choose and evaluate solutions, create a diabetes distress action plan, evaluate outcome and engage in pleasant activities. Also, through summary reports, it permits ongoing feedback to primary providers to foster communication and facilitate ongoing clinical care.

There is also a push from diabetes organizations to incorporate problem solving in to contact that happens between diabetes care providers and PWD. The American Association of Diabetes Educators (AADE) and their AADE7 program includes problem solving as one of the seven critical components of diabetes education. The structure of the problem solving intervention, whether it is four steps or eight steps, is less critical than ensuring that a straightforward approach for identifying and addressing problems has been learned. One critical component of all problem solving is goal setting. Setting goals within a SMART framework has been shown to be effective; Specific, Measurable, Achievable, Realistic and Time-bound is a simple way to remember the SMART mnemonic. For more

information, see Miller and Bauman [39] for a complete review and recommendations around goal setting.

In addition to the specific content on problem solving, meta-analyses have identified characteristics of interventions that promote smaller or larger effect sizes. For example, strictly educational interventions are less effective than interventions that integrate behavioral strategies, and compared with simpler designs, multicomponent interventions are more effective [4,40–42]. Among behavioral interventions, larger effect sizes are found in those that explicitly name an underlying theory, yet this remains relatively uncommon [2,13,41]. Effect sizes differ across primary outcomes, as well. Specifically, the effect of behavioral interventions on psychosocial and behavioral outcomes tends to be larger compared with glycemic outcomes [2], and interventions that target modifiable emotional or family processes related to diabetes self-management (i.e., psychosocial functioning) are stronger compared with those that solely target specific self-management behaviors (i.e., diabetes-specific functioning) [4].

Clinic-based behavioral skills interventions

A great deal of research on optimizing behavioral management of diabetes has occurred in youth and young adult populations. Given their relevance to facilitating behavior change, several evidence-based approaches will be presented here. Two of the behavioral skills interventions for youth with diabetes with the strongest empirical support are Coping Skills Training (CST; [43,44]) and Family Teamwork (FT; [19,45]). These interventions are highlighted because of their relevance to both Type 1 and Type 2 diabetes and many of their components have been shown to be effective for youth and adults. Further, both CST and FT are delivered in the diabetes clinic, which increases access to behavioral intervention programs. In a series of 4–6 sessions, trained research assistants teach participants skills to reduce barriers to effective T1D self-management, such as adaptive coping, problem-solving and communication.

Delivered in group format to adolescents with Type 1 diabetes, CST teaches coping skills to complete diabetes management tasks in potentially stressful or challenging social situations. Key results include improved quality of life, coping skills and glycemic control up to 1 year

post intervention. Recent evolutions of CST include adaptations for younger children [46], parents [47] and for delivery via the internet [44], all of which report similar coping and quality of life results, but fewer differences compared with an educational control condition.

The FT intervention is delivered to individual families (adolescent plus parent) and focuses on family diabetes management in the context of normative developmental processes of adolescence. With an emphasis on family communication and conflict prevention/resolution skills, families develop plans to share responsibility for diabetes management tasks. Reported outcomes include decreased family conflict, greater parent involvement in diabetes management and improved glycemic control up to 2 years post-intervention [19,48]. When delivered in combination with logistical assistance from a Care Ambassador (a trained research assistant who helps patients and families navigate the health-care system), FT also results in improved clinic attendance and fewer hospitalizations [45,49].

Combined CST-FT interventions have been published recently, delivered in a multifamily group format [50] or individual family sessions [51]. Both reported improvements in behavioral and psychological outcomes (e.g., family communication, parent involvement, quality of life) and prevented glycemic control deteriorations, but there were no differences compared with educational control groups. These results suggest that comprehensive educational interventions (e.g., education on diabetes self-management during school, sports, travel) may also be beneficial to many families. Adapting these interventions to adults and individuals with Type 2 diabetes would require additional elements to promote weight management, healthy caloric intake and increased physical activity.

Healthcare delivery system interventions

In addition to behavioral interventions delivered by mental health professionals or psychology research staff, medical providers and allied health professionals have also been trained to deliver brief, clinic-integrated behavioral interventions. In The Netherlands, De Wit and colleagues trained diabetes care providers to routinely monitor their adolescent patients' diabetes-related quality of life and discuss barriers to quality of life during routine diabetes clinic visits. This resulted in improved psychological functioning and healthcare satisfaction,

and prevented deterioration in glycemic control [52,53]. On a larger scale, self-management interventions can also be implemented in to larger health systems (e.g., National Health Service in the UK) and have demonstrated benefit with an online format [54]. The iterative design of this work and testing various formats of implementation should ultimately improve the intervention's penetration in the system and efficacy.

Elements of motivational interviewing (MI) include a communication style designed for healthcare providers to talk with their patients about their intrinsic motivation and plans for health behavior change. Evidence is emerging for MI-consistent interventions in pediatric diabetes [34,55–56]. Nonrandomized, multicomponent interventions incorporating MI show improvements in glycemic control, suggesting potential benefits of MI in combination with other evidence-based behavioral intervention components [57,58].

Additionally, there is an entire body of literature that focuses on individuals, other than mental health professionals, who deliver behavioral interventions. This is most often the case when interventions take place in primary care or community-based settings. Certified diabetes educators are one of the most notable professionals who deliver behavioral interventions. Evidence demonstrates the effectiveness of diabetes self-management education (DSME) in the short term (e.g., 6 months following DSME) for improving clinical and behavioral outcomes [59,60], increased use of primary and preventive services, lower use of inpatient hospital services and is cost-effective. Yet, there remains a paucity of research on approaches to sustain gains from DSME and the infrastructure needed to foster sustainability of improved outcomes. Such research is especially important in low-resource communities served by healthcare systems that lack the resources and personnel for providing long-term self-management support between clinic visits.

Although essential, PWD, providers, and the healthcare system increasingly recognize that DSME is generally not sufficient for patients to sustain the substantial self-management effort needed during a lifetime with diabetes. In order to sustain these improvements, most PWD need ongoing diabetes self-management support (DSMS; [61]). DSMS is defined as 'activities that assist the individual with diabetes to

implement and sustain the ongoing behaviors needed to manage their illness' [52]. The type of support provided can be behavioral, educational, psychosocial and/or clinical in nature. Evidence is beginning to demonstrate that DSMS is effectively delivered by both health professionals and trained peer leaders [62–64]. Studies where improved outcomes were reported for DSME interventions were longer and included follow-up self-management support [12,60,65–66]. Through DSMS, outcomes were sustained.

It is increasingly important to develop and evaluate low-cost interventions that build on available resources and existing infrastructures in the community. Given the growing burden, reduced time with physicians, rising costs and inequities in access to high quality care, the current healthcare system is not designed to support long-term self-management [67]. In response, efforts have shifted towards community resources in meeting these challenges [68]. Specifically, community-based healthcare professionals and peer leaders are increasingly utilized to facilitate health education and provide social support. Peer leaders, community health workers, lay health coaches and promotores de salud, are individuals who share common characteristics with a 'targeted' group or individual, allowing them to relate to and empathize on a level that a nonpeer cannot [69]. Common characteristics include age, gender, disease status, socioeconomic status, religion and ethnicity, place of residence and culture or education. Peer leaders often possess traits such as the ability to develop relationships and sufficient time availability, along with being empathetic and motivated [69].

The most effective diabetes peer leader models offer support following structured DSME [21,70], are delivered through multiple modes of interaction, and are often implemented in community settings. While there is no 'one size fits all' approach, the following four functions, developed by Peers for Progress [69], offer a standardized structure in which peer support programs may be built and evaluated. Within the scope of diabetes self-management, a peer leader assists in self-management, provides social and emotional support, links PWD to clinical care and provides ongoing support [69]. In order to be effective, it is crucial for peer leaders to receive standardized training to build the skills and competencies for delivering DSMS [62]. With training and support from healthcare professionals, peer leaders

enable PWD to manage the demands of diabetes through emotional support, access appropriate education material, clinical care, required services and other resources and ultimately improve outcomes. Within diabetes, 17 studies demonstrated statistically significant benefits of peer support with an average decline in A1c of 0.5%, a clinically meaningful improvement. Carefully designed peer leader initiatives can be a powerful way to reach more people with diabetes and help them to successfully engage in the behavioral management of diabetes.

Technology-based interventions

Behavioral intervention delivery via the internet and mobile health (mHealth) technologies is an area of growth in diabetes [71,72]. In-person interventions have been adapted for delivery via the internet and appear to be equally effective [44,73], and others have developed interventions specifically to be delivered via technology. Mulvaney and colleagues developed a web-based, self-guided behavioral intervention comprised multimedia vignettes, training in coping and problem-solving skills and social networking for adolescents with Type 1 diabetes [74]. Text-messaging motivational messages or reminders for diabetes tasks are among the most common mHealth interventions being developed [75–78]. Other examples of mHealth apps in development and the initial stages of evaluation include smartphone-based apps to track diabetes tasks or to communicate with providers [79–81] and motivational electronic games [82]. Although improvements in glycemic control are not consistently reported in these initial studies, web and mHealth interventions are appealing to youth, and there are trends toward benefits in diabetes self-efficacy, adherence and glycemic control among those youth who engage more with the technologies.

Special considerations: eating

Many interventions focus on adherence to blood glucose monitoring, insulin, and oral medications. However, eating is another aspect of diabetes management that many PWD of all ages and diabetes types struggle with and frequently discuss with diabetes care professionals. Diabetes-related eating behaviors include carbohydrate counting, calorie restriction, pre- and post-meal blood glucose monitoring, evaluating blood glucose trends around meals, among others. Recommendations to change

eating behavior are often difficult to implement, and it is important to consider psychological or behavioral issues around eating that may disrupt diabetes management. This brief section is intended to familiarize the diabetes care provider with these issues and consider them when making recommendations.

Although the relative prevalence of eating disorders in PWD compared with those without diabetes is inconclusive, there is consensus that having disordered eating behaviors or an eating disorder is related to worse glycemic control and a higher risk for complications [83–87]. Restriction of calories or insulin are common weight-loss strategies. For example, estimates of around 10% of youth and young adults with type 1 diabetes report deliberate insulin omission [88]. Binge eating episodes and binge eating disorder (BED) can also impact diabetes care. Characteristics of BED include objective overeating episodes, loss-of-control eating, eating in the absence of hunger, emotional or external eating, and secretive eating [89]. Binge eating is related to accelerated weight gain among children who are already overweight [90], increasing the risks among youth with obesity or Type 2 diabetes. Indeed, 6 and 20% of participants in the TODAY study reported clinical and had subclinical levels of binge eating, respectively [87].

Correlates of disturbed eating behaviors and BED include higher BMI percentile, more concerns with weight and shape, lower general and physical appearance-related self-esteem, greater depressive symptoms, having a parent who is trying to lose weight or who makes negative comments about eating or weight, and poorer family cohesion in general [84]. In addition to clinical observations of these risk factors, providers may consider using validated screeners to identify PWD with disordered eating that impacts diabetes care, such as the Eating Disorders Inventory Bulimia subscale [83] or the Youth Eating Disorder Examination Questionnaire (YEDEQ).

Summary & recommendations

Optimal health outcomes for people with diabetes require implementation, execution and maintenance of numerous and complicated health behaviors. Unlike other conditions, the management behaviors for diabetes are completed largely independent of direct medical oversight and may not be totally consistent,

varying from hour to hour or day to day in response to blood glucose variability. It is also worth noting that other contributing factors to diabetes management and outcomes that are more difficult (or impossible) to modify can become barriers to even the best efforts at behavior change. For example, limited personal resources, little access to healthcare, geographic restrictions and insurance and payer restrictions can serve as significant barriers to implementing and sustaining behavioral strategies. Mindful of that, this article notes a number of areas that have been reviewed and highlighted to encourage the diabetes care provider to offer recommendations that will lead to improved behavioral management of diabetes. The following recommendations are made to optimize the delivery of diabetes care and set the stage for positive behavior change and improved health outcomes:

- Consider the five characteristics of effective messaging for behavior change recommendations [29]. They are clarity, personal meaningfulness, frequency of feedback, active guidance and support, and patient interpretation. Messages conveyed to PWD that consider these key characteristics will increase the chances of effective implementation of behavior change;
- Consider teaching problem solving in all clinical encounters. Problem solving is a learned skill with documented benefits on behavioral management of diabetes and health outcomes. Teach a simple method of identifying problems, goal setting, brainstorming solutions, and implementing and evaluating a solution;
- Go beyond education and consider multiple components to behavior change recommendations. These include bringing in other caregivers and individuals from the community, and ensuring health literacy and numeracy have been considered and addressed;
- Rarely provide a ‘one-size-fits-all’ recommendation, but instead offer a recommendation that considers the age, gender, ethnicity, community infrastructure and perceptions about diabetes in PWD;
- Screen for psychological factors that may complicate PWD’s ability to implement and sustain behavior change recommendations. These include consideration of disordered

eating or eating disorder, depressive symptoms and diabetes distress, and worries and fears related to diabetes (immediate and long term).

In sum, efforts to encourage and sustain behavior change will pay dividends for both the diabetes care provider and PWD. PWD will experience improved behavioral management and outcomes while the diabetes care provider will perceive a greater sense of effectiveness in optimizing health. The transactions around behavioral management of diabetes can improve and will ultimately be the key driver in improving outcomes for people with diabetes.

Future perspective

The landscape of diabetes and its management is likely to experience significant change over the next decade. More will be done with technologic platforms that automate aspects of diabetes management. More will be done to increase access and reach through the internet and other sources of remote connection. Diabetes devices and technologies will continue to evolve, insulins will become faster and smarter, and the amount of data available to PWD about their own diabetes will continue to expand. Interventions that promote behavior change in PWD will need to be mindful of these changes and potentially change the mode of delivery (face-to-face vs online), components (e.g., larger emphasis on sifting through and pulling out trends of diabetes data) and adjunctive use of mobile apps (i.e., mHealth). It is likely interventions will need to be more targeted and focused, thus the notions (and soon realities) of precision and predictive medicine will be important components of diabetes care and self-management over the next decade.

Other areas will not change. While behaviors may change, the need to focus on behavior and the facilitators of diabetes management will not change. Further, the need for diabetes provider characteristics such as compassion and clarity, and promoting trust with PWD, will remain. Problem solving interventions will still be necessary, but may need to adapt to be more specialized. For example, technology problem solving will be a critical part of diabetes devices and apps. While much is likely to change over the next decade in terms of available tools and treatments for PWD, the critical role of compassionate and evidence-based clinical care will remain.

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