Research in a wide range of studies indicates that a large proportion of patients do not adhere fully to prescribed treatments (Haynes, Taylor, Sackett 1979; Buckalew and Sallis 1986; Col, Fanale, and Kronholm 1990). Because of the extent of this nonadherence and its potential negative consequences for patients, many consider it to be among the most serious problems facing physicians today (DiMatteo and DiNicola 1982) and the “most significant reason for failed therapy” (Robbins 1980, 709).

Adherence is assuming a greater degree of importance as medicine moves to cope with chronic diseases that require the active and longterm participation of patients. In addition, the changing cultural environment is increasing its insistence on a more cooperative relationship between doctor and patient, with the patient taking a more active and informed role than before (Taylor 1986). To reflect this change in the doctor-patient relationship, some researchers argue that the term “adherence” should be used in discussing the patient's response to the physician's instructions, and the term “compliance” should be abandoned because of its submissive connotations (Meichenbaum and Turk 1987; Vandereycken and Meerman 1988; Szasz and Hollender 1956; Braunstein and Silverman 1981; Brock and Wartman 1990).

DEFINITION AND EXTENT OF NONADHERENCE

Adherence, then, can be described as the degree to which a patient follows the instructions, proscriptions, and prescriptions of his or her doctor (Meichenbaum and Turk 1987). Adherence can cover a broad range of behaviors, from taking medication correctly and keeping appointments to broader lifestyle changes such as increasing exercise, dieting, and quitting smoking. Looking specifically at treatment that involves
prescription medication, there are several ways in which patients may fail to adhere (Ley 1988). First, the patient may not even fill the prescription. Second, the patient may not take the medication or may not complete the full course. Third, the patient may not take the medication frequently enough or may not accurately follow the dosage and timing instructions. Sometimes, without telling the doctor, patients may be taking other medications at the same time as the prescribed one.

Estimates of the percentage of patients who adhere to no part of a treatment package (are totally “nonadherent”) vary typically between 30 and 60 percent (Ley 1988; Masek 1982). This is due to a number of factors, including the definition and method of assessing adherence. Research suggests that one-half to three-quarters of those patients given prescription medication fail to follow the instructions properly, over one-half of the patients discontinue the medication before they are supposed to, and one-quarter to one-third make medication errors in ways that may endanger their health (Haynes, Taylor, and Sackett 1979; Stimson 1974). Buckalew and Sallis (1986) recently noted that more than onehalf of all prescriptions written each year will be partially adhered to or followed not at all. A slightly more optimistic rule of thumb has been described by Podell and Gary (1976): one-third of patients take their medication as prescribed, one-third of them sometimes adhere, and one-third never adhere.

**DANCERS OF NONADHERENCE**

There are a number of hazards to nonadherence, including the patient's continued or worsening ill health (Sharpe and Mikeal 1974; Psaty, Koepsell, Wagner, et al. 1990) or even hospitalization (Col, Fanale, Kronholm 1990; Maronde, Chan, Laren, et al. 1989). One risk is the potential for misdiagnosis stemming from the doctor's assumption that the patient has been taking the prescribed medication (Sharpe and Mikeal 1974); other dangers lie in the development of resistant strains of disease organisms because the prescribed treatment has been incompletely or incorrectly taken (Sharpe and Mikeal 1974). More difficulties are presented by some patients who concoct their own particular regimens (Ley 1988), perhaps based on a false assumption about the medication, such as doubling the dose for a quicker recovery (Sackett 1979) or mixing the prescribed drug with an alternative remedy to “enhance” its effects (Kasl 1975; Stone 1979).

**MEASURING ADHERENCE TO MEDICATION REGIMENS**

Patient adherence is monitored in order to test the effectiveness of a medication regimen as well as to check on the patient's health and tolerance of the treatment. Medication side effects can be dealt with and dosage can be altered if it is found that the medication's effects are insufficient or detrimental. In addition, the medication can be substituted or discontinued if the conditions warrant. Medication adherence can be monitored using indirect and direct methods.

**INDIRECT METHODS**

Common indirect methods include requesting (and noting volunteered) self-reports from patients, as well as seeking information from health practitioners and from significant others such as spouses and other family members. Advantages to using self-reports are numerous, including their ease of use and reasonable association with more objective methods. Research indicates that patient reports are generally more
accurate than estimates from doctors or family members, but that all such reports overestimate the true levels of adherence (Caron and Roth 1971; Taylor 1979; Orme and Binik 1989). Physicians tend to overestimate both the number of patients who adhere and the extent of their adherence (Stone 1979; Caron and Roth 1971; Orme and Binik 1989; Epstein and Cluss 1982), and family reports of patient behavior are inconsistent, as well, with actual patient behavior (Gordis, Markowitz, and Lilienfield 1969).

Other indirect monitoring methods include noting the patient's clinical outcome; counting pills and bottles (and other dispensers); checking prescription refills; and recording pill dispensing with mechanical devices. However, these, too, carry implicit problems. For example, a poor clinical outcome does not always indicate nonadherence, but it may signal the need for medication adjustment or indicate a faulty diagnosis (Hogarty, Goldberg, and The Collaborative Study Group 1973). Pill and bottle counts and refill checks compare what was taken and refilled with what should have been taken and refilled, and mechanical devices usually measure the time the medication was taken from the bottle by monitoring the dispenser. Not knowing whether the medication was actually consumed or simply thrown away is the primary disadvantage of pill and bottle counts, refill checks, and mechanical devices. While research has shown a .80 correlation between pill and bottle counts and blood and urine tests (Caron 1985), recent investigations into pill counts, refill checks, and mechanical devices show that pill counts and refill checks are less reliable than mechanical devices (Rudd and Marshall 1987; Rudd, Byyny, Zachary, et al. 1988; Roth 1987) and urine and blood tests (Ley 1988; Roth 1987). Some consider the mechanical device to be the gold standard for measuring adherence to medications (Caron 1985; Rudd and Marshall 1987) because it offers a time matrix with which to interpret clinical outcomes and symptoms.

DIRECT METHODS

Direct methods for measuring adherence include blood and urine analyses, which usually confirm the presence of a drug in the body or measure its concentration (Eney and Goldstein 1976; Nehemkis and Gerber 1986). Research comparing patient reports of nonadherence with more objective methods, as summarized by Ley (1988) and Caron (1985), found that patient reports of nonadherence averaged 22 percent nonadherence-low compared to more objective methods, such as urine analysis and mechanical devices, which found an average 54 percent nonadherence. Disadvantages are found in blood and urine analyses, however, including their invasiveness and the need for extremely accurate timing, especially if the medication is quickly metabolized (Gordis, Markowitz, and Lilienfield 1969; Becker, Drachman, and Kirscht 1972).

Adding tracers to medication to make it detectable in urine analyses has been another technique used to evaluate adherence. Unfortunately, these tracers, which are nontoxic, unaffected by urine, and freely excreted (Cluss and Epstein 1985), may be altered by variability in medication clearance and are expensive and difficult to use. For example, Babiker, Cooke, and Gillett (1988) showed that the riboflavin tracer may be detected in the urine more than one day after it is taken with a prescribed medication and thus may give a false indication of adherence. In addition, while tracers and blood/urine analyses usually provide accurate measures of medication within the body system, the patient may be taking the medication only before testing: the analyses are not usually able to differentiate such minimal adherence from longterm adherence. To avoid this problem, the marker method is ordinarily used. In this instance, a pharmacological marker is embedded in a particular order in the medicine itself so that on some days no marker will appear, or a specific kind of marker will appear one day and another type of marker another day. This indicates clearly whether the patient is taking the proper amount of medication on the proper successive days and is not skipping any required days.

Criteria need to be determined before measurement begins to make clear which patients are adherent. As Ley (1988) has reiterated, an acceptable level of adherence to a
medication regimen usually ranges between 75 and 100 percent. A threshold level of 75-100 percent adherence cannot be accepted uncritically, however, since the concept of therapeutic sufficiency is emerging from the presence of drugs that continue their effects on the system for more than 48-72 hours yet remain prescribed at 24-hour intervals. Such drugs produce pharmacologic redundancy, allowing a patient to adhere at relatively low levels while retaining a good clinical outcome.

All measures of adherence developed to date have limitations. Direct methods provide objective evidence that a medication has been taken, but they are often unavailable for most drugs, as well as expensive and time-consuming to work with. They may also underestimate adherence due to timing issues. Most indirect methods are neither expensive nor time-consuming, which makes them more practical and more often used (Cluss and Epstein 1985). Several authors have recommended that, whenever possible, multiple measures should be used in assessing adherence. Recommendations for selecting the adherence measures in research include (1) using or developing methods for measuring that are appropriate to the research question; (2) keeping in mind the resources available when choosing the method; (3) using or developing psychometrically adequate measures; (4) using highly specific methods of measurement; (5) using methods based on established theoretical models; and (6) defining adherence criteria clearly before choosing the measures (Meichenbaum and Turk 1987; Ley 1988; Caron 1985; Cluss and Epstein 1985; Gritz, DiMatteo, and Hays 1989; Korsch, Cozzi, and Francis 1968).

VARIABLES ASSOCIATED WITH NONADHERENCE

DOCTOR-PATIENT INTERACTION VARIABLES

Adherence research is converging on the doctor-patient relationship, and it is now recognized that the processes that occur within this interaction are critical to patient outcomes. Satisfaction, communication, and consultation style are all factors in the doctor-patient relationship that directly affect patient adherence and health outcomes.

Patient Satisfaction

General satisfaction with medical care has no bearing on adherence (Taylor 1986); however, patients' dissatisfaction and unfulfilled expectations with the treatment, the medical consultation, and the doctor, do result in low adherence rates (Taylor 1986; Korsch, Gozzi, and Francis 1968; Francis, Korsch, and Morris 1969; Whitcher-Alagna 1983; Hoelscher, Lichstein, and Rosenthal 1986; Scott 1981). For example, Francis, Korsch, and Morris (1969), in their study of 800 mothers of patients at a children's hospital clinic, found that mothers who were highly satisfied with the doctor's level of warmth, concern, and communication were three times more willing to comply than those who were highly dissatisfied. They reported also that parents whose expectations were not met, or were different from doctors' expectations, were more likely to be dissatisfied and comparatively unwilling to adhere. Ley confirms relationships between adherence and understanding, memory, communication, and satisfaction in both medical patients and healthy individuals (Ley 1988, 1972; Ley, Bradshaw, Kincey, et al. 1974; Ley, Jain, and Skilbeck 1975; Ley et al. 1976). His predictive model of adherence behaviors shows clearly that the patient's understanding and memory of the consultation directly affects his or her satisfaction which, in turn, affects adherence.

Organizational factors in doctors' practices are also found to affect patient adherence. Such factors as a long waiting time to see the doctor (Dunbar and Agras 1980); an uncomfortable waiting area; cold, unfriendly, and noncohesive staff; and inconvenient times of appointment (Fielding and Breslow 1983; Brownell, Cohen, Stunkard, et al. 1984) have resulted in dissatisfaction and in nonadherence to both treatment and
appointment times. Meichenbaum and Turk (1987) found that the reputation or stature of the doctor's practice or treatment facility in the community affects adherence, as well as the length of time between appointments. The physical distance between facilities when patients must present for diagnostic tests or treatments at another site is also an influencing factor in adherence behavior (Meichenbaum and Turk 1987).

Communication Style

Variables in the dynamics of communication between doctors and patients as perceived by the patients - such as the doctor's language and style of listening and delivery - have been found to affect adherence. Physicians seldom attribute nonadherence, however, to their own communication style or language; they are more likely to see the fault lying with the patient (Stone 1979). The type of language that physicians use with their patients is fundamental to effective communication and subsequent adherence. If the doctor's language confuses or depersonalizes patients through the use of medical jargon or infantile phraseology, adherence rates fall (Taylor 1986; Ley 1988; Korsch, Cozzi, and Francis 1968; Francis, Korsch, and Morris 1969; Hall, Roter, and Katz 1988). Stiles et al. (1979) identified certain exchanges that are required within each interview if the doctor and patient are to feel comfortable and satisfied with the encounter. For example, when the “reflection” exchange pattern (wherein the doctor feeds back to the patient what the patient has said) is missing, adherence is lower (Stiles et al. 1979; Davis 1971).

Asking questions is another exchange pattern that has been associated with adherence. Hall, Roter, and Katz (1988) found that when physicians asked several technical or information-seeking questions, adherence was low, but when doctors questioned patients about their opinions or understanding, asked for suggestions, or made requests for questions, adherence was enhanced. Conversely, there is evidence that doctors and patients both feel uncomfortable with patients asking questions (Roter 1977). Even though patients find questions to be an important part of the consultation (Heszen-Klemens and Lapinska 1984; Thompson, Nanni, and Schwankovsky 1990), they are reluctant to ask any questions themselves (Ley 1988).

There is also evidence that doctors often give confusing or inadequate information, which results in feelings of perplexity, confusion, and suspicion on the part of the patient (Jacobs 1971). One study found that three out of four physicians fail to give patients clear instructions in how to take their medication (Svarstad 1976). DiMatteo (1985) showed that doctors spend only about 10 percent of the visit giving patients information. Korsch, Cozzi, and Francis (1968) found that when mothers of patients fail to receive information about the diagnosis and cause of illness, adherence is significantly lower. An appropriate balance regarding the information given must be achieved, allowing clear explanations to safeguard against the oversaturation that leads to forgetfulness. Studies indicate that patients may forget over 50 percent of the information from consultations, especially if a large amount of information has been given (Sarafino 1990), and that a result is falling rates of adherence (Heszen-Klemens and Lapinska 1984). Patients are more likely to remember what they are told first, what they consider important, and what they perceive as information rather than instructions and advice (Ley 1988; Heszen-Memens and Lapinska 1984; Sarafino 1990).

Consultation Style

A participatory relationship between the doctor and patient seems to be the most successful in promoting adherence (Francis, Korsch, and Morris 1969; Hall, Roter, and Katz 1988; Heszen-Memens and Lapinska 1984). The patient's sense of control over the illness and feelings of active participation in the treatment program also play important roles in adherent behavior (Kaplan, Greenfield, and Ware 1989). If the patient does not feel in control or feels “left out”, nonadherence with the treatment is more likely to occur (Adelman and Taylor 1986; Trostle, Hauser, and Susser 1983; Antonovsky 1979;
For example, Adelman and Taylor (1986) and Conrad (1985) reported that some patients stopped taking their medication as a way of evaluating their progress in the treatment program themselves, and as a cheek on whether or not the treatment was actually necessary. Trostle, Hauser, and Susser (1983) found that some epileptic patients tried to regain control by not adhering to the treatment program because they felt they had no say in its design or setup. Nonadherence, in this context, can be viewed as the patient's efforts to restore control lost to the perceived rigors of illness, treatment, or an unsatisfactory doctor-patient relationship. A number of studies in which patients were taught how to gain a sense of control in consultations have resulted in improved health outcomes and higher levels of patient satisfaction, participation, and information recall (Thompson, Nanni, and Schwankovsky 1990; Kaplan, Greenfield, and Ware 1989; Greenfield, Kaplan, Ware, et al. 1988; Greenfield, Kaplan, and Ware 1985; Bertakis 1977; Anderson, DeVellis, and DeVellis 1987). Generally, the more actively involved the patient is in the consultation, the higher the patient satisfaction and level of adherence (Ley 1988; Hall, Roter, and Katz 1988).

PATIENT VARIABLES

There is little consistent evidence to demonstrate that the factors of age, sex, or socioeconomic status are associated with adherence (Haynes, Taylor, Sackett 1979; Meichenbaum and Turk 1987; Nehemkis and Gerber 1986; Eraker, Kirscht, and Becker 1984; DiNicola and DiMatteo 1984). However, many broader influences on patients affect adherence. For example, life stressors such as lack of resources (transportation, money, time), unemployment, and family instability, as well as life events such as the death of a spouse or divorce generally decrease adherence to medical treatment (Taylor 1986; Nehemkis and Gerber 1986; Eraker, Kirscht, and Becker 1984; Antonovsky 1987). Medication cost and medical service funding (whether individuals are covered through public programs or private insurance) also affect adherence behaviors.

Patient Perceptions

The Health Belief Model (Rosenstock 1974), used to explain and predict health behaviors, has been updated (Becker 1979) to predict adherence specifically. The components of the Health Belief Model (the patient's belief in his or her own susceptibility to a disease or illness; belief regarding the degree of severity of the illness consequences for health and daily functioning; belief in the efficacy of the treatment for the illness; belief about the barriers and costs related to treatment; and cues to action) all have been shown to influence the degree to which a patient will or will not adhere to a treatment program (Janz and Becker 1984; Becker, Maiman, Kirscht, et al. 1979; Christensen-Szlanski and Northcraft 1985). However, it has been argued that, while the Health Belief Model has impressive retrospective predictive value in identifying those who have already adhered, it has disappointing prospective value.

Misunderstandings about illness and health, about the causes and seriousness attached to an illness, and about the reasons why a particular treatment are indicated also have been found to contribute to nonadherent behavior (Taylor 1986; Leventhal, Zimmerman, and Cutmann 1984). A study illustrating these points was conducted by Roth and colleagues (Roth, Caron, Ort, et al. 1962), who found that a sample of patients using a model of illness different from that of their doctors believed that acid caused ulcers and that this acid was introduced into the stomach by food or was produced by teeth when chewing food. The treatment prescribed by the doctor was consumption of small, frequent meals-a model and treatment contrary to the patients' model and understanding, of the cause of ulcers -and the result was high levels of nonadherence.
Personality

No personality type has been found to be consistently related to nonadherent behavior, but some individual characteristics have been identified. An apathetic attitude toward health, and a subsequent lack of motivation and presence of pessimism, appears to result in nonadherence (Robbins 1980; Mayer and Kellogg 1989; Rees 1985; Martin and Dubbert 1986; Rosenstock 1985; Seltzer and Hoffman 1980). Poor or inadequate coping styles also have been found to contribute to nonadherent behavior in some patient groups (Cohen and Lazarus 1983). Cohen and Lazarus have surmised that, since stress compromises coping abilities and coping is usually directed at dealing with life problems, the coping mechanisms directed to maintenance of emotional equilibrium may, under some circumstances, be inconsistent with adherence. For example, patients' denial or refusal to acknowledge an illness directly interferes with adherence (Gerber 1986). Some patients may be nonadherent in an effort to maintain a low-anxiety environment and stable family functioning.

Recent research in the area of patient characteristics has focused on the patient's perception of social support and its relation to adherence. The majority of the social support studies have indicated a positive association between the patient's social support system and adherence (e.g., Rees 1985; Martin and Dubbert 1986; Dakof and Taylor 1990). For example, when patients perceive sufficient levels of practical, emotional, and cognitive social support and when relationships within the patient's circle of family and friends are stable, then adherence levels are high (Melamed and Brenner 1990; Bloom 1990; Sarason, Sarason, and Pierce 1988; Connell and D'Augelli 1990; Raven 1988).

Illness and Treatment Variables

Investigation has found little relationship between type of illness and levels of adherence (Haynes, Taylor, and Sackett 1979). However, the immediacy of the illness symptoms does appear to have a direct effect on adherent behavior. Reichgott and Simons-Morton (1983) described adherence issues in relation to distressing and intrusive symptomatology. When patients experience extreme pain or increasingly debilitating symptoms, they may discontinue medication if there is no immediate alleviation of their discomfort (Haynes, Taylor, and Sackett 1979). On the other hand, when disease symptomatology is constant, patients may not recognize the need for treatment (Caplan 1979). It is possible that this “adaptation” to long-term discomfort, as Meichenbaum and Turk (1987) have described it, results in nonadherence to a medical regimen because patients fail to see the need for the medication. In addition, certain illnesses produce symptoms that contribute to nonadherence to specific components of the treatment. For instance, Meichenbaum and Turk (1987) have identified the relationship between diabetic visual problems and false readings of glucose levels in urine. Heart pounding or dizzy sensations experienced by hypertensive patients have also led to the false belief that blood pressure is suddenly increasing and that medication should therefore be taken immediately (Baumann and Leventhal 1985).

Treatment variables that significantly affect adherence include side effects, intrusiveness, complexity, and duration. The weight of evidence suggests that the presence of side effects may decrease adherence, but this effect does not appear to be strong (Haynes, Taylor, and Sackett 1979; Meichenbaum and Turk 1987; Ley 1988; Reichgott and Simons Morton 1983). Anticipatory fear of side effects, and secondary effects of the illness such as dizziness and nausea, can also affect proper adherence to medical regimens (Meichenbaum and Turk 1987). Forewarning the patient of potential side effects does not appear to be effective in increasing adherence (Ley 1988).

The more often a patient has to take a medication in a given day, the more likely the patient will find it difficult to adhere fully (Reichgott and Simons-Morton 1983). DiNicola and DiMatteo (1984) have noted that taking medication often disrupts the patient's daily schedule, which then results in full or partial nonadherence. If the
potential treatment intrusions are high, such as interruption of daily activities, and if emotional and financial costs are high as well, nonadherence will more likely occur (Turk, Salovey, and Litt 1985). Often patients who halt their regimen because it is too intrusive may begin treatment again when the symptoms become unbearable.

**Complexity and Duration**

It is well established that the more complex the medical regimen, the less likely the patient will adhere (Haynes, Taylor and Sackett 1979; Stone 1979; Glasgow, McCaul, and Schafer 1986). In fact, Blackwell (1979) found that complexity of the treatment program was the most common factor for nonadherence. He proposed that the frequency prescribed for taking doses of a medication, and the number of different medications or treatments prescribed, contributed to complexity. Stone (1979) found that when patients took one medication, nonadherence due to error alone was 15 percent; when two or three medications were prescribed, the rate of nonadherence due to error increased to 25 percent; and when five or more medications were prescribed, nonadherence due to error was 35 percent.

Despite the claim that it is not the number of pills taken per se but the number of times the pills are taken per day that contributes to nonadherence (Meichenbaum and Turk 1987), reducing the number of pills needed as well as their frequency of ingestion results in increased adherence (Carter 1989; Baile and Gross 1979). Baile and Gross (1979) recommended that one drug be used whenever possible, and that drugs required only, once or twice a day with low dosage be prescribed over more complex regimens to improve the chances of adherence.

While investigations have found that patients have trouble adhering to a short-term medication such as an antibiotic regimen (Taylor 1986), patients' difficulty with following long-term medical regimens for cure, maintenance, or prevention concerns physicians (Nehemkis and Gerber 1986). Turk and Speers (1984) have found that the longer the patient must take medication, the more likely nonadherence in some form will occur. The highest rates of adherence occur for treatment with direct medication, such as injections, and high levels of supervision and monitoring (Taylor 1986; Meichenbaum and Turk 1987). The best examples of the effects of supervising medication directly are the adherence records of patients who are in the hospital and patients who must go to clinics to receive specific treatments. When, however, as in the majority of cases, no direct supervision and monitoring are required, nonadherence may result from forgetfulness, boredom, intrusiveness and complexity of the treatment, or a decline in attention (Haynes, Taylor, and Flackett 1979). This is particularly the case with chronic conditions that may be symptom free, such as hypertension and diabetes (Taylor 1986; Baile and Gross 1979; Turk and Speers 1984).

**SUMMARY**

Clinicians face nonadherence as the norm in everyday medical practice. The literature suggests a number of techniques that are likely to increase adherence when incorporated into regular clinical practices and routines. Central to these guidelines appears to be the doctor-patient relationship. For instance, the physician who uses understandable language, encourages open doctor-patient exchange, fosters participation by patients in their own medical care, and creates a friendly and efficient environment should increase the likelihood of adherence. Clinicians can also check adherence to medication regimens by requesting patients to bring in their pill bottles (or other prescription containers) for a discussion on how the medication appears to be working for them. This should elicit information from the patient about problems related to medication adherence.

Since patient variables and social support affect adherence behaviors, eliciting information from patients about their understanding and beliefs regarding their
particular illness and treatment, as well as enlisting the support of family and friends, may encourage adherence. Identifying what individual patients perceive as obstacles in following treatment regimens decreases their likelihood of nonadherence; these are difficulties that can be negotiated during the medical interview. Individualizing the treatment and minimizing its complexity may provide the solution that encourages adherent behavior. Frequent reeducation, reinforcement, and encouragement, as well as training in self-management and self-monitoring, will at the very least maximize the patient's comprehension of the illness and his or her motivation for adherence—an especially important requisite for living with a chronic condition. Some patients may even wish to openly solicit family and friends for help in the management and monitoring of their illness and treatment, and to structure their environment to support adherence.

Education programs for the patient featuring handouts and pamphlets that provide information about the illness in written and illustrated form have been used successfully. Education programs such as patient-oriented package inserts to accompany the medications and brief written summaries of complex treatment plans may also be useful. The purpose of such patient education adjuncts to illness and treatment lie in the hope that they will enhance the likelihood of following treatment recommendations. Through their use, the reason for the treatment and its potential effectiveness will, it is better understood (Ley, 1988).

Overall, significant advances have been made in adherence research. Measurement systems have become more finely tuned, and the definitions and criteria for adherent behaviors are more clear and precise. Variables that contribute to adherent behavior, such as social support, continue to be identified and examined, and the complicated and intricate connections between variables appear to have become more distinct. While much descriptive research has taken place, more empirical, theory-based research is still needed. Future empirical work could result in the development of practical interventions to improve adherence levels. Increasing patient participation in the medical interview has resulted in positive health outcomes, for instance, but the effect of such participation on adherence has not yet been studied in depth. The area of doctor-patient communication may offer adherence research both a practical and a theoretical framework, and it promises to give rise to soundly based interventions designed to improve one of medicine's most pervasive problems.

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