

The Wahls Behavior Change Model for Complex Chronic Diseases: A Clinician's Guide

Alaina N Elliott-Wherry¹, Jennifer E Lee ², Amy M Pearlman³, Terry L Wahls ⁴

¹Department of Community and Behavioral Health, University of Iowa College of Public Health, Iowa City, IA, USA; ²College of Nursing, The University of Iowa, Iowa City, IA, USA; ³Department of Urology, University of Iowa Carver College of Medicine, Iowa City, IA, USA; ⁴Department of Internal Medicine-General Internal Medicine, University of Iowa Carver College of Medicine, Iowa City, IA, USA

Correspondence: Alaina N Elliott-Wherry, 145 N Riverside Dr, Iowa City, IA, 52242, USA, Tel +1 319 480 8982, Email alaina-elliott@uiowa.edu

Abstract: Behavior change models are used to understand and intervene on health-related behaviors and outcomes. However, there is a gap in the literature regarding how to create and maintain behavior change in patients with complex chronic diseases such as Multiple Sclerosis (MS). To address this gap, the Wahls Behavior Change™ Model (WBCM) (The trademark applies to subsequent mention of the model.) was developed based on existing behavior change theory, empirical evidence, and extensive clinical experience caring for patients with complex chronic diseases. A patient-centered, comprehensive, and multimodal approach, this model provides a framework for understanding and implementing lifestyle behavior change. The overall goals of this paper are to: (1) review existing behavior change theories; (2) introduce the WBCM, including the model's 11 Principles for behavior change in patients with complex chronic diseases; and (3) share how providers can be trained to implement the WBCM. The WBCM can potentially improve short- and longer-term function and quality of life outcomes for people with complex chronic diseases.

Keywords: multiple sclerosis, lifestyle medicine, chronic conditions, guidelines, health promotion, adherence

Introduction

Chronic diseases present patients with physical, emotional, and social challenges that often require lifestyle behavior change (eg, improved nutrition, activity levels, stress reduction, coping skills) to enhance quality and quantity of life. For example, Multiple Sclerosis (MS) is a progressive neurodegenerative disease that causes cognitive impairment,¹ muscle weakness, poor balance, difficulty walking, and reduced bladder and bowel control.² MS symptoms lead to difficulty with activities of daily living and subsequent diminished quality of life and mood; there is a 35 to 50% lifetime prevalence of anxiety or depression in people with MS.³ Symptoms may improve with disease-modifying drugs, but there are prohibitive side effects,⁴ high costs,⁵ and MS drugs do not improve relapses or progressive disability.^{6,7} Evidence suggests that behavior choices, such as diet quality and tobacco use, impact MS severity more than genetics.⁸ As a result, patients with MS may choose complementary, non-pharmacologic options, such as specialized diets, supplements, physical activity or exercise regimens, and/or stress management. Specialized diets are varied and include the Swank or Paleolithic diets, allergen-free (gluten, milk) and/or polyunsaturated fatty acids (PUFA) supplements, vitamins (eg vitamin D), micronutrients, and/or antioxidants (eg selenium, *Ginkgo biloba*, coenzyme Q10).⁹ Physical activity and exercise regimens are associated with improved cardiorespiratory function, fatigue, muscle strength, body composition, and disability in people with MS.^{10–12} Interventions that combine treatments are also beneficial; A multimodal diet, exercise, stress management, and neuromuscular electrical stimulation program improved fatigue, quality of life, and mood in patients with progressive MS in those with progressive MS.^{13–17} While empirical evidence suggests behavior change improves symptoms in people with MS, adherence to MS-related lifestyle changes, such as eating a high-quality diet and exercising, is generally low.¹⁸ Similar low adherence rates, especially for weight loss-related dietary and exercise recommendations, are reported for other chronic diseases such as diabetes, obesity,^{19,20} and weight loss among the

general population.²¹ To increase participation in lifestyle interventions for improved health outcomes, clinicians turn to behavior change models.

Overview and Limitations of Behavior Change Models

Behavior change models were developed in the 20th century to explore mechanisms of health habits, and to develop strategies to improve modifiable health behaviors and outcomes.^{22,23} Since then, different behavior change models were created to assist with a multitude of health behaviors, including evidence-based tools to improve diet, activity, screen time, smoking, sleep, and medication adherence; overarching emphases across all models are the facilitators and barriers of health. Still to this day, behavior change models are effectively used in a variety of fields, such as public health, psychology, sociology, and healthcare.

For example, one set of health behaviors commonly included in lifestyle change programs are diet and weight loss strategies, as overweight or obese are universal risk factors for non-communicable diseases.²⁴ Albert Bandura's Social Cognitive Theory (SCT; note- The terms model and theory are used interchangeably in this paper) argues that an individual will change weight-related health behaviors when they have a strong sense of self-efficacy for change (belief that they are capable of achieving an outcome) given past experiences (eg lost weight previously).²⁵ SCT interventions identify previously successful patient behavior change experiences to improve the patient's overall change self-efficacy, increasing the likelihood of adherence to current behavior change. Additional behavior change models exist (eg Health Belief Model, Transtheoretical Model), with each contributing to behavior change approaches across settings, ages, health concerns, and diagnoses.²⁶

Despite their utility for informing modern behavior change lifestyle interventions, change models have limitations, particularly for complex chronic illnesses such as MS. First, there is no gold standard behavior change model and considerable variability exists among models, suggesting one model cannot inform all circumstances, or is dependent on the specific person, situation, outcome, and/or diagnosis. Second, there are between individual and within individual differences; whereas one (1) model effectively may explain and improve a specific health behavior for an individual (eg physical activity), that same individual might not respond to the identical approach at a different time (eg 1 year later), or when a different behavior is addressed (eg nutrition changes). Third, the influence of social factors, including social support and the person-provider relationship (eg roles, rapport, level of interaction), is not well understood. Whereas some patients and conditions may benefit more from a provider-centered approach with the provider directing the content and process, others may benefit from a non-directive or patient-centered approach, allowing the patient to determine the focus. The patient-provider relationship may also be reciprocal, with the patient and provider contributing equally, a collaborative process. Indeed, for degenerative diseases such as Parkinson's, a continuous, close interaction is recommended.²⁷ Fourth, current models are relatively simple (eg unimodal) considering the dynamic nature of behavior change. MS development and severity are affected by multiple lifestyle factors (eg nutrition and physical activity) more than genetics,⁸ thus a holistic, dynamic, and multimodal approach appears critical to addressing the complex interplay of contributing factors. Fifth, and perhaps most important for longer-term well-being, theories generally do not address the impact of time, including how adaptability and flexibility impact long-lasting behavior change. MS, in particular, is a progressive disease with fluctuations in symptomology and function, thus likely benefits from approaches that include time as a key variable.

To address literature gaps on clinical management of complex chronic diseases, Dr. Terry Wahls developed the Wahls Behavior Change Model (WBCM) based on behavior change theory, empirical evidence, and extensive clinical experience (see Table 1). Dr. Wahls created and refined this 11-principle model to improve patient health behaviors, function, and quality of life during her 20+ years of caring for complex disease states (Iowa City Department of Veterans Affairs Health Care). The WBCM builds upon the strengths of existing behavior change theories and adds to the literature by incorporating novel tenets for understanding and implementing lifestyle behavior change for chronic diseases; It is patient-centered, comprehensive, and multimodal. Certain WBCM components (eg Motivational Interviewing, support system) received preliminary support in recent clinical trials of a multimodal program for MS.^{13,15,16} Due to popular demand of her expertise, Dr. Wahls now teaches the WBCM to other clinicians treating complex chronic diseases, particularly clinicians trained in integrative and functional medicine. While the overarching

Table 1 Wahls Behavior Change Model (WBCM)

Principle [‡]	Name	Focus	Who
1	Develop patient-centered skills	Preparation	Provider
2	Increase patient motivation	Motivation	Provider and Patient
3	Teach coping and self-compassion	Motivation	Provider and Patient
4	One big goal and time frame	Planning	Provider and Patient
5	Identify or create a support system	Preparation	Provider and Patient
6	Address addictive habits	Preparation	Provider and Patient
7	Make a goal action plan	Planning	Provider and Patient
8	Optimal behavior change skills and environment*	Preparation	Provider and Patient
9	Incorporate disease physiology and biosensor training*	Preparation	Provider and Patient
10	Determine goal start date	Planning	Provider and Patient
11	Start, maintain, and restart behavior change plan	Action	Patient

Notes: [‡]The Principles may be implemented in any order, with the exception of Principle 1 which should always happen first. *Principles 8 and 9 details are omitted from this paper, as effective implementation requires completion of the WBCM training (www.terrywahls.com).

WBCM approach is available for public use, formal implementation of the WBCM requires being certified via an online training (www.terrywahls.com) to ensure consistency in the application of specific WBCM strategies.

This paper's overall goals are to: (1) review existing behavior change theories; (2) introduce the WBCM, including the model's overall care guidelines for patient behavior change; and (3) share how providers can be trained to implement the WBCM. While MS and complex chronic diseases are the WBCM's behavior change target populations, weight loss-related examples are incorporated throughout the paper because weight loss strategies are prevalent in chronic disease management, the behavior change literature, and generalizable to most patients and health concerns. Indeed, overweight and obesity are universal risk factors for noncommunicable diseases,²⁴ yet achieving longer-term weight loss is a considerable challenge for public health professionals.^{28–30} Clinical application of the WBCM in people with chronic diseases will ideally improve short- and longer-term function and quality of life outcomes.

Current Behavior Change Models

Health Belief Model

The Health Belief Model (HBM) is one of the most widely used behavior change theories, and proposes that change happens when the patient perceives the illness threat as serious, believes the recommended change will be effective, and the benefits outweigh the cost.³¹ The HBM suggests that several key constructs are related to the likelihood of change: perceived susceptibility/risk (for illness), potential illness severity, perceived change benefits, change barriers, consistency of cues to action/make change, and self-efficacy. For example, if a person is advised to lose weight to decrease metabolic disorder risk (ie heart disease, stroke, diabetes), the HBM may assess perceived susceptibility and severity by asking the person to assess the likelihood of developing metabolic disorders and anticipated disease severity given current weight. In terms of perceived change benefits, the person may view weight loss as a reasonable means for reducing metabolic disorder risks, and thus motivated to begin the weight loss process.³² However, perceived barriers such as time constraints or food costs may hinder weight loss goals and must be addressed before weight loss can occur. Cues to action are the motivating factors to begin and sustain change.³³ A weight loss cue to action may be a provider's reminder that metabolic disorder risk increases with weight gain, intensifying the person's awareness of being increasingly at-risk.

A key strength of the HBM is its inclusion of the individual's beliefs and perceptions on lifestyle changes, including helpful constructs for explaining and predicting behavior change (ie perceived barriers, cues to action).^{32–35} One limitation of the HBM, however, is not addressing the role of mood or affect in behavior change and decision-making.³⁶ Mood impacts

human decision-making (eg being sad may decrease self-efficacy for change), so including mood as an additional construct may improve the HBM's ability to explain behavior change.³⁶ The HBM is moderately successful at predicting and changing health behavior in the decades of research since its inception, with mixed results across diagnoses and conditions. The discrepant results of HBM research are arguably due to variability in HBM construct measurement and application across studies. For example, some studies use the HBM's patient constructs to independently predict behavior (versus the overall model), while others operationalize the constructs differently.³¹ That said, the HBM informs a variety of empirical and clinical work and is particularly valuable due to its emphasis on patient perception and beliefs.

Social Cognitive Theory

The Social Cognitive Theory (SCT) explains behavior change as the multidirectional interaction among personal, behavioral, and environmental influences, referred to as reciprocal determinism.²⁵ The SCT focuses on the patient's capacity for change, while also considering the external environment's impact on the patient and behavior, and the social or collaborative nature of behavior change.²⁵ Constructs of the SCT are observational learning/modeling, outcome expectancies, and self-regulation. Observational learning/modeling is knowingly or unknowingly changing behavior as a result of observing the same behaviors.²⁵ For example, a person may initiate dietary and physical activity changes after seeing their spouse lose weight from improved diet and activity behaviors, particularly if the patient believes in their ability to change weight loss behaviors. Outcome expectancies are the expected consequences of a behavior; self-regulation is the ability to think, feel, and act in ways that make progress toward the behavior change.³⁷ If the individual is confident in their ability to lose weight, acts interested in and capable of making change, and expects to lose weight, then the person has high self-efficacy, self-regulates, and has positive outcome expectancies for the behavior changes.

The SCT is used effectively to inform various public health programs and interventions, including managing chronic pain, increasing physical activity, discontinuing tobacco use, and losing weight.^{26,38–40} A particularly beneficial contribution of the SCT is its emphasis on self-efficacy for improving health promotion strategies.^{41,42} A limitation of the SCT, per Schunk and DiBenedetto (2020), is a lack of research on the long-term effectiveness of SCT interventions, which may be more of a limitation of typical SCT study design (ie single time data collection). In addition, the association among constructs (ie personal, behavioral, environmental) is not explicitly explained by the SCT, so it is challenging to measure the directionality of influence (ie behavior change may lead to self-efficacy, or self-efficacy may lead to behavior change, or both).⁴³ Future research should examine the nature of the associations among SCT constructs, especially over time.

Theories of Planned Behavior and Reasoned Action

The Theory of Planned Behavior (TPB), an extension of the Theory of Reasoned Action (not reviewed here), argues that an individual's behavior change potential is predicted by behavioral intentions, including the willingness and strength of motivation to change.⁴⁴ Specifically, the TPB indicates that the intent or motivation to change is directly related to the perceived behavioral control ("I am in control of what I eat"), attitudes (eg "eating fast food is unbecoming"), and perceived subjective norms ("overweight individuals are not liked") associated with the unhealthy behavior. Perceived behavioral control moderates the influence of attitude and subjective norms on behavior change intentions, as if the situation is out of the patient's perceived control (eg "I can only afford fast food), they are unlikely to initiate the behavior change.⁴⁵ According to the TPB author, perceived behavioral control is similar to self-efficacy.⁴⁵

The TPB is used effectively in many areas of health psychology and public health, including to improve vaccination and smoking cessation interventions,^{46,47} as a patient's intentions are key to behavior change motivation and effort. There are some reported limitations of the TPB, such as validity concerns with using a patient's intention to predict behavior,^{48,49} as there is not a TPB questionnaire, nor a standardized TPB measure (ie researchers develop their own tools). Another limitation of the TPB is the implied cause-effect relationship between behavioral intention and change behavior. Measuring cause is a limit of correlational designs,⁵⁰ and is increasingly problematic without a TPB questionnaire, as there is no standardized method to measure TPB constructs. For a helpful review of the TPB, including the TPB author's answers to frequently asked TPB questions, see Ajzen, 2020.⁴⁵

Transtheoretical Model (Stages of Change)

The Transtheoretical Model (TTM; also called Stages of Change Model) explains an individual's readiness for behavior change based on where they are in a series of six (6) steps, or stages of change, that patients go through in the change process.⁵¹ Stages of the TTM include precontemplation (not ready), contemplation (getting ready), preparation (ready), action (doing), maintenance (ongoing), and termination (behavior is now automatic, if applicable), coupled with decisional balance (decision-making process). According to the TTM, each stage takes a certain length of time (eg 6 months). This model acknowledges that behavior change is not always linear, so patients might move back and forth through stages, thus providers should be flexible and keep the dynamic nature of the behavior change process in mind.⁵¹ For example, a person may be in the action stage because they are actively losing weight but may move back to the precontemplation stage if they are no longer interested in losing weight. Decisional balance is the process of identifying the benefits and drawbacks of continuing a behavior.⁵¹ For example, a person may use decisional balance to understand the positive (eg decreased risk for metabolic disorders, increased energy) and negative (eg difficult, requires time and effort) aspects of losing weight. The TTM also includes the positive impact of self-efficacy on health behavior change.

The TTM is one of the most applied models of behavior change, as its concrete stages and constructs permit reliable and valid measurement of the TTM (including self-efficacy) using standardized questionnaires. Importantly, the TTM allows providers to stage individuals based on their readiness to change, and interventions can be individualized to each patient's readiness to change and progress toward goals (eg two patients who want to lose weight may be at two different stages, even with the same behavior change goal).⁵² The TTM is also applicable across a variety of problems (eg weight loss, smoking cessation, addiction, preventive measures such as pap smears); the concrete stages, generalizable language, and outward relevance to common human situations makes it relatively easy to generalize and apply in empirical work, clinical work, and in the general public for use by non-experts.^{53,54}

The TTM has limitations, including the absence of a standardized measure to assess the stage of change,^{55,56} arguably reducing the generalizability, validity, and reliability of the TTM's application. Another limitation is the Theory's relatively arbitrary assignment of the length of time expected to complete each of the six (6) stages.^{56,57} Prochaska & DiClemente (1998) developed timeframes (ie 30 days, 6 months, 1 year) in which the individual is expected to complete the behavior change for each stage, but these time frames vary between people and even for the same person over time.^{57,58}

Social Ecological Model

The Social Ecological Model (SEM) suggests that several levels of influence (ie intrapersonal, interpersonal, organizational, community, societal) combine to influence behavior change.⁵⁹ Intrapersonal refers to an individual's role in their own behavior change, whereas interpersonal involves the patient and others, such as family or friends.⁵⁹ The organizational, community, and societal levels of influence address larger scale (eg more people, funding) behavior change. These levels of influence interact with each other and may increase, decrease, or mediate behavior.⁵⁹ A layered approach to intervention involves more than one level, though may be limited by barriers such as lack of funding.

Social Norms Theory

Societal influence is central to human behavior and as such, the Social Norms Theory posits that there are perceived norms and attitudes that influence behavior.⁶⁰ Perceived norms are typically described as external factors, often misperceived, that influence patient behavior, and attitudes are typically described as the ways in which patients misperceive view their peers' attitudes and behaviors.^{60,61} Correcting perceived norms and attitudes—through interventions and health promotion messaging—affects lifestyle and behavior changes by replacing the misperceptions with correct information regarding health and health-related outcomes.⁶¹ However, while necessary, it is difficult to understand the influence of social norms on behavior because of methodological limitations. Self-report surveys are commonly used to report social norms data, and while convenient, there is the potential for underreporting.⁶² Additionally, there is little known about the development of misperceptions of social norms.⁶³ Without the knowledge of how misperceptions develop, it may be difficult to stop their development, especially in the absence of a theoretical framework.⁶⁴

Self-Determination Theory

The Self-Determination Theory (SDT) argues that healthy development requires meeting the basic psychological needs of competence (feeling of mastery), relatedness (belonging, connected), and autonomy (self-initiative, ownership of situation and outcomes). Important to individual autonomy is a sense of behaviors being intrinsically motivating (controlled internally and personally rewarding based on skills and values), not extrinsically driven (externally controlled rewards or punishments).⁶⁵ The SDT informs a variety of health behavior changes, including smoking cessation, weight loss, and diet changes; applying the SDT to improve health behavior adoption and maintenance typically involves strategies that produce an optimal level of competence, relatedness, and autonomy, motivating the individual to persist in behavior change.^{66–68} One criticism of SDT is the sole focus on positive motivation and the absence of the more negative mood involved in motivation (eg anger, fear).⁶⁹ According to Pyszczynski, Greenberg, and Solomon (2000), negative motivations that prompt behavior change should be studied to expand the scope and implications of SDT across settings.

Synthesis of Current Behavior Change Models

Collectively, existing behavior change theories contribute substantially to the ability to explain behavior change-related facilitators, barriers, and constructs, with each model having unique strengths that inform health promotion efforts. There are also limitations to current models and theories, particularly in their ability to explain complex, chronic diseases, such as the: (1) lack of a gold standard approach; (2) between and within individual differences in the effectiveness of a behavior change model; (3) the influence of social factors (eg family and friends, person-provider roles, and relationship); (4) generally simplified, unimodal approaches; (5) and ambiguity regarding time and flexibility in behavior change.

Developing a New Model

To address gaps in the ability to use behavior change models among people with complex chronic illnesses, particularly MS, Dr. Terry Wahls developed the WBCM (see [Table 1](#)). This model was created based on behavior change theory, empirical evidence, and extensive clinical experience while Dr. Wahls was the Therapeutic Lifestyle Clinic Medical Director at the Iowa City Veterans Affairs Health Care System (2013–2017). The WBCM is a patient-centered, comprehensive, multi-modal framework for understanding and implementing behavior change; after creating the WBCM, Dr. Wahls further refined the model in her clinical practice and clinical trials.^{13–17,70–72} Some WBCM-intended outcomes for people diagnosed with MS include improved: well-being, cognitive, sensory, and visual functioning, balance, walking, and bladder and bowel control.^{13–17,70–72} Additional conditions may also experience these positive outcomes.

The following is a brief introduction of the WBCM, including examples of provider techniques that could be used to assist patient symptoms and challenges. The tools and examples are guidelines that can be tailored to each provider and patient, with additional training and WBCM licensure available online (see www.terrywahls.com for details). This model's 11 Principles may be implemented in any order, depending on the patient's needs and preferences, except Principle 1 (develop patient-centered skills); Principle 1 should always happen first to ensure the provider is adequately trained in the skills necessary to assist patients with the change process. Provided at the end of each Principle's description are suggestions of components the given Principle shares with existing lifestyle behavior change theories. [Table 2](#) is a snapshot of the 11 Principles, including suggestions of the general focus (eg preparation, motivation) and person responsible (ie provider, patient) for each Principle. The focus of each Principle in [Table 2](#) is not intended as a stage through which to progress (like the TTM), rather an indication of the overarching emphasis of each Principle to assist providers.

Develop Patient-Centered Skills

A strong patient-provider relationship is vital to treatment adherence and improved outcomes in people diagnosed with chronic, progressive diseases such as MS⁷³ and Parkinson's.²⁷ Analogous to the mental health client-therapist relationship, the ideal patient-provider relationship is person-centered and tailored to each individual's unique characteristics and situation. Central skills of patient-centered care include empathy, communication, unconditional positive regard, respect, and honesty. While the importance of patient-centered care in medicine is mentioned in clinical and empirical work,

Table 2 Comparison of Existing versus WBCM Behavior Change Models

Areas for Improvement With Existing Behavior Change Models	Does the WBCM Address?
Lack of a gold standard approach	No. While this model cannot alone address the gap in behavior change models it may inform behavior change models for chronic diseases (eg, MS, obesity).
Between and within individual differences	Yes
Social factors	Yes
Simplified, unimodal	Yes
Time and flexibility	Yes

a patient-centered focus and skill development are requirements for effective WBCM implementation, thus are taught to ensure the consistency and effectiveness of WBCM in clinical practice.⁷⁴ One additional skill for providers is Motivational Interviewing, a patient-centered approach designed to identify and reconcile discrepancies between a patient's desired and actual behaviors, increasing motivation for change. Through a combination of directive (challenging questions) and nondirective (open-ended questions and reflective statements) techniques, the provider and patient collaborate to identify what is best for the patient. Motivational Interviewing is a gold standard approach for improving health behaviors such as diet and exercise, substance use, and smoking cessation.⁷⁵ The WBCM Principle 1 shares the interpersonal level of influence component with the SEM.

Increase Patient Motivation

There are three (3) general strategies to increase a patient's motivation. First, share a health-related behavior change success story about patient in a similar situation. For example, an individual with diabetes may hear about a similar patient who also worked full time, with little spare time, but who created time in their work schedule to prepare a fresh lunch and be physically active between meetings and calls, and the patient lost 10 pounds in one (1) month. Second, combine relevant, healing stories with metaphors to illustrate underlying scientific mechanisms to help the patient understand how healthy behaviors may improve disease symptoms. For example, the ebb and flow of symptoms and disability are similar the ebb and flow a river's health. If water quality is poor because of industrial pollutants, the river becomes chronically ill and fish and aquatic life will decline or disappear. Conversely, if the pollutants are cleared and the water is cleaned, the water quality will steadily improve, and fish and aquatic life return and thrive; The river's health is restored. Patients can visualize their life as an ecosystem that they can clean and return to function through their actions, giving them a sense of hope (can also use imagery). Third, identify the "why" with questions to increase motivation to adopt and extinguish helpful and harmful health behaviors, respectively. Potential questions may include: (1) What specific activities would you like to do when you are healthier (eg to play with my children or grandchildren)?; (2) What is your purpose in life (eg honoring my spiritual beliefs)?; and (3) What is your personal mission (eg raising emotionally healthy children)? Link the patient's responses to desired behavior changes, pointing out that lifestyle changes move them closer to their wishes. A sense of self-determination via disease control and self-management are valuable, particularly for people with MS because self-management⁷⁶ and locus of control⁷⁷ are key contributors to MS treatment outcomes. The WBCM Principle 2 shares the motivation and self-determination components with the TPB and SDT.

Teach Coping and Self-Compassion

Behavior change requires considerable commitment, effort, and sometimes costs, making it even more discouraging when the MS symptoms (depression, disability, pain) lifestyle interventions are designed to treat, decrease the likelihood of success.⁷⁸ To improve the ability to overcome challenges and setbacks, providers should be cognizant of patient personality characteristics and coping strategies²⁷ and teach coping skills before and throughout behavior change. There

are evidence-based coping skills measures available to assist with reliable and valid assessment of coping. When desired, patients may also be referred to another care provider for coping skills training to complement the lifestyle behavior change. Coping skills training is individualized to each patient, but overarching, effective patient skills to teach include unconditional positive self-regard, self-forgiveness, and self-compassion. Research has found that positive coping skills were related to improved MS-related illness beliefs, well-being,⁷⁹ fatigue, life quality,⁸⁰ disability,⁸¹ mental health,⁷⁷ resilience, pain, and stress, also reducing subsequent unhealthy behaviors and/or quitting the lifestyle intervention altogether.^{82–84} The WBCM Principle 3 shares the self-efficacy and self-regulation components with the SCT.

One Big Goal and Time Frame

With provider assistance and encouragement for this commitment to change, the patient clearly defines: (1) one tangible, lifetime goal that inspires them and can be accomplished when their health and function improve (referred to as a Big, Hairy, Audacious Goal or BHAG); and (2) the goal's specific deadline (a predetermined date) or general time frame (eg in one year; determining when to start the goal happens later). For example, a goal example is to walk the patient's child down the aisle at the child's wedding (which might be a more than one year into the future) or participate in the annual school fun run/walk with their elementary age child(ren). If the goal is more than one year away, identify an intermediate one-year goal that supports achieving the larger goal. The goal must be significant, motivating, feasible, easily measurable,⁸⁵ and attainable as a direct result of physical improvement due to the behavior change. Ideally, achieving the goal is a celebration with family and friends, marking the behavior change success to-date, including physical function that improved so much that they may now do this celebratory activity that was not previously possible. Provider feedback is instrumental to ensure the goal and deadline are feasible and beneficial for short- and long-term health and function, keeping in mind that there are often setbacks along the way. When goals are too ambitious or not ambitious enough, patients may be overwhelmed and give up, or bored and unmotivated and give up, respectively. Indeed, not achieving a goal after this intensive process may decrease self-determination, self-efficacy, motivation, health, function, and trust in the process and provider team, also reducing the likelihood of attempting behavior change again in the future. For example, an obese patient who uses a wheelchair due to weight-related knee pain may not achieve a goal of completing annual school one mile walk-run with their 8 eight-year-old in six (6) months, but this goal at 9 (nine) months or 1 (one) year could be rewarding and feasible. Ensure the patient identifies how this goal will impact them, such as how they will feel, or improved family relationships). In addition to verbally discussing the goal plans, the patient will write the goal details and time frame, to be placed in a prominent location in the home. The WBCM Principle 4 shares the interpersonal level of influence component with the SEM and the perception of preparedness to make change component with the TTM.

Identify or Create a Support System

Involving family and friends, using the patient's definition of family, in lifestyle change in any way possible is strongly encouraged by the WBCM, and often a vital contributor to success. Isolation is often a barrier to effective behavior change and experiencing isolation may create additional barriers, including increased inflammation, loneliness, and chronic disease symptoms.^{86,87} To decrease isolation and improve social support, evidence suggests that sharing health promoting activities with peers and mentors, in-person and/or virtually, increases patient success in behavior change goals.^{18,88} Moreover, positive social support in chronic illness management and behavior change also increase self-efficacy and adherence to lifestyle modifications,⁸⁹ adding to the benefits of social support during the adoption of healthy lifestyle behaviors. For patients with a positive, health-minded spouse, family, and/or social group, ask the patient to involve their supports in the entire behavior change process, including appointments and health activities (eg exercise together or eat the same foods). When patients lack support, or have unhealthy support (eg encourage eating unhealthy foods), it is highly beneficial to assist patients with finding peer support groups and/or sponsors who will encourage and positively affect behavior change.⁹⁰ The WBCM Principle 5 shares the multilevel influence of behavior change component with the SEM.

Address Addictive Habits

Acknowledge the challenges and barriers associated with lifestyle behavior change, particularly when reducing harmful food and drink habits and/or addictions (eg foods containing gluten, alcohol); Normalize the topic, particularly substance use, through dialogue about the commonality of reluctance to disclose substance use due to concerns with confidentiality, how the provider will react, and a potential loss of insurance coverage or employment.⁹¹ Uncomfortable withdrawal symptoms following the cessation of certain foods or technologies vary greatly in severity and frequency among people and habits, but may include cravings, headaches, and mood changes (eg irritability).^{92,93} To assist patients persist through withdrawal, remind patients that the uncomfortable symptoms are usually temporary and lead to change benefits such as an overall reduction or elimination of disease symptoms, severity, and risk; recommend specific strategies and resources to mitigate the impact of potential withdrawal symptoms. Strategies from Overeaters Anonymous or Alcoholics Anonymous may be helpful for persons with addictions, such as peer support, mentors, and a belief in a higher power.^{94,95} The WBCM Principle 6 shares the perceived illness severity, change barriers, and change benefits components with the HBM.

Make a Goal Action Plan

To set the patient up for short- and long-term success, a goal action plan is created, including micro-commitments, or smaller, intermediate steps toward achieving the goal (eg buy walking shoes, schedule a physical therapy appointment, dispose unhealthy food in the house). The provider and patient discuss all potential micro-commitment facilitators (eg spouse is doing goal with the patient) and barriers (eg upcoming vacation) and identify whether each micro-action is a one-time event (eg buy walking shoes, remove foods from home that do not support the patient's healthy eating goals), or ongoing, repeated actions (eg a series of yoga classes, sign up for a walking club). The person then identifies specific micro-actions and a timeline for each micro-action.⁹⁶ Whereas micro-commitments include the goal or purpose of each step (eg reduce unhealthy food temptations), micro-actions are the behaviors (eg removing unhealthy foods) needed to accomplish micro-commitments. Individuals should choose micro-actions with a high perceived likelihood of success (>80% expectation of success). Patients describe how, when, and where they can obtain non-provider social support (eg peer group, family, friends) throughout the action plan to promote patient autonomy and self-determination (and provider time is limited). When possible, the patient, family and friends can celebrate function improvements and progress toward their big goal with intermediate celebratory events, such as doing activities together that the patient could not do prior to the behavior change success. The WBCM Principle 7 shares the perception of preparedness to change component with the TTM and the intention to change component with the TPB.

Optimize Behavior Change Skills and Environment

Successful implementation of this Principle requires completion of the WBCM training (see www.terrywahls.com).

Incorporate Disease Physiology and Biosensor Training

Successful implementation of this Principle requires completion of the WBCM training (see www.terrywahls.com).

Determine Goal Start Date

Once the goal action plan is set, the provider guides the patient through deciding the ideal time to start working on the goal, weighing options based on current and anticipated life events. Keep in mind that the present may not be the right time if there are many competing demands that would take their time and attention away from the behavior change. The goal start date is decided after setting the action plan so micro-actions and timelines can be assessed to ensure they will be completed in time to achieve the goal deadline. When assessing the goal start date, consistent patient-provider communication and collaboration are particularly important because this is the ideal time to provide health education tailored to the patient and their proposed micro-actions and -commitments; since this is the last step before initiating goal progress, it is imperative that the patient receives key health education relative to their characteristics and action plan to ensure they have all of the information needed to finalize the start date.^{97,98} When the patient informs the medical team

that they determined their specific goal and start time, self-determination is again reinforced by the expectation that the patient will begin the behavior change process on their own time and volition. The WBCM Principle 10 shares the perception of preparedness to change component with the TTM.

Start, Maintain, and Restart Behavior Change Plan

The patient begins performing or implementing their micro-commitments. As the person experiences successes, they are encouraged to increase the challenge level of their micro-commitments to make further progress towards their goal.⁹⁶ For example, once the patient creates a routine of walking 20 minutes once a week (after purchasing running shoes), they could increase the exercise duration to 25 minutes, moving closer to their goal. Where the person begins (eg walk one day per week) is not where they will end (eg running 45 minutes per day several days per week). As progress is made towards the goal, additional micro-commitments are made to bring the person closer to attaining their goal (eg wake 15 minutes earlier to prepare healthy breakfast). It is important to remind the patient that changing behavior is difficult and that symptoms of withdrawal in the initial weeks of addictive behavior cessation (eg eliminating sugar sweetened beverage intake), including headaches, malaise, and irritability may occur and are normal and expected.⁹² It can be particularly beneficial to educate the patient about physiological processes the mind and body experience while adjusting to behavior changes to demonstrate that uncomfortable symptoms are usually time-limited and are actually evidence that the behavior change is working, bringing them closer to the goal. Sustaining behavior change also requires reminders and instruction to promote patient flexibility and resiliency to persevere through the withdrawal.⁸² Helping the patient identify healthy ways to celebrate successes along the way is important and can reinforce one's motivation, but celebratory actions should not detract from the micro-commitments and BHAG.⁹⁹

Health habits tend to develop in adolescence and persist through adulthood, making it a challenge for adults in the general population to replace lifelong health-harming behaviors with health-promoting behaviors.¹⁰⁰ Research indicates that when patients with MS were prescribed a multimodal lifestyle intervention (exercise, meditation, diet), the majority of individuals did all prescribed activities initially, but none to the recommended levels, and only a subgroup maintained behavior changes three (3) to five (5) years.¹⁸ Thus, it is important to keep in mind that, when assisting patients with behavior change, it is not uncommon for individuals to revert to unhealthy, disease-harming behaviors after successfully making health changes (eg daily walking regimen, gluten-free diet). New stressors and triggers may also develop which can set the person back in their behavior change goals. If/when any setback(s) occur, it is recommended that the patient be praised for their efforts and motivated to re-engage in the commitment to healthy lifestyle behaviors as many times as necessary.⁸² Similar to the initiation and maintenance of behavior change, when social support is included while restarting healthy behaviors, patients' have increased success re-adopting the behavior changes.⁸⁹ The WBCM Principle 11 shares the self-determination component with the SDT, the self-efficacy component with the SCT, and the interpersonal level of influence component with the SEM.

How to Be Trained on the Wahls Behavior Change Model

The WBCM is trademarked and is a component of the Wahls Protocol[®] (Note: The registered trademark applies to subsequent mention of the protocol.), an integrative approach to managing complex chronic disease states. The Wahls Protocol approach to complex chronic disease, including MS and other neurodegenerative conditions, evaluates the environmental and modifiable lifestyle factors that contribute to the development of chronic symptoms and comorbid diagnoses. Treatment includes the evaluation and management of excessive inflammation, hormonal dysregulation, mitochondrial strain, microbial imbalances, nutritional status, cell membrane health, family history, toxic exposures, and modifiable lifestyle factors. Professionals with a healthcare license or certificate are eligible to complete training in the use of the Wahls Protocol approach and the Wahls Behavior Change Model in the care of patients with complex chronic disease. Completion of the online curriculum and case studies, and passing the examination, gives the health professional the opportunity to license and use the Wahls Protocol and Wahls Behavior Change Model in their clinical practice (see www.terrywahls.com for details).

Discussion

To our knowledge, the WBCM is the first patient-centered, comprehensive, and multimodal behavior change model of its kind for patients with chronic diseases. Previous models led the way for current lifestyle modification approaches, with considerable value for their contributions to understanding and implementing behavior change. The WBCM approach addresses some constraints of existing models (see Table 2). First, while there is variability among current behavior change models, thus no gold standard, the WBCM incorporates current model strengths (eg, role of motivation, per the TPB), into a general framework for treating chronic diseases. Second, between and within individual differences in responsiveness to behavior change make clinical application challenging. The WBCM treats variability as inherent to the process, does not require the principles in a specific order (except Principle 1, develop patient-centered skills, should be first), and explicitly addressing the variable nature of behavior change to normalize it and prepare patients. Third, whereas behavior change approaches may exclude the influence of social factors, the patient-provider and patient-support system are integral to the WBCM. Fourth, existing models are generally unimodal (eg activity focus); the WBCM recognizes the dynamic, multifaceted nature of behavior change, thus includes multiple modalities (eg, activity, nutrition, coping, motivation), to be comprehensive and holistic. Fifth, improving lifestyle health behaviors involves short- and long-term processes that change over time, so the WBCM includes elements to increase the likelihood of short- and long-term success, such as micro-commitments that build to the goal(s) and including family and friends to increase the likelihood of longer-term behavior change.

Limitations

First, the WBCM has not been empirically examined using reliable and valid measures. That said, the WBCM was developed in part based on empirically supported (1) behavior change theories (eg SCT, SDT); and (2) clinical trials of a multimodal program for MS that included certain WBCM components (eg Motivational Interviewing, support system).^{13,15,16} Additional chronic disease research is underway evaluating the WBCM in its entirety (11 Principles). Second, the WBCM may not translate to other conditions or patient groups. While these Principles are not expected to be universally successful across all patients, this model provides guidelines for treating patients who otherwise struggle with lifestyle behavior change (or health problems that are hard to treat). Furthermore, the WBCM and prior models lack guidance on how structural social and economic determinants affect behavior change. Systemic variables such as economic and social policies negatively affect individual's access to income, education, housing, access to health care and education, making it challenging for some patients to have knowledge of and the ability to engage in behavior change. It is critical that moving forward, there is special consideration for the social and structural determinants that impact health behaviors. Finally, the WBCM varies from traditional public health models because it centers around microlevel “downstream” individual and interindividual factors (eg nutrition, social support), whereas public health behavior change centers around macrolevel “upstream” (eg health policy, inequity) factors.^{101,102}

Clinical Implications and Future Directions

The WBCM aims to improve clinical care for complex chronic diseases that are challenging to treat and patients who do not respond to other approaches, both sources of provider and patient distress. One potential benefit of the WBCM is reducing health provider burnout, as it provides a detailed road map to assist patients with health behaviors. Indeed, empirical evidence suggests that one health professional burnout cause is the lack of effective behavior change management strategies available to health professionals.¹⁰³ Effective clinical approaches can lead to decreased costs and clinical time, as patients learn tools that improve symptoms, thus theoretically needing less clinical time and resources. While these 11 Principles may seem overwhelming to implement clinically when health care time and resources are already limited, the strategies can be learned over time and incorporated into existing provider approaches, not simply added on top of current protocols (ie used concurrently, not consecutively). As indicated, only Principle 1 is necessary (develop patient-centered skills), so other Principles can be incorporated as applicable. Finally, given the association among diet, lifestyle, social support, and the chronic disease development,¹⁰⁴ WBCM components may generalize to other health problems (eg weight loss, diabetes).

Research is in progress to assess the role of the WBCM's components on complex chronic disease symptomology and treatment. Additional clinical trials and studies testing the efficacy of the WBCM in other chronic diseases, including autoimmune diseases such as diabetes, are warranted and recommended.

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