Patient Treatment Adherence

Concepts, Interventions, and Measurement

Edited by
Hayden B. Bosworth • Eugene Z. Oddone • Morris Weinberger

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LEA LAWRENCE ERLBAUM ASSOCIATES, PUBLISHERS
2006 Mahwah, New Jersey London

Lawrence Erlbaum Associates, Inc., Publishers
10 Industrial Avenue
Mahwah, New Jersey 07430
www.erlbaum.com

Library of Congress Cataloging-in-Publication Data

Bosworth, Hayden B.
Patient treatment adherence concepts, interventions, and measurement / Hayden B. Bosworth, Eugene Z. Oddone, and Morris Weinberger.
p. cm.
Includes bibliographical references and index.
ISBN 0-8058-4833-9 (alk. paper)
1. Patient compliance. I. Oddone, Eugene Z. II. Weinberger, Morris. III. Title.

R727.43.B67 2005
615.5—dc22 2004062505
CIP

ISBN 1-4106-1562-6 Master e-book ISBN

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Preface

Although investigators have studied patient adherence since at least the late 1940s, the past 25 years has witnessed an explosion of adherence-related research in response to the growing burden of chronic diseases and the emphasis on patient self-management. Understanding the nature, causes, and consequences of nonadherence is critical to developing effective strategies to enhance adherence and, ultimately, improve patient outcomes. Thus, the goal of the book is to summarize the state of the adherence literature for a number of specific health behaviors and populations.

As described in this book, there exists a bewildering literature regarding the conceptualization, interventions, and measurement of treatment adherence, thereby creating inefficiencies and confusion among investigators. Thus, this book provides: (a) a conceptual definition of treatment adherence using multiple models, (b) a summary of existing literature regarding the impact of treatment nonadherence (e.g., costs, clinical outcomes, health-related quality of life), and (c) a review of patient factors related to treatment adherence for specific behaviors (i.e., diet, exercise, medication use), as well as across diseases and special populations (e.g., children, patient–physician interaction). Finally, we discuss important methodological issues related to treatment adherence, including community-based interventions, measurement and analytical issues, assessing cost-effectiveness, translation and dissemination of results into practice, and the use of new technological advances to improve treatment adherence.

Our primary audiences are researchers including health service researchers, health psychologists, social psychologists, and cognitive psychol-

ogists, as well as primary-care physicians, policymakers, and health managers responsible for quality improvement within a health organization. It is anticipated that the book could be used as a potential text for graduate courses on health behaviors, applied statistics, and public health as well as medical school programs on patient–physician interaction.

We have organized the book into four parts. Part I (chaps. 1 and 2) presents problems associated with treatment adherence and summarizes various theoretical models that have commonly been used to understand, predict, and/or improve adherences (e.g., health belief model, theory of planned behavior, and transtheoretical model). These models share an emphasis on patients' cognitive and social processes (e.g., beliefs, norms) and patients' resources (e.g., psychologic and social support). Part II addresses adherence with specific behaviors, including exercise, diet, smoking, rehabilitation, medication, and psychological therapies (chaps. 3–7). Understanding adherence to these behaviors is important because factors affecting adherence for each specific behavior are likely to be similar across chronic diseases and conditions. Each chapter begins by discussing the impact of treatment adherence for specific health behaviors (e.g., prevalence, costs, clinical outcomes, health-related quality of life). Part III (chaps. 8–12) is organized by special areas and populations, including depression, children, parent–provider communication, and provider guideline adherence. Chapters throughout this part highlight strategies that were both successful and unsuccessful in enhancing adherence. Each chapter provides a discussion on the clinical, research, and when appropriate, policy implications. The final part of the book (chaps. 13–17) discusses methodological issues related to treatment adherence including community-based models of interventions, analytical and methodological issues specifically related to nonadherence, assessing the cost-effectiveness of adherence interventions, translation and dissemination of results into practice, and the use of new technological advances to improve treatment adherence.

Introductory Remarks

As health care has transitioned from treating acute illness to treating chronic ailments, we have moved from curing disorders to controlling symptoms and improving quality of life. Sometimes, these regimens can be quite complex and difficult for patients to follow. Moreover, beyond therapeutic agents, improved health often requires modifying behaviors to encourage such changes as weight loss, cessation of smoking, and increasing exercise. Following complex medication regimens and modifying activities require complex and difficult behavioral changes by patients. Thus, patients must have a long-term commitment to complex regimens that emphasize patient self-management (1–3). Perhaps Mark Twain's astute comment best summarizes the problem: "Habit is habit, and not to be flung out the window, but coaxed downstairs a step at a time."

Though enhancing adherence is complex, the rationale for doing so is clear: Patients' outcomes will be maximized if health care providers make appropriate recommendations *and* patients have the requisite knowledge, motivation, skills, and resources to follow the recommendations. Viewed in this way, patient adherence to physicians' recommendations is the key mediator between medical practice and patient outcome. However, there are many places where this process may break down. Some individuals do not receive appropriate advice; others may follow the advice exactly, but not benefit from treatments; and others follow the advice incompletely, inconsistently, or not at all.

Adherence has been a major focus of researchers from various disciplines: A Medline search identified more than 10,000 papers related to

nonadherence that were published during the last 10 years. The vast majority of these papers characterized factors associated with, and barriers to, adherence. However, relatively little progress has been made in demonstrating the effectiveness of pragmatic strategies to enhance adherence. Whereas randomized controlled trials have identified several strategies to help patients to follow their treatment regimens (4), many other interventions have been either ineffective or too labor-intensive and expensive to be pragmatic. In addition, there is a lot of "reinventing the wheel." That is, practitioners and scientists interested in resolving barriers to adherence often begin from scratch, rather than capitalize on the research of others. Once effective and pragmatic strategies have been identified, the challenge will be to get this information to providers, administrators, and policymakers in order to improve patients' health outcomes.

For the effective provision of care for chronic conditions, it is necessary to activate the patient and the patient's community of support (5). A continuous effort must be made to improve the provision of information to patients, but motivation, which drives sustainable good adherence, is one of the most difficult elements for the health care system to provide. Although health professionals have an important role in activating patients through promoting optimism, providing enthusiasm, and encouraging maintenance of health behaviors (6), the health systems and health care teams experience difficulties in sustaining these efforts. These difficulties have led to an increased interest in the role of community-based educational and/or self-management programs aimed at the creation and maintenance of healthy habits, including adherence to health recommendations.

Brief descriptions of each chapter follow:

- In chapter 1, Bosworth, Weinberger, and Oddone provide a general introduction to the issue of treatment adherence.
- In chapter 2, Bosworth and Voils present various theoretical models that have been used to understand, predict, and/or improve adherence.
- In chapter 3, Dominick and Morey focus on the initiation and maintenance of exercise. They summarize the vast literature on factors related to poor exercise adherence, and they describe various behavioral interventions that have demonstrated efficacy in enhancing physical-activity levels among communities and within structured programs.
- In chapter 4, Yancy and Boan review problems with assessing adherence to diet, the current media interest in low-carbohydrate versus low-fat diets, and interventions clinicians can easily implement to improve diet and reduce weight.
- In chapter 5, Bastian and colleagues discuss the importance of short- and long-term smoking cessation. The most successful interventions (cessa-

tion rates over 50%) incorporate multiple components (e.g., tailored print materials, telephone counseling, nicotine replacement therapy). They discuss the importance of capitalizing on "teachable moments" by targeting special populations (e.g., patients with a recent diagnosis of heart disease or cancer) using multicomponent interventions.

• Bosworth, in chapter 6, highlights important advances in medication adherence. Beyond describing potential factors related to medication adherence, this chapter reviews the relative strengths and weaknesses of alternative measures of medication adherence. Educational, behavioral, and multifaceted interventions are discussed.

• Zinn, in chapter 7, highlights developments in rehabilitation, a relatively unexplored area of adherence. Adding complexity to studies of adherence in rehabilitation are three considerations not generally found in chronic-disease management: (a) many conditions that require rehabilitation have both an acute and postacute or chronic phase that have different treatments, (b) the rehabilitation population includes a large proportion of patients with physical or cognitive impairments that are not readily accounted for in the normative-based theoretical models of adherence presented in chapter 2, and (c) many rehabilitation patients who require adaptive technology (e.g., wheelchairs, walkers) experience stigma not found in many other chronic diseases.

• In chapter 8, Cheng and Walter discuss unique issues related to maintaining treatment adherence among children such as need for independence among children and the need for practitioners to be aware of the additional dimension of complexity introduced by the interests of the parent or caregiver. Specific methods for enhancing treatment adherence for this group are provided.

• Chapter 9 addresses adherence issues related to depression. Specifically, the authors identify the independent effects of depression on adherence to medical treatments, mental-health treatments, and preventive care. This chapter is particularly important given that the increased number of problems and severity of depression is correlated with increased complexity of the treatment, increased risk of depression, and increased likelihood of treatment nonadherence.

• Chapter 10 addresses treatment adherence among individuals with severe mental illness, particular schizophrenia and posttraumatic stress disorder. The cost of nonadherence for these extremely disabling diseases is discussed, as are potential factors related to nonadherence. Notably, impaired thought processes and potential side effects of many prescribed medications pose significant challenges to patients and clinicians.

• Provider–patient communication has been identified as one of the most important factors for improving patient adherence. In chapter 11, Al-

exander and colleagues examine the underlining mechanisms that mediate how provider–patient communication affects treatment adherence. They discuss the unique communication challenges encountered when providers work with diverse patient populations, specifically covering issues related to cultural competency, health literacy, and working with elderly patients with complex treatment regimens. Then, they review interventions to improve provider–patient communication and patient adherence to treatment regimens. The chapter closes with a discussion of the limitations of existing research on provider–patient communication and treatment adherence and directions for future research.

• Weinberger and Salz (chap. 12) focus on physician adherence to clinical practice guidelines. The authors review the development of clinical practice guidelines; issues related to defining and measuring adherence to guidelines; strategies that have been successful or unsuccessful in increasing adherence to guidelines; and challenges for researchers and policymakers interested in evaluating and/or implementing innovative strategies to enhance adherence to guidelines.

• In chapter 13, Ammerman and Tajik present three frameworks that help improve treatment adherence at multiple levels of a continuum rather than solely at the individual level: (a) a socioecologic framework, which provides a multilevel model that describes the impact on behavior at various levels; (b) the RE-AIM model (7) on translating "proven" interventions to everyday settings; and (c) the importance of community-based participatory research, which allows researchers to reach a broader population more effectively and have a meaningful and sustainable impact on adherence at multiple levels over time.

• Van Houtven, Weinberger, and Carey (chap. 14) present a model to illustrate how researchers might consider the cost of nonadherence in their work. They review the economics literature on studies of nonadherence, as well as economic evaluation methods and health utility preference measures. The mechanics of adapting the cost-effectiveness calculation to incorporate nonadherence are discussed and a template of costs and effects that researchers should consider, including how these considerations influence the study design and interpretation, is presented. Finally, the authors discuss the implications of considering nonadherence costs in health policy.

• In chapter 15, Anstrom, Weinfurt, and Allen focus on the effects of nonadherence on the interpretations of clinical study findings. This has been the subject of much recent work in statistical methods. The intent in this chapter is to convey the key concepts using simple examples without focusing on computational and implementation issues.

• One possible reason for the lack of improvement in treatment adherence may be the ineffective dissemination of interventions. Chapter 16 ad-

dresses the issue that developing and disseminating evidence-based guidelines to improve treatment adherence is a complex system that exists in a dynamic equilibrium. Matchar and colleagues discuss the substantial efforts have been made to find tools that will improve adherence with guidelines, and many are creative solutions to specific barriers to practice improvement. They describe one approach to practice improvement that builds on the general principles of total quality management for process improvement and discuss their experience implementing this approach.

• Skinner and colleagues (chap. 17) describe new technologies and their influence on existing adherence interventions focuses on how tailoring technology has been used in adherence-promoting interventions. They present examples that illustrate various types of tailored interventions and summarize what can and cannot be concluded about the effectiveness of tailored adherence interventions.

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Part

WHAT IS TREATMENT ADHERENCE?

Chapter 1

Introduction

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DEFINING TREATMENT NONADHERENCE

Treatment adherence has been examined from various scientific perspectives and it has an important influence on treatment effectiveness. There is confusion about the conceptual and operational definitions of treatment adherence. In part, this may be attributed to the multitude of terms that have often been used interchangeably to refer to this concept. For example, *compliance, cooperation, concordance, mutuality,* and *therapeutic alliance* have been used, and operational definitions of these terms vary widely across studies (1). Most definitions contain elements relating to patients' self-care responsibilities, their role in the treatment process, and their collaboration with health care providers.

Though providers have known about the problem of patient adherence since beginning of medicine, researchers have studied patient adherence since at least the late 1940s (2). As a response to the growing burden of chronic diseases and providers' increasing reliance on patient self-management, research in patient adherence has grown significantly over the last 30 years since Sackett (3); later Haynes (4) provided us with the most cited definition of compliance: "the extent to which a person's behavior [in terms of taking medication, following a diet, modifying habits, or attending clinics] coincides with medical or health advice" (4). Subsequent authors have objected to the term compliance because it implies subservience on the part of the patient. Thus, the terms adherence or concordance are generally

more preferred (5). The term adherence is used through this book. Adherence connotes the patient's participation and engagement in maintaining a regimen she or he believes will be beneficial, strongly implying a therapeutic partnership with providers that is essential for the patients' successfully following the prescribed treatment regimen. Similar to the World Health Organization recommendation (6), it is also recognized that adherence to a regimen may reflect behavior ranging from seeking medical attention and filling prescriptions to obtaining immunizations and executing behavioral modifications that address self-management of disease (e.g., medications, smoking, diet, physical activity).

The lack of a generally accepted definition of treatment adherence makes it difficult to measure the concept. As a behavioral concept, treatment adherence involves complex actions, intentions, emotions, and phenomena that may not be directly observable. Therefore, self-reports have the advantage of revealing the patient's own assessment of treatment adherence. Outcome-oriented definitions (e.g., cure rate, serum level, clinical parameters) have the advantage of being "objective," but may not reflect adherence because of the complex processes required to achieve these outcomes. Process-oriented indicators make use of intermediate variables such as appointment keeping or pill counts to measure adherence (7). Other measurement issues include: (a) the degree of adherence (e.g., perfect adherence, partial adherence, complete nonadherence), (b) scale of measurement, that is, as a continuous ratio (percent adherence) versus categorical (e.g., good vs. poor adherence), and (c) combining indicators of adherence with multiple aspects of the regimen (e.g., index score vs. separate analyses). Measurement issues may also vary with the disease being studied. For example, to receive benefits for HIV/AIDS requires complete adherence, whereas patients with many other chronic diseases can miss some medication doses and still receive the benefits. Another issue involves differences between short- (e.g., antibiotics) and long-term (e.g., chronic medication, exercise, diet) behavioral regimens.

MAGNITUDE OF TREATMENT NONADHERENCE

Given these challenges to conceptualizing and measuring regimen adherence, it is not surprising that research reviews find wide ranges of adherence among patients, ranging from 0% to over 100% (overuse) with 50% adherence being an average (8–10). In a recent meta-analysis of 569 studies reporting adherence to medical treatment prescribed by a nonpsychiatrist physician, the average nonadherence rate was 24.8%. Adherence was highest in HIV disease, arthritis, gastrointestinal disorders, and cancers; it was lowest in pulmonary disease, diabetes, and sleep disorders (2). For behav-

iors involving lifestyle modifications (e.g., exercise, diet, smoking cessation), treatment adherence rates are distressingly poor (11, 12). Smoking cessation, exercise, and dietary modification can be extraordinarily difficult for patients to carry out and maintain successfully. Some medical practitioners are discouraged by their patients' failures to adhere and may be reluctant even to make preventive recommendations or provide reminders regarding the actions that may protect a patient's health. A 2003 Institute of Medicine report suggests that greater efforts to help people quit smoking, lose weight, and change other unhealthy behaviors could lead to a 29% decline in United States cancer rates by 2015; by decreasing risky health behaviors, the number of lung cancer cases could be cut in half and the number of colon cancers cut by a third (http://www.nap.edu/catalog/10263.html?onpi_newbooks_031403).

IMPACT OF MEDICAL REGIMEN NONADHERENCE

Nonadherence can result in tangible and intangible consequences, including suffering and death; diminished quality of life; and provider and patient frustration, anger, and hopelessness. Poor adherence can compromise the effectiveness of treatment and result in increased morbidity and health care costs. Nonadherence to medication regimens is estimated to result in 125,000 deaths in the United States per year (13). At least 10% of all hospitalizations and nearly one quarter of all nursing home admissions result from to patients' nonadherence with medications (14). More than one third of hospital admissions for heart failure results from nonadherence with dietary and medication regimens (15, 16). Small deviations from immunosuppressive therapy are associated with untoward outcomes, including organ rejections in transplant recipients. However, it is important to acknowledge that, in some cases, nonadherence may be beneficial if it prevents adverse drug reactions that might have occurred (17). Nonadherence may represent rational choice as patients attempt to maintain their personal identity to achieve their goals and preserve their quality of life (18–20).

Poor treatment adherence can have societal impacts as well. Nonadherence, for example, has a significant role in the reemergence of drug-resistant organisms (21) including tuberculosis (22). Nonadherence also contributes to waste of resources and the loss of health care dollars and productivity. It has been suggested that the offering of medical recommendations that are misunderstood or subsequently forgotten or ignored is a waste of scarce health care resources and suggests a systemic problem (2).

In research, nonadherence impacts the evaluation of the therapies. Because poor adherence to a treatment protocol can underestimate that in-

tervention's effectiveness, either study power is reduced or additional subjects are required in order to attain a measurable effect, at increased study cost (23). Furthermore, nonadherence to experimental treatment may underestimate the incidence of side effects or result in an overestimation of the optimal dosage for therapeutic efficacy. The trial's internal validity may be threatened by differential adherence across experimental conditions (24). Though much research regarding adherence has been focused on the negative impact of nonadherence, it is important to acknowledge that adherence can also be detrimental. In one trial, for example, adherence to what turned out to be a detrimental medication resulted in increased arrhythmic mortality among the active medication group and expedited the termination of two of the active drugs (25).

KEY DETERMINANTS OF TREATMENT NONADHERENCE

In general, a multitude of studies examining determinants of treatment adherence demonstrate that there is no "stereotypical" nonadherer, and clinicians are unable to predict who is likely to adhere any better than chance. There are, however, four characteristics that do increase patients' risk of nonadherence. First, difficult social circumstances (e.g., marital discord, social isolation, family conflict and dysfunction) predict adherence difficulty, whereas increased levels of family support, cohesion, and organization are associated with better adherence (26). DiMatteo, for example, reported in a meta-analysis of 122 studies that treatment adherence is 1.74 times higher in patients from cohesive families and 1.52 times lower in patients from families in conflict (27). Second, access to care and financial barriers limit treatment adherence. For example, after controlling for various covariates, more-educated HIV-positive patients were found to be more likely to adhere to therapy; and similarly among diabetics, the less-educated were much more likely to switch treatment, which led to more health problems (28). In another study, it was reported that 2 million elderly beneficiaries did not adhere to drug treatment regimens due to cost. Lower income beneficiaries with high out-of-pocket drug spending appear especially vulnerable to nonadherence (29). Third, patients with psychiatric disorders including dementia (30, 31) and substance use problems (32–34) are less likely to adhere to medication regimens. Fourth, medical regimen nonadherence is less problematic when the recommended regimen is a short-term intervention for an acute problem, particularly one with a salient symptom such as pain. However, chronic illnesses, especially those that are asymptomatic, are associated with higher nonadherence. For example, after 5 years of statin treatment only 25% of patients maintained an adher-

ence rate (proportion of days covered) of at least 80% (35) and within 6 months of statin initiation at least 25% of the patients discontinued therapy (36). This makes sense, because chronic disease is defined by a lifelong commitment to a regimen.

ASSESSING TREATMENT ADHERENCE IN CLINICAL PRACTICE

Because physician assessments of patients' adherence is often inaccurate, other measures of adherence are more difficult to implement in clinical practice. However, there are three simple techniques that can be used by providers to detect poor treatment adherence. First, providers can watch for patients who fail to attend appointments. Not only can these patients be dropping out of treatment, but they are also less likely to be following their prescribed regimens. Second, clinicians should watch for treatment responses. For patients whose conditions fail to respond to appropriate therapy, for example, nonadherence is one plausible explanation. Third, and most important, clinicians should ask patients about their nonadherence. When asked in a nonthreatening manner (e.g., "Many people have difficulty time exercising. During the past week, how much physical activity have you gotten?"), patients will often admit nonadherence. A meta-analysis has shown that simply asking the patient has a sensitivity of 55% with a specificity of 87% (37). Armed with this knowledge, physicians can elicit barriers to adherence and offer potential solutions. Notably, treatment adherence is not a unidimensional construct: Adherence to one component of a regimen is not necessarily related to other self-treatment behaviors (38). For example, medication recommendations are more likely to be followed, whereas such lifestyle changes as diet and exercise tend to be more problematic (39). Thus, physicians should ask about adherence to each aspect of a patient's regimen.

SUMMARY OF ADHERENCE INTERVENTIONS

Treatment adherence is a complex behavioral process determined by many interacting factors. These include attributes of the patient, the patient's environment (e.g., social support) the health care system (e.g., functioning of the health care team, availability of health care resources), and characteristics of the disease. Most research on adherence focuses on a health outcome and presumes that adherence to selected recommendations mediates or facilitates achievement of the desired outcome. Although studies have examined efforts to improve adherence, few are randomized controlled trials with adherence as the outcome (40, 41). The most promising strategies

for improving treatment adherence involve patient education (42), contracts (43), self-monitoring (44), social support (45), telephone follow-up, and tailoring (46, 47); multicomponent strategies tend to be more effective in improving poor adherence (48). Managing risk factors by multidisciplinary teams within systems designed to modify health care delivery and respond to patient and provider needs have been more successful than physicians alone providing interventions in a traditional, minimally structured environment (49, 50).

Increasing the effectiveness of adherence interventions may have a far greater impact on health of the population than any improvements in specific medical treatments (51). There continues to be a tendency to focus on patient-related factors as the causes of problems with adherence to relative neglect of provider and health system–related determinants. In general, the ability of patients to follow treatment plans is frequently compromised by a number of barriers, which may include social and economic factors, the health care system, the characteristics of the disease, disease therapies, and patient-related factors. Thus, successful interventions must address these multiple factors if patients' adherence to therapies is to be improved. Because there is no single intervention strategy shown to be effective across all patients, conditions, and settings, interventions that target adherence must be tailored to the particular illness-related demands experienced by the patient. To accomplish this, health professionals need to be trained in assessing risk of nonadherence, factors that influence adherence, and delivering intervention to optimize adherence. Furthermore, improve adherence requires a continuous and dynamic process, and for effective provision of care, it is necessary that the patient, the family, and the community who support the individual all play an active role.

In summary, simplistic approaches to improve treatment adherence and subsequently improve the quality of life of people are not possible. What is required instead is a deliberative approach that starts with reviewing the way health professionals are trained and rewarded and addresses the many barriers patients and their families encounter as they strive to maintain optimal health. The following chapters discuss the prevalence and barriers to adherence for specific behaviors and populations, methods for improving adherence across various behaviors and populations, and ways to analyze and disseminate this information.

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Chapter 2

Theoretical Models to Understand Treatment Adherence

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In this chapter, we review the models or theoretical approaches that have been used to describe and understand treatment adherence. Space constraints prevent us from reviewing every model, so we have selected those that have received the most attention and empirical support. For each, we describe the model, review empirical evidence for the model, and review applications to treatment adherence. We next discuss suggested strategies providers and researchers can use to encourage adherence based on the model's theoretical constructs. We conclude by discussing challenges with existing theories and models and suggest why and how the theories might be integrated to gain a better understanding of treatment adherence.

SOCIAL LEARNING (COGNITIVE) THEORY

Social learning theory (recently relabeled social cognitive theory) combines aspects of cognitive psychology and behavioral psychology. The theory suggests that behavior results from external stimuli and is explained in terms of rewards and punishment. According to social learning theory, behavior results from mental processes such as reasoning, decision making, and problem solving. Social learning theory also assumes that the majority of reinforcers of human behavior are social in nature (e.g., acceptance, smiles). As a result, theories that come out of the social learning tradition have been labeled social cognition theories (1). Although there are several

theoretical models that can be applied to treatment adherence, most have their roots in social learning theory.

The social aspect of learning is evident from research suggesting that people can learn behaviors from watching others perform them—a process called observational learning. Observational learning may prove useful to increase treatment adherence to some behaviors such as exercise (e.g., by watching Richard Simmons on television), diet, and cancer screening (e.g., following Katie Couric undergoing a colonoscopy on national television), as these behaviors are highly recommended by health professionals and examples may be more readily available.

The cognitive aspect of learning is highlighted by research suggesting outcome expectancies (or response efficacy) influence behavior. Outcome expectancies, overlapping with parallel concepts in the theory of reasoned action and the health belief model, represent the expectancy that a positive outcome or consequence will occur as a function of the behavior. Two major competing views emerged from social learning theory to explain how this occurs: *locus of control* and *self-efficacy*. Locus of control refers to the belief that one has at one's disposal a response that can influence an event (2). Self-efficacy refers an individual's confidence in his or her ability to perform a given task (3). Thus, locus of control refers to one's perception of the availability of a response, whereas self-efficacy refers to one's confidence in the ability to effect that response.

Locus of Control

Rotter's Locus of Control Theory. Rotter (4, 5) suggested that, when presented with the same information, different people learn very different things. Some individuals respond to reinforcement, as behavioral psychologists predict. That is, when people are rewarded for a behavior, they are more likely to repeat it in the future; when they are punished for a behavior, they are less likely to repeat it. Other individuals do not respond to reinforcement in that way. Indeed, they may convey the impression that they learned nothing at all because they often shift their expectancies in the direction opposite to the prior outcome; it is as though they believe chance determines behavior. The variable that represents these individual differences is termed locus of control. Locus of control has two dimensions: internal and external. People high in internal locus of control believe that reinforcement is contingent on one's behavior—for example, if one exercises, one will be rewarded with a slim figure and better health. In contrast, people high in external locus of control believe that reinforcement is contingent on outside forces such as luck, fate, or chance.

Wallston's Locus of Control Theory. Wallston and colleagues (6) expanded on Rotter's concept of locus of control to understand health-related behaviors. Like Rotter's theory, Wallston et al. suggested there are people who are high in internal locus of control who believe health rewards are contingent on healthy behavior. However, Wallston et al. also suggested that there are different ways to have an external control orientation. In their conceptualization, external locus of control refers to relying on powerful others, such as health care providers, as a source of reinforcement, whereas chance locus of control refers to relying on fate or chance for reinforcement (as in Rotter's concept of external locus of control).

Several studies have used locus of control to understand individual differences in the likelihood of engaging in healthy behaviors. Some research has suggested that individuals high in internal locus of control are more likely to be adherent to medical regimens (7). For example, such individuals are more likely to be nonsmokers (8), adhere to HIV medication (9) and hypertension medication (10), and are more successful at weight control (11). Other studies have found no relationship between locus of control and treatment adherence (12). Some have suggested this discrepancy may be resolved by examining locus of control in interactions with other variables (e.g., expectancies, social support, motivation) rather than as a main effect (7, 13). For example, adherence to depression medication was predicted by an interaction between locus of control and social support, such that increasing social support was associated with greater adherence among people high in internal locus of control (14).

Self-Efficacy

A second variation in the role of expectancies is based on Bandura's (15) concept of *self-efficacy*. Bandura suggested that just knowing what to do is not sufficient for one to behave; instead, one must also be confident that one is capable of performing the specific behavior. This belief is called self-efficacy (3). Self-efficacy is the product of both efficacy expectations (an individual's perception of his or her ability to achieve a specific level of performance) and outcome expectations (an individual's evaluation of the probable consequences of a specific behavior) (16). Hundreds of studies have shown that self-efficacy predicts the extent to which people are likely to engage in a behavior (17, 18). People who do not think they can stop smoking, for example, are more likely to relapse (19). Likewise, women who feel capable of performing breast self-examination are more likely to do so (20). Self-efficacy is also related to medication and exercise adherence (9, 21). However, it is important to emphasize that self-efficacy is be-

havior-specific. That is, someone may feel capable of performing one particular behavior, but not another.

Efficacy expectations are derived from four different sources: performance mastery, vicarious experience, social or verbal persuasion, and physiological states or cues experienced by the individual (22). Performance mastery refers to doing a task well. Vicarious experience refers to seeing another person model a behavior, often with the situational context and the consequences that follow. Persuasion, or trying to convince someone to do something, can occur socially (e.g., when norms support a behavior, such as not smoking) or verbally (e.g., by presenting information supporting one's position, such as evidence that smoking can cause lung cancer). Physiological states or cues refer to affect or arousal that one experiences in a situation; how one interprets the arousal influences one's beliefs. For example, experiencing a runner's high may lead one to think one is capable of increasing one's exercise routine.

The effect of performance mastery will be maximized when one believes that a positive outcome (e.g., weight loss) is the result of one's behavior (e.g., adhering to an exercise program). Additionally, performance mastery will be achieved most easily when learning or adopting a new behavior is broken down into manageable chunks. For example, patients will be more likely to adhere to an exercise program if they slowly increase their amount of physical activity each day. Although interventions designed to improve performance mastery generally are the most effective means of building patient self-efficacy, health care professionals also can develop strategies specific to the other sources of efficacy expectations (23). For example, verbal persuasion may be more successful if providers use past performance information, such as emphasizing past or recent weight loss. In addition, physiological arousal will influence self-efficacy to the extent that it is perceived as positive. For example, an increase in energy can help one feel capable of walking two miles, whereas nervousness may make one feel unable to give oneself a shot of insulin.

Strategies Using Social Learning Theory Concepts

There are several strategies providers and researchers can use to enhance self-efficacy. For example, providers can provide opportunities for the patient to master the necessary skills. This may be done by modeling the behavior or providing an example in order to facilitate learning the new behavior. For example, providers can teach their patients how to monitor their blood pressure or show a videotape of an individual engaging in the prescribed activity. Clinicians can also provide an opportunity for patients to rehearse the new behavior in front of them for feedback. For example, providers can have patients check their insulin after being shown how this

is done. Previous experience with the health behavior change in question should also be addressed with patients. Providers can address previously failed attempts and explore individual and environmental factors that may have contributed to these unsuccessful attempts. Finally, verbal positive reinforcement should be given when patients practice or perform the recommended behavior. Feelings of self-efficacy may give rise to greater internal locus of control, which in turn should be associated with greater adherence to a medical regimen.

CONTINUUM THEORIES

Several concepts that came out of the social learning tradition formed the basis for current models of health decision making. In general, these theories can be grouped under two broad categories: continuum models, which include the theory of reasoned action/theory of planned behavior, protection motivation theory, health belief model, self-regulatory model of illness; and stage models, which include the transtheoretical model and precaution adoption process model. Continuum models assume that all variables that influence behavior can be combined into a single equation that predicts the likelihood of action. Furthermore, the way the variables combine to influence behavior is presumed to be the same for everyone.

Theory of Reasoned Action/Theory of Planned Behavior

The theory of reasoned action (24) was an attempt to resolve a debate in social psychology concerning whether attitudes predict behavior. According to the theory, the strongest predictor of behavior is intention to perform that behavior. Intention, in turn, is determined by attitude toward a behavior (i.e., a person's overall evaluation of performing the behavior) and subjective norms (i.e., a person's perceptions of how others feel about the behavior) (see Fig. 2.1). Determinants of attitudes toward a behavior include one's beliefs about the consequences of performing a behavior and one's evaluation of those possible consequences, whereas determinants of subjective norms include perceived expectations of significant others and motivation to meet those expectations.

The theory of reasoned action was later modified to explain behaviors that are not completely under volitional control; the revised theory was named the theory of planned behavior (25). The theory of planned behavior included a third determinant of intention, perceived behavioral control (i.e., the extent to which one believes one has control over performing the behavior, or the ease or difficulty of performing the behavior). Determinants of perceived behavioral control include beliefs about controllability

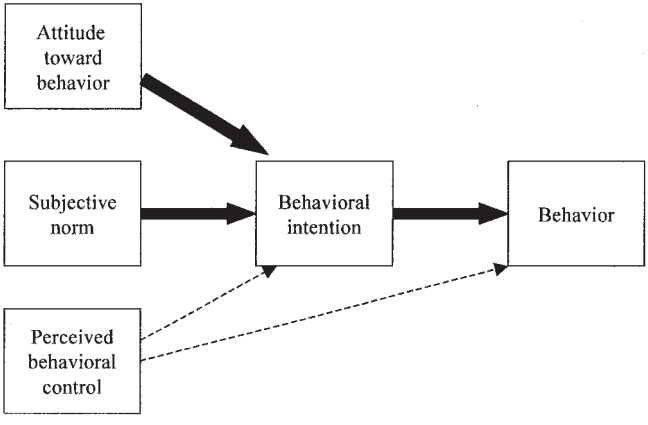

FIG. 2.1. Theories of reasoned action (solid) and planned behavior.

and perceived power to perform the behavior. The theory of planned behavior stipulated that, whenever people's perceptions of control are accurate, perceived behavioral control would not only predict behavioral intention, but behavior as well (see Fig. 2.1). The concept of perceived behavioral control is related to Bandura's (26) concept of self-efficacy (27).

In sum, the theory of reasoned action and theory of planned behavior postulate that the more positive people's attitudes and subjective norms regarding behavior are, and the greater their perceived behavioral control, the stronger people's intentions to perform the behavior will be. Similarly, the stronger people's intentions, and the greater the perceived behavioral control, the more likely it is that people will perform the behavior.

In general, theory of reasoned action and theory of planned behavior concepts are good predictors of behavioral intentions; meta-analyses have shown that theory of reasoned action and theory of planned behavior variables account for 40% to 50% of the explained variance for health behaviors (see ref. 28 for a review of meta-analyses). However, there are at least three limitations of the theory of planned behavior. First, the theory has not addressed potential changes in individuals' beliefs and attitudes over time. Second, because the theory of planned behavior is primarily an account of goal setting rather than goal pursuit (29), the model is less equipped to explain patterns of behavior change. Third, the theory does not account for the discrepancy between intention to adhere and actual adherence; the latter may be a distinctly different process. For example, the relationship between intentions and behavior is less strong; in prospective studies, theory of reasoned action and theory of planned behavior variables account for only 20% to 40% of the variance in health behaviors (30–32). The relation-

ship appears to be attenuated by intentional abstainers—people who intend to perform a behavior but fail to do so.

Considerable research has been devoted to understanding why the intention–behavior relationship is so weak and how it might be strengthened. Several factors play a role, including behavior type, intention type, and cognitive and personality variables (33). Specific examples include past behavior (34, 35), certainty about intentions or attitudes (36), anticipated regret (37), and attitudinal versus normative control (38). These moderators function by strengthening one's intentions (39).

The intention–behavior relationship can also be strengthened by forming implementation intentions—specific intentions that denote when, where, and how a behavior is to be performed (40). People who form implementation intentions are more likely to perform a behavior than people who have general behavioral intentions for at least two reasons (41, 42). First, behavioral intentions are often accompanied by uncertainty (43, 44). For example, people may "intend to get screened for cancer" but lack details about how or when they will do so. Therefore, making a specific plan to carry out the behavior eliminates the uncertainty. Second, implementation intentions create memory traces that can be activated by environmental cues (40). For example, one may be reminded to take one's medication in the morning after seeing one's toothbrush if one normally takes one's medication after brushing one's teeth.

Applications to Treatment Adherence. The theories of reasoned action and planned behavior have been applied to understand several health-related behaviors, including addictive behaviors (e.g., smoking, alcohol, drugs), automobile-related behaviors (e.g., speeding, wearing seat belts), screening (cancer screening, breast self-exam), eating and exercise, HIV/AIDs behaviors (e.g., using condoms), and oral hygiene (for reviews, see refs. 32 and 45). Implementation intentions have also been used to increase treatment adherence, including breast self-examination (46), healthy eating (47), cervical cancer screening (34), and exercise (48).

The extent to which the theory of reasoned action and theory of planned behavior variables predict behavioral intentions appears to vary across treatment adherence behaviors (32). Attitudes are more predictive of intentions related to addictive behaviors, screening, and exercising than to eating; subjective norms are more predictive of intentions related to oral hygiene than to eating and exercising; and perceived behavioral control is more predictive of intentions related to oral hygiene and exercising than to eating and HIV/AIDS behaviors. The variables also vary in their ability to predict behaviors; perceived behavioral control is more predictive of addictive behaviors and screening behaviors than are intentions (32).

Strategies Using the Theory of Reasoned Action/Theory of Planned Behavior. Because patients must have a positive attitude toward the targeted behavior, providers might start by assessing patients' attitude toward treatment adherence. Negative attitudes could be changed through techniques of persuasion, including presenting a strong argument for the recommended behavior (e.g., increased life expectancy due to reducing risk of cardiovascular disease), providing knowledge that can serve as a basis for one's attitude, and alleviating fears. Social norms must also favor the recommended behavior. Providers could determine whether the patient thinks family members and friends endorse the behavior. They should highlight social pressure to engage in the behavior, if it exists, and provide examples of similar others who are currently engaging in the behavior. Often, patients with weight management problems are surrounded by people who do not believe the patient should lose weight (49). This creates a problem for the patient as he or she is often motivated to behave similarly to others (50). Providers should also provide social norms by adhering to the very behaviors that they recommend. It has been shown that patients are less confident about health advice given by obese than nonobese physicians (51). Perceived behavioral control can be increased using the strategies discussed previously for increasing self-efficacy. In addition, providers might try to address any perceived external constraints, such as cost and access to facilities. To increase the behavior intention and behavior relationship, specific examples of behaviors should be used when assessing behavioral intentions (52). Finally, providers should have patients form implementation intentions concerning the targeted behavior. For example, patients can decide that they will take their diuretics every morning after breakfast.

Protection Motivation Theory

Rogers's (53) protection motivation theory was originally designed to specify and operationalize the components of a fear appeal (i.e., a message that uses fear to persuade) that lead to attitude change and ultimately behavioral change. He later revised his theory into a more general theory of cognitive change (54), which has been used to understand decision making in relation to health threats. As in theory of reasoned action/theory of planned behavior, protection motivation theory stipulates that behavioral intentions, or what Rogers termed "protection motivation," is the best and most immediate protector of behavior. However, the models suggest different determinants of behavioral intentions. Whereas theory of planned behavior suggests that attitudes, social norms, and perceived behavioral control influence behavioral intentions, protection motivation theory suggests threat and coping appraisal influence them (see Fig. 2.2). Threat appraisal refers to the evaluation of the components of a fear appeal to determine

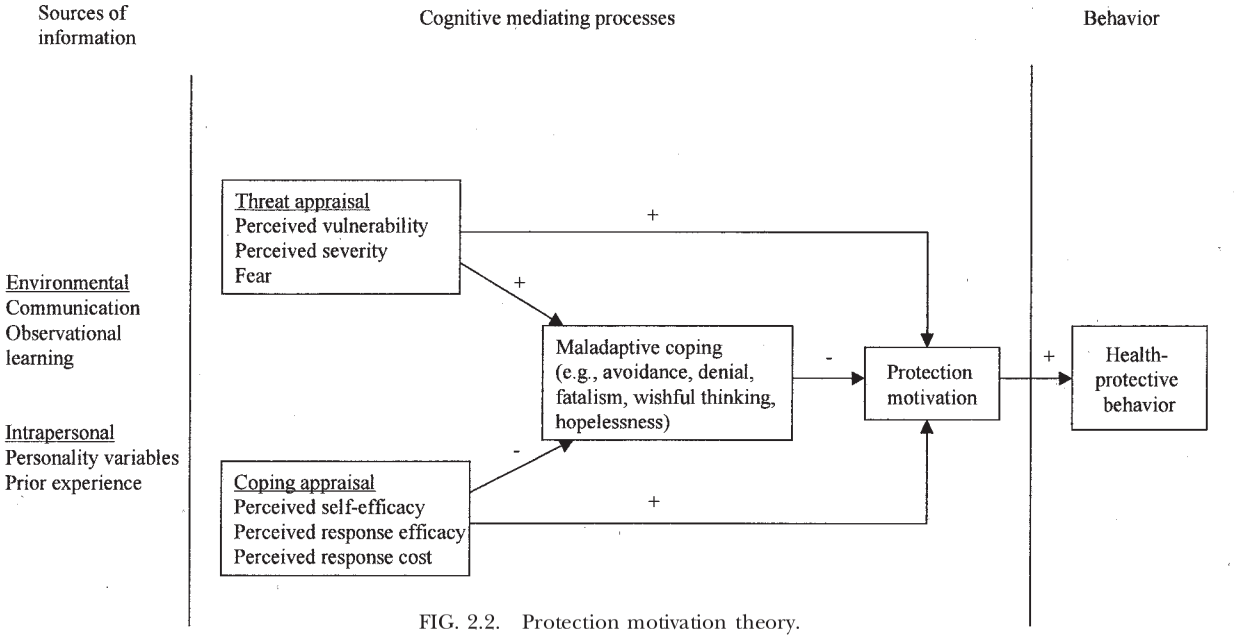

FIG. 2.2. Protection motivation theory.

how personally endangered one feels by the threat. It involves perceived vulnerability, or how susceptible one feels to a threat; perceived severity, or how serious one feels the threat is to one's life; and fear arousal evoked by the threat. One will be more likely to form intentions to adopt the recommended behavior if one believes one is susceptible to the threat, the threat is severe, and one is fearful of the threat. Coping appraisal refers to the evaluation of the recommended suggestion(s) for coping with the threat. Coping comprises self-efficacy, or how capable one feels of performing the recommended behaviors; response efficacy, or the belief about how effective a behavior will be in reducing a threat; and response costs, or beliefs about how costly the recommended response would be. One will be more likely to form intentions to adopt the recommended behavior if one is capable of performing that behavior, one believes a behavior will effectively reduce the threat, and the recommended response is not costly.

Protection motivation theory postulates that threat and coping appraisal are instigated by environmental (communication, observational learning) and intrapersonal (e.g., personality variables, prior experience) sources. It also postulates that threat and coping appraisal not only affect behavioral intentions, but also may lead to maladaptive coping responses (avoidance, denial, fatalism, wishful thinking, and hopelessness), which in turn may influence behavioral intentions. For example, through threat appraisal, one may determine that a threat is not personally relevant, which is associated with a denial coping response, which leads to low intentions to adopt the recommended behavior. The threat of smoking may not be perceived as relevant for an individual, which would lead to a low likelihood of cessation.

Applications to Treatment Adherence. Protection motivation theory has been used to increase intentions to exercise (55), use condoms (56, 57), perform breast self-examination (58) and testicular self-examination (59), obtain genetic testing for breast cancer (60), floss (16, 61), stop smoking (62), reduce dietary fat (63), and decrease substance use (64). In addition, associations have been found between protection motivation theory variables and concurrent behavior, including dietary fat intake (63). Prospective studies have shown that protection motivation theory variables predicted subsequent breast self-exam (58), breast cancer screening (65), and adherence to a physiotherapist's recommendations (66).

In a meta-analysis that examined protection motivation theory applications to health behavior, Milne et al. (67) found that all threat and coping appraisal activities were associated with behavioral intentions. Among the specific appraisal components, self-efficacy showed the strongest relation (r = .33). In addition, all threat and coping appraisal activities except fear were associated with concurrent behavior. As predicted, the strongest correlate of concurrent behavior was behavioral intention (r = .82). Perceived vulnerability, self-efficacy, and response costs were the only appraisal vari-

ables that were significantly associated with subsequent behavior, with self-efficacy showing the strongest relation. Finally, as predicted, behavioral intentions were predictive of future behavior ($r = .40$).

Although this meta-analysis suggests a sizable relation between behavioral intentions and concurrent and subsequent behavior, there is room for improvement. The concept of implementation intentions, although developed in a theory of planned behavior framework, could be effectively applied to increase the relation between intentions and behavior in the protection motivation theory framework as well. To our knowledge, this has been done in only one study in the health domain: Milne et al. (48) demonstrated that supplementing protection motivation theory variables with implementation intentions strengthened the relationship between intentions to exercise and exercise participation.

Strategies Using Protection Motivation Theory. First, providers need to assess the patient's perceived susceptibility and severity of the outcome and frame the health message according to these perceptions. Providers can engage in this process by discussing with the patient his or her perception of pros and cons for engaging in the behavior, thus eliciting perceived barriers to the health behavior change in question, and discuss how to overcome these barriers. Providers could enhance perceived threat by stressing the possible negative consequences of the problem behavior and aspects of a patient's medical history that make them vulnerable to a health problem. For example, providers could emphasize that atherosclerosis can lead to stroke and point out that a patient's high cholesterol and blood pressure increase the likelihood of having atherosclerosis, and possibly a stroke later. This threat information should be balanced with information and strategies for helping patients cope. For instance, providers should assess the perceived benefits of engaging in exercise and medication adherence and incorporate these benefits as reinforcers of behavior (52). In addition, providers should stress the effectiveness of a particular response (e.g., smoking cessation can reverse lung damage). Finally, strategies for enhancing self-efficacy and strengthening the relation between intentions and behavior, discussed previously, should be used.

Health Belief Model

The most frequently used model in studies of health behavior and adherence (68), the health belief model was developed to explain why people fail to engage in disease prevention or screening tests before the onset of symptoms (69). The model proposes that the likelihood of one carrying out a particular health behavior (e.g., taking a medication) is a function of personal beliefs about perceived susceptibility, severity, benefits, and barriers (see Fig. 2.3). Perceived susceptibility refers to one's perception of the risk

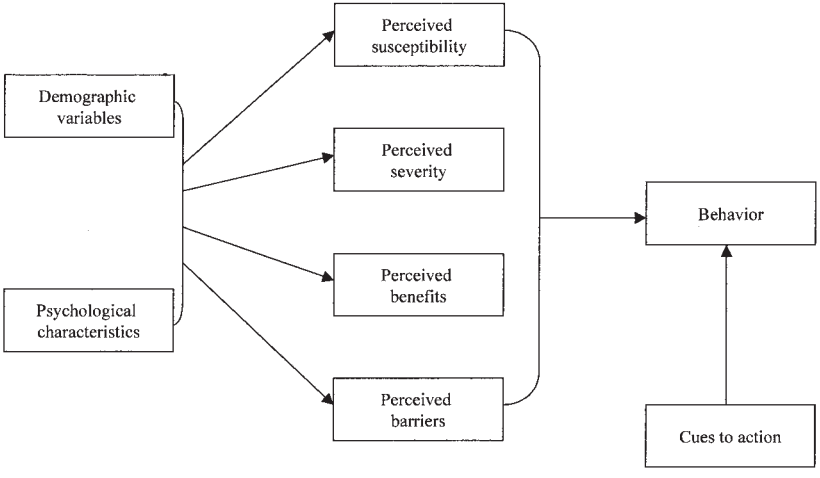

FIG. 2.3. Health belief model.

of contracting an illness. Perceived severity refers to the evaluation of the seriousness of contracting the illness and leaving it untreated and includes an evaluation of both social and medical/clinical consequences. The combination of perceived susceptibility and severity has been labeled perceived threat. In addition to deciding on perceived threat, an individual weighs the perceived benefits of an action (e.g., screening will detect problems at an early stage) against the perceived barriers to the action (e.g., difficulty in finding time to attend screening). The health belief model also stipulates that a cue or stimulus to action must trigger the behavior.

In sum, the model predicts that the likelihood of action is increased if the perceived threat of the disease is high, the benefits of the behavior outweigh the barriers, and certain cues are in place. Although the theoretical structure of the model has never been well specified, researchers suggest that the belief elements together produce some degree of psychological readiness to act in the face of threat. If these beliefs are above some threshold and environmental conditions permit, action is likely (70).

Several decades after the health belief model was conceptualized, it was revised. For instance, Bandura's (71) concept of self-efficacy was added to the model as a barrier (72). Other factors have been included as well, such as fairly nonspecific general health motivations, personal attributes that are stable across situations, resusceptibility to an illness previously contacted and currently under consideration, general orientation toward medicine, and characteristics of the patient–doctor relationship (73).

Review articles and meta-analyses have concluded that, in general, the constructs of the health belief model are good predictors of health behavior (74–76). However, inconsistencies in the way the constructs are meas-

ured have made it difficult to draw firm conclusions about the size of the effects (76, 77). Taken together, the findings of research on preventive medical behavior yield some of the strongest evidence for predictive usefulness of health beliefs, with the amount of variance explain between intention and behavior ranging from .25 to .50 (69).

Eraker et al.'s (78) health decision model was developed as an extension of the health belief model. It includes health belief model variables and patient preference, including decision analysis and behavioral decision theory. The health decision model includes bidirectional arrows and feedback loops, which suggest that adherence behavior can also change beliefs. To date, there is insufficient data on the validity and predictability of the health decision model.

Although the health belief model per se is not a theory about change, it has often been used in interventions involving health messages. In reality, the model may have its greatest use in developing and testing interventions. The components can serve as dimensions for defining the nature of a health threat in terms of different types of impact, risk for people, possible actions to take and their value, and what such actions might entail in terms of resources and skills. In addition, other parts of the communication process may be facilitated through health belief considerations; the attentional steps necessary for the process to occur can be affected by the way in which a health threat is presented and dramatized. The nature of existing beliefs about a health problem may also determine the value of different types of information (70).

The health belief model should fit best in the less repetitive realm where health considerations are clearly linked to the action. The model is also appropriate in the context of a decision about starting or stopping repetitive behaviors. The health belief model is likely to predict initiating the elimination of a habit because risky habits are often tied to a number of nonhealth considerations.

Applications to Treatment Adherence. The evidence for health beliefs as causal factors in treatment adherence is not clear, particularly in relation to ongoing treatment of chronic disease. Hershey et al. (79) assessed treatment adherence among hypertensive patients attending a hypertensive clinic. None of the health belief model indexes differentiated levels of adherence to prescribed medications, with the exception of a six-item measure of barriers. A study by Cummings (80) on adherence among a group of hemodialysis patients included assessment of beliefs specific to various parts of the regimen. In general, beliefs about benefits and barriers were associated with adherence measures, particularly those self-reported. Among other beliefs, only susceptibility showed an association, but only for dietary restriction. Thus, the health belief model has not clearly demonstrated predictive validity in relation to adherence with medical recommendations.

One reason the model is difficult to apply is that different aspects of regimens are often unrelated (e.g., taking medication and keeping appointments) (81).

Strategies Using the Health Belief Model. The strategies for addressing barriers and benefits discussed under protection motivation theory are applicable to this theory as well. Another strategy would be creating cues to action, which could be accomplished by having patients form implementation intentions. For example, having patients decide to take medication after dinner every day should serve to create an association in memory between dinnertime and medication taking so that taking medication after dinner becomes routinized.

Self-Regulatory Model of Illness

Like social cognition models, the self-regulatory model (82) emphasizes the role of self-efficacy and cognitive representation of a threat. Where this model differs, however, is in its description of the interaction between cognitions, motivation, and behavior. Self-regulation refers to efforts to lessen the discrepancy between current status (i.e., ill) and a future goal state (i.e., less ill or not ill). The self-regulatory model breaks self-regulation down into three stages: representation of the illness, which may be activated by internal cues (e.g., symptoms) or external cues (e.g., information); development and implementation of a plan to cope with the illness; and evaluation of the coping mechanism (see Fig. 2.4). These stages serve to create a dynamic feedback loop; that is, a person moves from stage to stage, both forward and backward. For example, one could determine that one has a headache (representation), decide to ignore it (cope), realize that it is not going away on its own (evaluate), take medication (reenter coping stage), and feel better (reevaluate). As demonstrated in this example, the decision about whether to adhere is conceptualized as one of a number of possible procedures for coping with an illness threat.

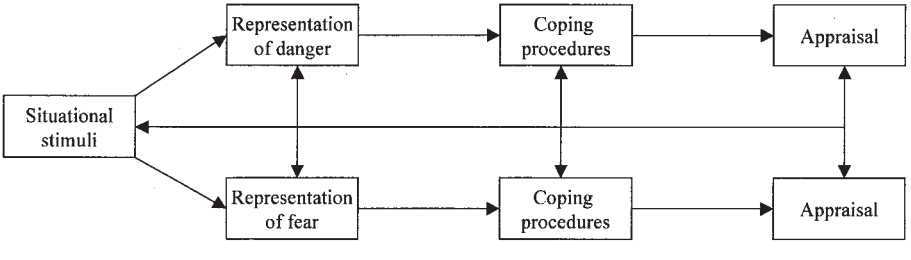

FIG. 2.4. Self-regulatory model of illness.

Important to note, this model stipulates that cognitive and affective processing occurs in parallel along the three stages. The cognitive component includes beliefs about the threat of illness, which give rise to coping mechanisms and an evaluation of those mechanisms for dealing with the threat. The affective component includes feelings about the illness, such as fear or distress, which give rise to coping mechanisms and an evaluation of those mechanisms for regulating emotion.

Applications to Treatment Adherence. One limitation to this model is that it is so complex that operationalizing the components is difficult. The lack of standardized instruments seems to be a barrier to the use of this model. In addition, the model is difficult to use because of its multivariate and transactional character. Thus, most empirical support for the model comes from studies highlighting the role of illness representations in behavior. Illness representations and beliefs have been shown to predict subsequent rehabilitation following myocardial infarction (83) and medication adherence for hypertension (84), asthma (85), and HIV (86).

The self-regulatory model is applicable to problems requiring a cognitive response to a threat that occurs with acute illness or episodic exacerbation of chronic disease. However, the self-regulatory model does not address maintaining sustained behavior in chronic diseases or prevention measures in which the threat is low. For example, many chronic diseases such as hypertension, hyperlipidemia, or osteoporosis are asymptomatic and thus have a silent impact on health. The model could be used to increase adherence to behaviors that help ameliorate or prevent such diseases, such as losing weight and exercising. For example, one could try to lose weight, evaluate one's efforts after a specified time period, adjust one's diet and exercise routine, and reevaluate the effort after another period of time. In the long run, this would reduce blood pressure and cholesterol levels.

Strategies Using the Self-Regulatory Model of Illness. Providers can help create accurate representations of illness using the strategies for inducing threat discussed under protection motivation theory. For example, patients need to be aware of the long-term effects of nonadherence to treatment regimens, such as increased risk of certain types of cancer and cardiovascular disease that results from obesity, smoking, hypertension, and hyperlipidemia. Providers can also help by suggesting coping strategies. Finally, providers can help patients appraise success or failure of their coping behaviors and help patients revise their coping behavior, if necessary. For instance, if a patient has been exercising three times per week but has not lost weight, the provider can help the patient adjust his or her exercise schedule and diet and then reevaluate at a follow-up visit.

STAGE THEORIES

Whereas the emphasis on intentions in the theory of reasoned action (24), the theory of planned behavior (25), and protection motivation theory (54) is fairly static (i.e., their primary focus is on learned predispositions retrieved from memory rather than on active processing of the implications of goal attainment), a number of quite similar health behavior models known as stage models have been proposed to describe the process of change (87, 88). Stage theories suggest that behavioral change occurs via progression through different stages. Stage theories have four key defining characteristics: a category system, whereby an individual can be in only one stage at one time; an ordering of categories; similar barriers to change within categories, such that people in the same category can be helped by similar interventions; and different barriers to change between categories (89). Thus, these models hold the most promise if interventions are tailored according to an individual's stage. Stage theories also have the advantage of drawing attention to the difference between adopting a behavior and maintaining it long term, which is frequently ignored in studies using continuum theories (90).

Transtheoretical Model

The transtheoretical model (87, 91) was originally developed for smoking cessation, but it has also been applied to adherence with other health behaviors, such as drug abuse, diet, exercise, seat belt use, avoidance of sun exposure, cancer self-exams, and condom use (92, 93). The crux of the model is that behavioral change occurs in a series of temporally ordered, discrete stages. Movement between stages is influenced by the ratio of pros and cons of the problem behavior, self-efficacy, temptations to revert to the problem behavior, and coping mechanisms used to change the problem behavior. The three organizing constructs of the model are stages of change, processes of change, and levels of change (93).

Stages of Change. Six discrete stages reflect one's interest and motivation to alter a problem behavior. One is able to achieve successful behavioral change by moving through them in a predetermined temporal order (93), as follows:

1. *Precontemplation* is the stage in which there is an unwillingness to change a problem behavior or there is a lack of recognition of the problem. At this stage, patients either deny having or do not recognize consequences of a condition.

2. *Contemplation* involves consideration of change, with an evaluation of pros and cons of both the problem behavior and the change. Individuals frequently begin to weigh the consequences of action or inaction. At this point, patients are able to discuss the disadvantages and advantages associated with, for example, taking an antihypertensive medication to prevent a stroke. Usually, patients discuss changing their current behavior in the next 6 months.

3. *Preparation* is the period when there is a commitment to change in the near future—usually within 1 month. Patients express a high degree of motivation toward the desired behaviors and outcomes. Patients in the preparation stage have determined that the adverse costs of maintaining their current behavior exceed the benefits. Therefore, initiating a new behavior is more likely. Patients have moved from thinking about the issue to doing something about it.

4. *Action* involves altering behavior successfully for 1 day to 6 months.

5. *Maintenance* occurs when one has engaged in the new behavior for at least 6 months. During this stage, the focus is on lifestyle modification to stabilize the behavior change and avoid relapse (93).

6. *Termination* occurs when the problem behavior is no longer a concern for individuals. Therefore, this stage applies to some behaviors (e.g., smoking cessation) but not others (e.g., cancer screening). In the process of behavioral change, individuals often cycle through the first five stages before reaching termination or permanent behavior change (91, 94).

Processes of Change. The processes of change are the activities that take place as individuals move through the six stages. Ten processes have been identified that are responsible for movement (see Table 2.1) (93). Five of these processes are experiential or cognitive and include consciousness-raising, dramatic relief, environmental evaluation, self-evaluation, and self-liberation. These are internally mediated factors that are associated with an individual's emotions, values, and cognitions (95). Consciousness-raising is described as encouraging individuals to increase their level of awareness, seek new information, or gain an understanding about a problem. Dramatic relief refers to experiencing negative emotions about a problem behavior, after which time affect is reduced; it is a cathartic process. Environmental evaluation is assessing how one's problem affects the physical environment. Self-evaluation is assessing how one feels and thinks about oneself in relation to the problem. Self-liberation is when one believes in oneself and one's ability to change (96).

The remaining five processes are behavioral and include counterconditioning, helping relationships, reinforcement/contingency management, stimulus control, and social liberation (95, 96). Counterconditioning is

TABLE 2.1
Transtheoretical Model—Integration of Stages of Change With Processes of Change

	Stage of Change				
Process	*Precontemplation*	*Contemplation*	*Preparation*	*Action*	*Maintenance*
Consciousness-raising	X	X			
Dramatic relief	X	X			
Environmental reevaluation	X	X			
Self-reevaluation		X			
Self-liberation			X		
Counterconditioning				X	X
Helping relationships				X	X
Reinforcement/Contingency management				X	X
Stimulus control				X	X
Social liberation				X	X

Note. From ref. 93.

substituting alternatives for problem behaviors (e.g., using meditation to cope with unpleasant emotions). Helping relationships are defined as those that provide trust, acceptance, and support (e.g., having a provider that listens when there is a need to discuss a problem). Reinforcement management is the use of positive reinforcements and appropriate goal setting with the patient. Stimulus control is helping the patient to restructure the environment so that the stimuli, or triggers, of the undesired behavior are controlled. Social liberation is increasing alternatives for nonproblem behaviors in society.

An integration of these processes with stages can be seen in Table 2.1. There is a match between the stage that the patient is in and the intervention that is used. Individuals in the contemplation stage would be most open to consciousness-raising, the use of dramatic relief, and environmental evaluation. In the action phase, effective use of behavioral processes would be particularly helpful (87, 96).

Levels of Change. Individuals have multiple problems that often overlap. Poor blood pressure control, for example, may be associated with a lack of exercise, smoking, poor diet, and not taking medication as prescribed. With this recognition, the transtheoretical model incorporates five levels of change for consideration. These include changes that relate to the symptoms or situations, maladaptive cognition, interpersonal problems, family/systems problems, and intrapersonal conflicts. Treatment outcomes are often better when multiple problems are addressed (97).

The transtheoretical model incorporates the theory of decisional balance (98), which examines the pros and cons in decision making. The balance of perceived pros and cons of adopting a new behavior varies across the stages of change so that the cons of changing outweigh the pros in the precontemplation stage. At some point during the contemplation or preparation stage, the pros start outweighing the cons.

The concept of self-efficacy is also important to the model and has two components: *confidence,* which refers to the confidence people have that they can cope with high-risk situations without relapsing, and *temptation,* which refers to the intensity of an urge to revert to a problem behavior. In relation to the stages of change, self-efficacy is generally at its lowest point in the precontemplation stage and increases to its highest point in the maintenance stage. Studies have shown self-efficacy to be a predictor of movement into action and maintenance, but less so in the early stages where decision-making processes are more important. Once individuals have decided that taking medicines is worth the relative loss of freedom, doubt about their own ability to take the medications on a regular basis can be a barrier to change, causing them to continue to contemplate changing. As individuals become more confident in their ability, the likelihood of movement into action and taking the medication is greater.

Applications to Treatment Adherence. Support for the transtheoretical model has been accumulating over the past 20 years. The model has been applied successfully to preventive behaviors such as cancer screening (99), smoking (100, 101), diet (102, 103), exercise (104, 105), and contraceptive use (106). One of the most relevant findings for practice is that, typically, 40% of a population with an unhealthy behavior are in the precontemplation stage, 40% are in the contemplation stage, and fewer than 20% are in the preparation stage (107, 108). Several studies have focused on creating assessment tools to determine the level of motivation for change, which include the 12-item Readiness to Change Measure (109), the 20-item Alcohol Abstinence Self-Efficacy Scale (110), the University of Rhode Island Change Assessment (URICA) (111), the Stages of Change Readiness and Treatment Eagerness Scale (SOC-RATES) (112), and the Readiness Ruler (113).

Extensive relapse and recycling occurs in populations attempting to take action to change behavior. This appears to be the norm and has important implications for practice. Terms such as *noncompliant, nonadherent,* and *unmotivated* are frequent labels applied to patients who do not follow through on their treatment plans. This may reflect the norm of relapse or may reflect a poorly created treatment plan that does not consider a patient's stage of change. In labeling patients as such, the provider may be externalizing responsibility by placing blame rather than reflecting upon his

or her own skills. Therefore, appreciating the stage of change the patient is in is imperative before one develops an optimal treatment plan.

Whereas the transtheoretical model has gained widespread popularity in health psychology, there is limited evidence of sequential movement through discrete stages in studies of specific behaviors. In addition, this model, like other stage theories, oversimplifies the complexities of behavioral change by imposing artificial categories on continuous processes (114–116). Although the transtheoretical model may have heuristic value, its practical utility is limited by concerns about the validity of stage assessments (117).

Strategies Using the Transtheoretical Model. Once a patient's stage of change is identified, the health care practitioner can help facilitate the patient's progression and movement through stages. Motivational interviewing is a framework that can help facilitate this movement. Motivational interviewing has been used extensively in the addiction field (118, 119); however, there has been considerable recent interest on the part of public health, health psychology, and medical professionals in adapting motivational interviewing to address other health behaviors and conditions such as regimen adherence (120).

Motivational interviewing is not a discrete intervention strategy but an amalgamation of principles and techniques drawn from several theoretical paradigms. A key goal of motivational interviewing is to assist individuals to work through their ambivalence about behavior change. Motivational interviewing assumes that, rather than trying to convince patients to change, providers would be more effective if they elicited arguments for change from patients themselves. Unlike many traditional patient-education paradigms, motivational interviewing usually does not involve providing information or advice unless the patient makes that request (121).

The technical aspects of motivational interviewing include three elements: (a) client-centered counseling skills, based on Rogerian counseling; (b) reflective listening statements, directive questions, and strategies to elicit internal motivation from the client, operationalized as self-motivating statements made by the client; and (c) strategies for ensuring that client resistance is minimized. Providers using motivational interviewing ask open-ended questions about the patient's values and goals and examine how they are discrepant with current behavior, respond with reflections to convey a sense of understanding, avoid arguments when encountering resistance, and convey hope that change is possible.

Support for the use of motivational interviewing has grown (see ref. 122 for a listing of studies involving motivational interviewing). Dunn and colleagues conducted a review to examine the effectiveness of brief behavioral interventions adapting the principles and techniques of motivational inter-

viewing to four behavioral domains: smoking, substance abuse, HIV risk, and diet/exercise (118). They identified 29 randomized trials of motivational interviewing interventions. Sixty percent of the 29 studies yielded at least one significant behavior change effect size. No significant association between length of follow-up time and magnitude of effect sizes was found across studies.

Limited research has examined motivational interviewing–based interventions to promote medication adherence. However, Kemp and colleagues used motivational interviewing among people experiencing psychosis (123, 124), which resulted in improved observer-rated adherence compared to participants receiving nonspecific counseling. Furthermore, changes were retained over an 18-month follow-up period (123). It seems likely that motivational interviewing could be used successfully to improve adherence to various aspects of regimens, including medication, exercise, and diet.

Precaution Adoption Process Model

The precaution adoption process model's hypotheses were initially tested in prediction of home radon testing (125). The model consists of seven self-explanatory stages: unaware of the issue; aware of the issue but not personally engaged; engaged and deciding what to do; planning to act but not yet having acted; acting; having decided not to act; and maintenance.

This model differs from the transtheoretical model in a few ways. First, the precaution adoption process model distinguishes between people who have never thought about changing a behavior and those who have thought about it but decided not to, whereas the precontemplation stage of the transtheoretical model does not. The precaution adoption process model includes a stage in which people can be unaware of an issue. This is because it was developed to encourage behavior relevant to an issue about which people are unaware (i.e., that radon gas is in their homes), whereas the transtheoretical model was developed to change behavior that people are aware of (e.g., smoking). Second, the precaution adoption process model distinguishes people who are undecided and those who have already decided to act, whereas the contemplation stage does not. Finally, the precaution adoption process model does not describe the process by which cognitive and behavioral change takes place.

Although this model holds promise for understanding adherence, applications of it have been limited. It has been used to predict mammography (126), oral-contraceptive use (127), and osteoporosis prevention (128). Due to the overlap in conceptualization, the strategies developed in the transtheoretical model framework could be applied within the precaution adoption model framework as well.

CHALLENGES WITH EXISTING MODELS AND THEORIES

There are many other models in literature that aim to predict adherence and further the field; space constraints prevent us from discussing all models in detail. Suffice it to say that no one unifying theory can encompass all aspects of behavior because no model explains completely an individual's interaction with the medical care system. In predicting relevant health behaviors such as treatment adherence, there are only a few clear rules for selection of the right framework. Data must exist that support the usefulness of a framework in predicting relevant health behavior or adherence. Often researchers will find data supporting the usefulness of a theoretical model, but not data on the specific behavior in question; therefore, the relevance of the model to the particular behavior is not known. Alternatively, supporting data may be obtained, but only in cross-sectional or longitudinal observational studies and not in randomized intervention studies, which precludes researchers from drawing conclusions about the usefulness of a model in a changing setting. In addition, there are few direct empirical comparisons of the predictive value of two or more models, making direct comparisons difficult.

The traditional models dominant in the study of patient adherence, such as the health belief model, are typically based on a rough cost–benefit calculus in which the patient considers the advantages and burdens of taking medications by weighing the probabilities of risks and benefits (69). Although these models have been useful as organizing frames, they have had limited predictive value. Furthermore, common problems using these models is that they often include cross-sectional designs to test predictive models and fail to explain how constructs are operationalized or validated (129). Moreover, many models allow us to examine only the patient's perspective, but adherence is clearly influenced by provider behavior as well. Therefore, it is necessary to go beyond the usual individual psychological focus of these models and give attention to contextual cues and reinforcements that are more amenable to intervention within treatment programs.

Considering maintenance is particularly important because intervention approaches have been identified that reliably elicit healthy changes in behavioral practices such as smoking, weight control, and exercise. Yet, rates of initial changes in behavior have not consistently translated into similar rates of behavioral maintenance. Some models, particularly the continuum models, make no direct reference to issues regarding behavioral maintenance, and empirical tests of these models have focused primarily on predicting a single behavioral outcome.

INTEGRATING MODELS TO PREDICT REGIMEN ADHERENCE

All of the theories reviewed earlier recognize the importance of motivation to change behavior and highlight the importance of strengthening the factors or processes that prompt behavioral change. In addition, it is clear from our review that the aforementioned models contain similar and overlapping components. For example, the concept of perceived behavioral control in the theory of reasoned action subsumes the concept of self-efficacy, which is incorporated in protection motivation theory, the health belief model, and the transtheoretical model. Likewise, the concept of behavioral intentions is found in many of the models. The overlap of concepts across models is one reason we believe the models should be integrated into interventions to increase treatment adherence.

Another reason for incorporating models is that it is difficult to operationally define some model components (especially in the self-regulatory model and health belief model) and examine each model as a whole. For instance, because the self-regulatory model is so complex, research has focused on illness representations and largely ignored the other components of the model and how they may work together to influence behavior.

Finally, integrating models is useful because it helps to explain behavior more accurately. For example, Ried and Christensen (130) examined relations between adherence to medication for urinary tract infections and variables from the health belief model (barriers and benefits) and the theory of reasoned action (belief strength, outcome evaluation, and behavioral intention). They found that health belief model variables explained 10% of the variance in adherence, whereas the theory of reasoned action variables explained an additional 19% of the variance. Thus, the amount of variance accounted for by variables from both models (29%) was greater than using either model alone. As another example, Senécal and colleagues (131) examined the relationship between constructs from social cognitive theory (self-efficacy) and self-determination theory (autonomy) and two outcomes—adherence and life satisfaction—among diabetics who managed their disease with self-care activities. Although constructs from both theories were significantly related to both outcomes, self-efficacy was more strongly related to adherence, whereas autonomy was more strongly related to life satisfaction. In sum, these findings suggest that interventions designed to increase adherence should utilize constructs from various theories of behavioral change.

How might various models be integrated? We made a distinction between theories of behavioral prediction (e.g., theory of planned behavior, health belief model) that "determine" the performance or nonperform-

ance of any behavior at any given point in time and models of behavior change that focus on "stages" individuals may go through in their attempt to change behavior (e.g., transtheoretical model). Although behavioral prediction and behavior change theories often have different foci, they are complementary; the intensity and direction of the variables identified in behavioral prediction theories often serve as markers of a stage of change. The precontemplator has not formed an intention, may have low self-efficacy, and may perceive little social pressure. As one moves from strong negative through neutral through weak positive interventions, they may be moving from the precontemplation to the contemplation stage (87).

By integrating the theories, we can specify the conditions that must be met for behavioral change to occur. One must (a) have a strong positive intention or predisposition to perform a behavior, (b) perceive her or himself as having the requisite skills for the behavior, (c) not face physical, logistical, or social environmental barriers to performing the behavior, (d) believe that material, social, or other reinforcement will follow the behavior, (e) believe that there is normative pressure to perform and none sanctioning the behavior, (f) believe that the behavior is consistent with a person's self-image, (g) have a positive effect regarding the behavior, and (h) encounter cues or enablers to engage in the behavior at the appropriate time and place (52, 132). In general, for behavior to occur, the first three conditions must hold. The remaining five variables are viewed as influencing the strength and direction of intention.

The idea that models should be combined is at the heart of the collaborative-care paradigm. In contrast to the traditional medical model, in which providers tell patients what to do and nonadherence is viewed as the fault of the patient, the collaborative-care paradigm suggests that the provider and patient work together, in a partnership (133). This perspective acknowledges that patients can and do make decisions about whether and when to follow the suggested treatment regimen—in other words, they self-manage their disease. In the partnership, providers not only provide patients with technical information about their disease and treatment, but also help patients learn to problem solve. In this way, a patient can learn to work through different issues that may influence adherence to a treatment regimen.

One central feature of self-management education is that patients make short-term action plans—what we referred to earlier as forming implementation intentions. For example, a patient trying to adopt an exercise routine may decide to walk half a mile 3 days per week. Once the short-term goal has been reached, another action plan can be formed so that the amount of exercise gradually increases to an optimal level. Another feature of self-management is self-efficacy. If patients indicate that they are not confident they can carry out an action plan, the provider can work with them to instill confidence, perhaps by helping them rehearse a behavior or making their

goal easier to achieve (e.g., start out by walking three times per week instead of every day). The key is for patients to participate in decisions about what they will do to manage their disease so that motivation will become more internal than external.

Self-management programs incorporating constructs from several theoretical models have proven successful for many diseases, including asthma, arthritis, and diabetes (133). Recently, Lorig and colleagues provided evidence for the efficacy of their Chronic Disease Self-Management Program (134). Patients with heart disease, lung disease, stroke, or arthritis participated in a group training program that met for 2½ hours weekly for 7 weeks. Peer leaders provided patients with information, trained them to problem solve, and used mastery techniques to increase self-efficacy. Two years after the program was initiated, patients had fewer emergency room/outpatient visits, less health distress, and greater self-efficacy and energy compared to their baseline values.

Self-management interventions will be most effective to the extent that they incorporate providers and patients and focus on environmental, individual, and interpersonal factors that influence behavior (135). Environmental factors include access to care, cost, insurance status, housing, and air quality. Individual differences include demographic, cognitive, knowledge, attitudinal (e.g., self-efficacy), affective (e.g., depression), and behavioral (e.g., skills) characteristics. At the interpersonal level, social support and communication are key factors for influencing adherence to physical activity as well as dietary and pharmacological interventions (136). Social support may come from a number of sources, including the health care provider, home (e.g., spouse, family), work, or within the treatment itself (e.g., fellow participants) and may be of emotional, informational, or instrumental nature. However, relatively little is known regarding how the nature of social support influences adherence. For example, in the dietary domain, support of an informational nature may be important (e.g., nutritional information), whereas instrumental support may be more important in the pharmacological domain (e.g., help with insulin administration for diabetes). The nature of the support may also vary depending on the duration of the behavior (i.e., how long the person has been adhering). For example, instrumental and informational support may be important predictors of adherence at the start of the behavior, whereas emotional support may begin to play a larger role after some time has elapsed and adherence has been maintained.

CONCLUSION

Further development and integration of theories to explain patient behavior will need to occur to improve treatment adherence. Adherence with lifestyle modifications, particularly toward the goal of primary prevention,

is distressingly poor. Smoking cessation, exercise, and dietary modification can be extraordinarily difficult for patients to carry out and maintain successfully; failure rates are in the 75% to 80% range (137). Existing models of health behavior, such as the health belief model (69) and the theory of reasoned action (24), have found wide applicability in health behavior research but have not received as much attention in adherence research (138). For the state of the patient adherence literature to improve, further attention to the theoretical models that predict nonadherence is necessary.

ACKNOWLEDGMENTS

This research is supported by Grant R01 HL070713 from the National Heart, Lung, and Blood Institute.

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