

Behavioral Interventions for Tension-type Headache: Overview of Current Therapies and Recommendation for a Self-management Model for Chronic Headache

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Behavioral treatments (relaxation, biofeedback, cognitive-behavioral therapy) have been empirically validated for migraine and tension-type headaches, with recent meta-analyses yielding 37% to 50% reductions in tension-type headache, comparing favorably with 33% reduction from medication prophylaxis (amitriptyline). Research has moved toward increasing availability and cost effectiveness through alternative delivery formats and combining and comparing them with standard medications. Further modifications would make standard behavioral treatments available and conducive to primary care settings where most patients receive treatment. Beyond the current behavioral and drug treatments, we propose a fundamental shift in conceptualization and treatment for headache.

Introduction

Drug therapies are the mainstays of tension-type headache management [1], with well-established treatments including simple analgesics and nonsteroidal anti-inflammatory drugs for acute treatment and the tricyclic antidepressant amitriptyline for preventative therapy [2]. Although clinically well established, these therapeutic approaches are poorly tolerated or provide only modest benefits for many headache sufferers. A number of potential new drug therapies are in development (eg, nitric oxide synthase inhibitors, botulinum toxin), but none holds the promise of being innocuous or dramatically effective. Thus, there is a need for strategies that

extend beyond medication use alone to assist patients in managing their tension-type headaches.

Behavioral therapies for headache can be employed complementary to drug therapy or offered alone as an alternative (non-drug) mode of treatment when conventional medications are insufficient or contraindicated or when patients wish to minimize or avoid medication use. The first portion of this paper reviews the behavioral treatments for headache that have been empirically validated and often are available in specialty headache treatment centers (eg, relaxation training, biofeedback, cognitive-behavior therapy).

The second portion of this paper proposes that we move beyond the application of a drug-versus-behavioral treatment manner of thinking about headache treatment toward a model for headache that encompasses behavioral and pharmacologic treatment components for optimal management—a self-management model for chronic headache. Such a model encompasses medication therapies, behavioral skills training, medication adherence training, lifestyle change, and techniques to limit disability; this should be highly complementary with and should enhance the efficacy of all of the available pharmacologic and behavioral treatments.

The self-management treatment model has been successfully applied to other chronic conditions to improve outcomes and quality of life while reducing the costs of healthcare [3••]. Various national organizations involved in health policy have recommended that self-management principles be applied broadly across chronic diseases; many such initiatives are in progress. Evidence of the increasing interest in self-management principles and their integration into mainstream healthcare can be found readily at the National Institutes of Health (NIH). A recent simple search of the NIH web site using the term "self-management" yielded more than 100 hits, including program announcements in at least nine different NIH institutes soliciting

research on self-management interventions to multiple chronic diseases that accrue across the lifespan.

A brief summary of the conceptual model for self-management is presented in this article. The model by Creer and Holroyd [4] has substantially altered the way health care professionals manage asthma. Self-management includes core elements that do not need to be reinvented for every disorder, such as strategies to optimize medication adherence and manage emotional sequelae of living with chronic illness.

Efforts that have applied self-management principles to primary headache disorders have demonstrated that headache is well suited to this approach. However, a truly integrated model for headache has yet to emerge. In the authors' opinion, additional efforts to apply the principles of self-management to primary headache disorders could engender a fundamental advance in headache treatment; this article introduces the rudiments of a self-management model that hopefully will be developed more fully over time.

Overview of Behavioral Interventions and Selected Behavioral Issues

Behavioral treatments for headache

Behavioral interventions are particularly well suited for headache patients with the following: poor tolerance of pharmacologic treatments; medical contraindications; insufficient response to pharmacologic treatments; patient preference for nonpharmacologic treatment; pregnancy, planned pregnancy, or nursing; history of frequent or excessive use of analgesics or other acute medications that can aggravate headache problems (or decrease responsiveness to other pharmacotherapies); and significant stress or deficient stress-coping skills. The long-term goals of behavioral headache therapies include reduced frequency and severity of headache, reduced headache-related disability, reduced reliance on poorly tolerated or unwanted pharmacotherapies, enhanced personal control of headache, and reduced headache-related distress and psychologic symptoms.

Throughout the past three decades, several behavioral interventions for headache (tension-type and migraine) have garnered ample empirical support [5–7,8••]. In most instances, these interventions emphasize prevention of headache episodes as opposed to aborting an acute headache. Although behavioral modalities can be highly effective as monotherapy, they are used more commonly in conjunction with pharmacologic management. Most behavioral interventions can be categorized broadly as relaxation training, biofeedback training, cognitive-behavioral therapy (CBT; *ie*, stress-management training), or combinations of the above [7,8••].

Effectiveness

A number of meta-analytic reviews have summarized the empirical evidence on the effectiveness of behavioral interventions for tension-type headache [9,10,11••]. An

exhaustive review by McCrory *et al.* [11••] was undertaken with support from the Agency for Healthcare Research and Quality and the Foundation for Chiropractic Education and Research and employed highly conservative study inclusion criteria. The review identified 107 articles that described behavioral treatments for tension-type headache published between 1966 and 1999. The 35 prospective and randomized trials that met all of the stringent research design and data extraction requirements yielded 77 treatment groups in the following categories: relaxation training (RLX), electromyographic biofeedback training (EMG BF), EMG biofeedback plus relaxation training (EMG BF + RLX; stress-management training), wait list control, and other controls (Fig. 1). For comparison purposes, McCrory *et al.* [11••] also identified all of the controlled trials of amitriptyline (the medication most commonly prescribed for tension-type headache prophylaxis). Treatment outcome data were calculated using two metrics: summary effect size estimates and average percentage improvement from pre- to post-treatment. Behavioral interventions for tension-type headache yielded 37% to 50% reduction in headache versus 33% reduction for amitriptyline, 2% for no treatment, and 9% for other controls. The effect size estimates indicated that all of the behavioral interventions were statistically more effective than wait list or other controls (Fig. 1).

The meta-analysis by McCrory *et al.* [11••] is the only meta-analysis of the tension-type headache literature to employ highly selective study inclusion criteria. Each of the earlier meta-analyses were broadly inclusive of all of the available research [9,10]. Nevertheless, the findings of the other meta-analyses closely parallel the review by McCrory *et al.* [11••], indicating that behavioral treatments for tension-type headache are effective (35% to 55% improvement) and all treatments are more effective than control conditions (Fig. 1). There is a sizeable amount of evidence indicating that, at least among those who respond initially, the effects of behavioral treatments endure over time, with the longest follow-up occurring after 7 years [10,12]. For example, Blanchard *et al.* [13] found that 78% of tension-type headache sufferers remained significantly improved 5 years after completing behavioral headache treatment.

Behavioral management versus pharmacotherapy of tension-type headache

Despite its exceptionally widespread use for the prophylaxis of tension-type headache, the use of amitriptyline rarely has been evaluated in controlled clinical trials. The meta-analysis by McCrory *et al.* [11••] identified only three such trials that yielded, on average, a 33% reduction in headache activity. Thus, the effectiveness of amitriptyline falls on the low end of the effectiveness range achieved by behavioral therapies. With the paucity of research evaluating prophylactic pharmacotherapies for tension-type headache, there is even less research examining the relative effectiveness of prophylactic drug and behavioral treat-

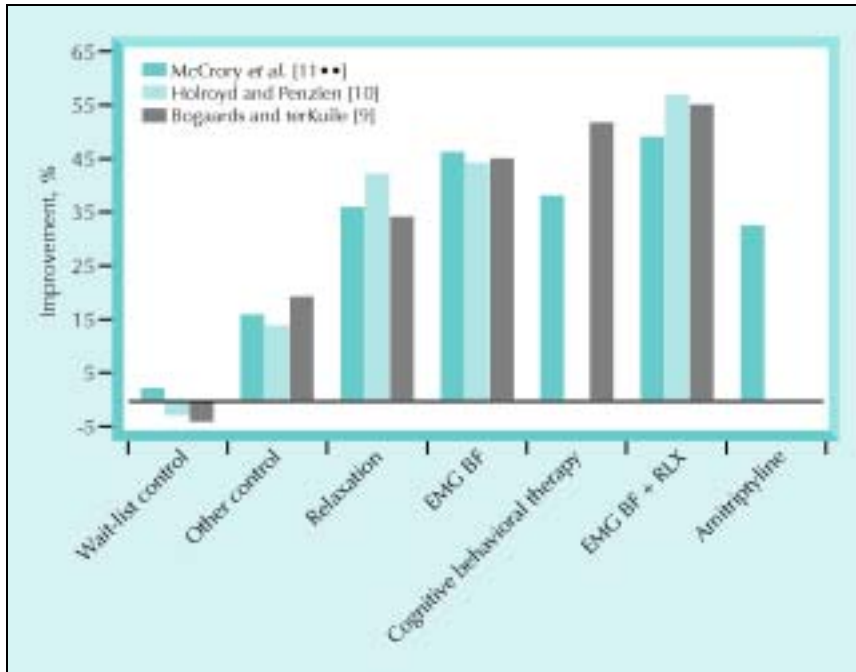


Figure 1. Percent improvement scores for control conditions, behavioral treatments, and amitriptyline in three meta-analyses. EMG BF—electromyographic biofeedback training; RLX—relaxation training.

ments. Holroyd *et al.* [14•] provided the best available evidence addressing this issue. They randomly assigned more than 200 chronic tension-type headache (CTTH) patients to one of four treatments: tricyclic antidepressant medication, stress-management training, combined antidepressant and stress-management, or placebo. Medication and behavioral therapy each produced larger reductions in headache activity, analgesic medication use, and headache-related disability than placebo, but the medication condition yielded more rapid improvements in headache activity. The combined therapy was more likely to produce clinically meaningful reductions in headache (64% of patients) than antidepressant medication (38%) or stress management training (35%) used alone. Whereas each individual treatment strategy was modestly effective, the combination of treatments may improve outcomes.

Alternate treatment formats for behavioral interventions

In the 1980s, researchers became increasingly aware of drawbacks to intensive clinic-based and individually administered (or 1:1 behavioral treatment delivery models) treatments and began to consider issues of cost and efficiency. Minimal therapist-contact treatments, group treatment, and some novel mass communication treatment formats also have emerged to increase accessibility or reduce costs of behavioral treatments.

Minimal therapist-contact treatment

In a minimal-contact or home-based intervention, self-regulation skills are introduced in the clinic, but training primarily occurs at home with the patient being guided by written materials and audiotapes. Consequently, only three or four clinic sessions may be necessary when behavioral

techniques are delivered by this format versus the eight or more weekly clinic sessions required for the standard clinic-based format. Three meta-analyses of minimal-contact behavioral interventions for headache have consistently demonstrated the use of this approach, indicating that for many patients, such treatments can be as effective as those delivered in a clinic setting [15–17].

Group treatment

In clinical practice, behavioral interventions for headache often are administered in small groups rather than individually. Although the literature addressing this treatment format is relatively scant [18], one meta-analysis has identified 10 studies in which behavioral treatments were administered in a group format [16]. The 53% improvement associated with the group format was similar to that reported when the same interventions were individually administered. When patient flow is adequate, group rather than individual administration of treatment allows the cost of treatment to be reduced and professional time to be efficiently allocated.

Internet and mass communications treatments

Noteworthy efforts are underway to develop headache treatments that use the Internet and other media. These may help overcome the limitations of strictly self-help approaches [19,20]. Should a sufficiently large number of people have access to such programs and attain even a modest level of benefit, this approach could have a substantial impact on headache. Particular challenges in these types of approaches will be ensuring adequate medical evaluation and follow-up, dealing with emergencies and crises, and resolving issues related to practicing across state-licensing boundaries.

Table 1. Commonly identified headache triggers

| |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disruption of dietary pattern or schedule |
| Fasting, insufficient food, delayed meals |
| Specific dietary agents |
| Caffeine, aged cheese, alcohol, chocolate, nuts, monosodium glutamate |
| Sleep |
| Excessive sleep, insufficient sleep, sleep schedule changes, sleep disorders (eg, bruxism, sleep-related breathing disorders, restless legs, insomnia) |
| Ovarian hormones |
| Menstrual, oral contraceptives, pregnancy, menopausal |
| Environment |
| Heat, cold, air conditioning, sunlight, bright or flashing lights, computer screens, noise, smoke, odors, fumes |
| Physical exertion |
| Exercise, sexual activity |
| Sinusitis or allergies |
| Tobacco |
| Smoking, chewing, nicotine patch |
| Stressful events |
| During stress, after stress (ie, let-down headache) |
| Negative emotional states |
| Anger, anxiety, crying, depression, worry |
| Postures |
| Poor ergonomic conditions, especially concerning the head and neck, restricted movements, bending, reaching, clenching, straining, rocking |
| Eyestrain, squinting |
| Weather |
| Humidity, heat, barometric changes |

Behavioral and Psychosocial Factors in Tension-type Headache

Trigger factors for headache

Failure to address triggering or exacerbating factors is cited as one of the most common reasons for the failure of headache treatment [6,21•]. General population studies indicate stress, sleep difficulties (eg, irregular sleep/wake schedule, nonrefreshing sleep, insufficient sleep), fatigue, and lack of physical activity are the most frequently identified triggers for tension-type headache [22,23]. In fact, there is an important behavioral component to nearly all of the identified headache triggers. Thus, identification of headache triggers provides valuable opportunities for behavioral intervention and headache self-management (Table 1).

In headache self-management, patients prospectively monitor potential headache triggers because triggers provide information that can help patients take actions to prevent or manage their headaches. Once associations between usual precipitants and headache episodes are identified, patients develop (after initial instruction from therapist) appropriate responses to avoid, modify, or cope more effectively with various triggers. Emotional and cognitive processes may be addressed through self-management. The goal is to replace the sense of dread, anxiety, and helplessness many individuals feel when anticipating a headache with a plan of action.

For example, to assist in observing headache-related stress reactions, patients complete thought-monitoring forms similar to those used in CBT [24,25], which require patients to identify stressful situations and their thoughts and feelings during these stressful situations. Completion of worksheets help patients recognize relationships between their thoughts and beliefs, emotions, and physical reactions. Patients then are instructed how to identify and challenge cognitive distortions or inaccurate appraisals, develop and employ more proactive, positive coping statements, and place limits on the amount of time spent focusing on negative and counterproductive thinking or worry. With training, most patients can use these techniques independently to self-manage stress and headaches.

Psychologic stress

Stress is the most frequently identified headache trigger [23,26–28]. Individuals with tension-type headaches report more minor daily life stressors, but not a greater number of major life stressors than matched control subjects [27,29,30]. Moreover, patients with tension-type headache rate their daily stressors as more “distressing” than matched control subjects [29,30]. For some patients with a stress-headache relationship, headache is best predicted by stress occurring concurrently with headache; for others, headache is best predicted by stress occurring 1 to 3 days earlier (the so-called “let-down” headache) [31,32].

Sleep

Sleep difficulties (insufficient or nonrefreshing sleep, oversleeping, or sleep/wake schedule irregularities) often are identified as headache precipitants [33]. Women are more likely than men to identify sleep-onset insomnia and restless sleep as precipitants [23]. Patients with sleep difficulties should be instructed in sleep hygiene and advised to maintain a regular sleep schedule, which includes avoiding sleeping in on weekends or days off. Practicing relaxation techniques may facilitate sleep onset. Cognitive-behavioral interventions can reduce sleep onset and maintenance problems [34]. Headaches may develop from a sleep disorder, such as sleep apnea, suggesting that it is worthwhile to screen for the presence of a sleep disorder and to refer to a sleep specialist when a sleep disorder is suspected [35].

Dietary factors

Few controlled trials of dietary triggers have been conducted and clinical opinions differ regarding the role they play in tension-type headache or the benefits to be expected from dietary modifications. Excessive caffeine consumption [36] and skipping or delaying meals may increase the likelihood of experiencing a headache for some patients [37].

Psychiatric comorbidity

Psychiatric comorbidity likely influences individual headache episodes and long-term management. The prevalence

of depression and anxiety disorders does not appear to be elevated in episodic tension-type headache (headaches occurring < 15 days monthly). However, this finding cannot be generalized to CTTH (headaches occurring > days monthly) [38]. More than 40% of patients with CTTH in primary care settings and as many as 84% of patients with CTTH seen in specialty settings have diagnosable depression or anxiety disorders [26,39,40].

Cognitive-behavioral techniques typically are employed in the self-management of symptoms of depression and anxiety; however, the techniques must be highly tailored to the patient's needs and symptoms. Similar to managing other headache triggers or factors that exacerbate headaches, the first step is self-monitoring of psychologic symptoms and identifying associations with headaches. This step may include cognitive strategies such as thought-monitoring and restructuring negative cognitions, as described previously. Depressive cognitions typically are self-critical, pessimistic, and hopeless about the future and engender counterproductive behaviors. Anxiety typically is accompanied by feelings of danger, vulnerability, and anger, with thoughts of violation, inadequacy, and unfairness. Patients with anxiety or depression tend to make cognitive distortions and errors that lead to feelings of inadequacy and helplessness, anticipation of unrealistically poor outcomes, and poor coping strategies, which magnify their psychologic distress. Patients can learn to self-manage symptoms of depression and anxiety with strategies similar to those used to manage stressful thoughts and make subsequent behavior changes.

Facilitation of compliance with pharmacotherapy

Noncompliance with pharmacotherapy may be the most significant problem facing medicine. Across chronic diseases, typical adherence rates for medication use are only approximately 50% and they are much lower for lifestyle changes such as diet and exercise [41,42]. Compliance typically has been defined as the extent to which the patient's actual history of medication use corresponds to a prescribed regimen [43]. The term "compliance" has been suggested to imply yielding, complaisance, and submission; the patient "submits" to the prescription of doctors intentionally or unintentionally [44]. In the past several decades, research has suggested that the patient be considered as a decision-maker [44–46]. This conceptualization is more in line with the tenets of self-management in which the patient is seen as active and disease management is a shared or collaborative relationship between the patient and health care providers.

The few studies that have assessed medication compliance among headache sufferers, typically migraineurs, have found that only 50% to 66% of headache patients are adherent with medication [47,48]. Adherence rates drop even lower, to 24%, 1 year after initiating treatment [49]. As the complexity of treatment regimens increase (*eg*, multiple dosing schedules, multiple medications), adherence to treatment decreases further [48].

To our knowledge, only one study has evaluated a self-management intervention to improve adherence with pharmacotherapy (abortive treatment) for headache [50]. Seventy percent of patients were identified as failing to make optimal use of ergotamine for migraine. With a brief behavioral intervention, adherence failures declined in four categories: failure to take medication because it was unavailable to the patient; failure to take medication sufficiently early in headache episode to be effective; ingestion of ergotamine on an empty stomach, which resulted in nausea and a decreased likelihood of subsequent use; and medication overuse. In the study by Holroyd *et al.* [50], patients in the adherence-enhancing group participated in a 30-minute education session and received three brief phone calls to identify and remedy problems with medication use. They also were provided a self-management workbook to assist the patient in monitoring and identifying adherence problems, improving decision-making, and correcting adherence problems. Patients who participated in the adherence intervention attempted to abort approximately 70% of migraine attacks and showed clinically significant reductions in headache activity (40% improvement at post-treatment). In contrast, patients in the control group who received standard medication management attempted to abort only approximately 40% of their headaches and showed smaller reductions in migraine activity (26% improvement at post-treatment). This study highlights how a shared collaboration between patients and health care providers using self-management techniques can improve adherence successfully.

For some patients, self-monitoring of emotional states can prove a valuable component of headache self-management, especially as it pertains to medication adherence. For example, anxiety and fear of developing a headache, rather than valid prodrome, often provoke the headache sufferer to take medication and increase the risk for medication overuse. For others, it is the mood-altering effects of agents containing barbiturates or stimulants such as caffeine that reinforce excessive use of medications. Patients for whom depression or anxiety is suspected to be an important factor in their medication use are asked to monitor their mood before and after the onset of their headaches and before and after the use of their medication. The patient then evaluates the information gathered from self-monitoring to distinguish valid signs of headache onset (*eg*, increased muscle tension or tightness or dull ache in head or shoulders) from anxiety (*eg*, physiologic arousal such as increased heart rate, shortness of breath, and sweaty palms accompanied by negative cognitions or worry, and possibly increased muscle tension) or fear of headaches ("if I get I headache, my day will be ruined," "I can't handle another headache"). Patients then can be assisted in determining the appropriate course of action based on the information gathered. For example, when self-monitoring indicates the onset of headache, patients may be trained to employ relaxation techniques, reduce exposure to other possible

headache triggers, engage in positive coping statements (“I can handle this,” “I can still get most of my work done today”), and take medication when indicated. If the information gathered from self-monitoring indicates a tendency to take medication in response to anxiety over the possibility of a headache or in response to specific stressors, rather than the actual onset of headache, the patient may be instructed to employ cognitive techniques to reduce fearful thoughts and deep breathing to reduce physiologic arousal, rather than taking medication. As with every self-management technique, patients evaluate (react to) their new behaviors just as they do the initial information gathered from self-monitoring; they can make their subsequent treatment decisions accordingly.

The Self-management Model and Its Application to Headache

Self-management refers to the performance of preventive or therapeutic health care activities, often in collaboration with health care professionals [51]. The self-management treatment paradigm for chronic illness is characterized by interventions focused on teaching skills for managing one's own illness within the context of a collaborative relationship with health care professionals. The self-management model has been applied successfully to a variety of chronic diseases and disorders. Self-management is not self-help. Self-management embodies the essential collaboration between the patient and treating physician or other health care provider, with greater responsibility on the part of the patient to engage in health promotion and behaviors that prevent or limit exacerbations of the disease or disorder and, when symptoms do occur, to enact predetermined medication and behavioral treatment strategies. Self-management has been shown to improve outcomes and to reduce health care costs in various chronic conditions such as asthma, arthritis, epilepsy, and diabetes [52••].

Conceptual overview of self-management of chronic disease

During the past 50 years, chronic disease has overtaken acute illness as the primary cause of morbidity and mortality [53]. With increasing life expectancy and an aging population, the trend is expected to continue. Chronic conditions account for 75% of US health care expenditures (\$425 billion direct medical and \$234 billion indirect costs in 1990) [54]. The annual cost of headache treatment has been conservatively estimated to be \$1 billion and headache costs employers more than \$13 billion each year as a result of absenteeism and reduced effectiveness at work [55]. The impact of chronic disease, coupled with knowledge that management of such conditions are more complex and of longer duration than what is required to treat acute conditions, was the impetus for development of innovative self-management models for chronic disorders. The result can be optimal control over a chronic disease.

Self-management of any chronic medical condition involves several processes. A complete description of the processes is detailed by Creer and Holroyd [4]. It includes six basic elements.

Goal selection

Health care personnel and patients collaborate to establish realistic, desirable outcomes. Goal selection enhances the patient's commitment to performing goal-relevant self-management skills and establishes positive expectations for performance of subsequent required tasks.

Information collection

To accomplish the goals selected, patients must self-monitor (observe and record) information that has an effect on achievement of goals; this is essential to prompt later corrective behavior change.

Information processing and evaluation

Self-monitoring must yield information that patients can use to detect change in their condition and evaluate this information in relation to goals. Analysis of the antecedent events, the behaviors performed, and the consequences of their actions are necessary for decision-making about future courses of action. Recognition of making change in a given situation may permit patients to avoid or escape similar contexts in the future.

Decision-making

After patients collect, process, and evaluate information on themselves and their condition, they are asked to make appropriate decisions based on this information. Decision-making includes considering the range of potential treatment strategies, analyzing the probability of success for each, and selecting the strategy most likely to achieve the desired outcome based on their personal database of experience.

Action

Action entails the actual performance of behaviors to control their condition. Among other things, this involves enacting plans from decision-making and performing self-management skills, often in a stepwise fashion, that they have worked out beforehand with their health care provider.

Self-reaction

Patients evaluate their own performance of strategies to control their condition. Over time, they develop “self-efficacy” or the belief that one can correctly perform specific skills in a given situation and manage their own disorder. Research has demonstrated that self-efficacy accounts for continued success in self-management of a disorder [56].

Why self-management for headache?

The prevalence and societal impact of headache, the behavioral aspects of headache, the risk of headache exacerbation with inappropriate treatment or medication overuse,

and the high costs associated with poorly controlled symptoms (eg, emergency room visits, inpatient hospitalizations) make headache a natural candidate for self-management. Although this paper focuses on tension-type headache, self-management is equally appropriate for other chronic benign headache disorders.

Headache, similar to other chronic conditions, is substantially influenced by a patient's own behaviors. These include a variety of behavioral factors that affect the onset and course of specific headache episodes, compliance with medical interventions, and the psychosocial sequelae of headache, including the level of functional disability. Although the predisposition to development of a headache disorder is biologic and probably genetically linked, most recognized precipitants for headache are clearly behavioral (eg, stress, sleep disturbance, posture, dietary patterns). As described previously, failing to address headache triggers is implicated in treatment failure [6,21•]. The threshold for headache may be lowered by certain psychological factors (eg, anxiety, depression), while other psychological factors such as social support may raise the headache threshold by buffering the impact of stress.

The effectiveness of medical intervention ultimately relies on patients' ability to effectively use health care. Patients' reporting of symptoms and other medical information impacts diagnosis and treatment planning and adherence to medication regimens impacts efficacy and even safety. The patient's ability to refrain from overuse of headache medication is particularly relevant because overuse may result in exacerbation of the condition (ie, medication-overuse headache). Each of these patient behaviors is potentially amenable to change through self-management training.

Self-management interventions for chronic headache

Only a handful of studies have been reported on attempts to develop a comprehensive headache self-management program. Although many of the programmatic elements required for implementation of a headache self-management approach are well developed and empirically validated (eg, monitoring of behavioral headache precipitants, identification of comorbidities, behavioral interventions such as relaxation training, biofeedback, and stress management training, and behavioral compliance facilitation for medication regimens), these specific treatment components often are applied in relative isolation and without clear articulation of a self-management model to guide their application. Only a few studies have investigated a comprehensive headache self-management program or at least key facets of a program. Several studies have evaluated headache management programs within a health maintenance organization (HMO), two within a multidisciplinary inpatient program and one evaluated a psychologically oriented intervention independent of a medical practice. Although none of the studies reviewed in this article has fully exploited the potential of self-management, each employed key elements of the self-management process.

Maizels *et al.* [57•] examined the outcome of an HMO-based headache management program. Their results focused on the impact of a "disease management" intervention on direct medical costs related to headache. Eligible patients included those overusing triptans, those requiring emergency department visits for headache, and those physician-referred for specialty headache treatment. The "headache class" was led by a nurse practitioner and emphasized headache pathophysiology and triggers, with additional focus on medication overuse. Patients also were seen individually in consultation with the nurse practitioner or physician. At 6 months after the intervention, patients exhibited increased triptan use (relative to baseline) that was accounted principally by new prescriptions at consultation rather than an increase in ongoing use. In fact, patients with high triptan use before consultation decreased their use. A decrease also was observed in physician office and emergency room visits, with the greatest decrease among patients with high use before the intervention.

Harpole *et al.* [58•] developed and evaluated an HMO-based headache management program. It included tools for headache diagnosis, evidence-based guidelines for treatment, a patient registry for tracking patients, and protocol for record management and correspondence with the patient's primary care provider. In a 1.5- to 2-hour group session, a nurse practitioner introduced the self-management elements of the program, including information about headache types and triggers and instruction in headache diary use. Educational materials for home use were provided. Individualized treatment plans were formulated with itemized medications to be administered in a simultaneous or stepwise fashion. Although uncontrolled, after the intervention, there was a significant decrease in headache frequency, an increase in patients' satisfaction with headache care, a decrease in the number of emergency room visits for headache, and improvements in measures of disability and functional status.

Blumenfeld and Tischio [59] reported the outcome of another HMO-based headache disease management model program. Although the multidisciplinary treatment team included a neurologist, nurse practitioner, physical therapist, psychiatrist, biofeedback specialist, and pain specialist, the central focus of the intervention involved the patients and the nurse practitioner. Patients were referred by their primary care physicians, a decision facilitated in some cases by pharmacy personnel who identified patients using nine doses of a triptan each month in the absence of preventative medication for headache. Patients participated in a 2-hour headache education class in groups of 20 to 30 patients per class. The class was led by the neurologist and nurse practitioner and addressed headache types, precipitants, and treatment options and presented video patient testimony on narcotic use. Patients also had individual consultations with the nurse practitioner to develop a detailed plan of care including medication and lifestyle changes. Patients' global headache ratings indicated that

92% of patients were improved after participation in the program, 7% were unchanged, and 1% worsened. Improvements were observed on quality-of-life measures; there was a significant reduction in headache-related health care visits and a significant decrease in prescriptions for narcotics (no change in triptan prescriptions).

Each of the HMO-based studies employed a relatively brief and circumscribed intervention that incorporated key elements of self-management. All of the programs generated tangible improvements in headache management or decreased health care use. In most cases, the intervention was carried out by nurse practitioners with specialized training who worked with headache patients in small groups.

Lake and Saper [60] evaluated a more intensive self-management program implemented within an in-patient multidisciplinary headache treatment setting. In the first of two studies, Lake and Saper [60] reported outcome data from 100 in-patients with an average hospital stay of 8.5 days. All of the patients were diagnosed with severe migrainous chronic daily headache described as treatment refractory. The in-patient program included individualized behavioral treatments (relaxation, biofeedback, and other pain management interventions), health promotion skills (eg, focusing on sleep regulation, smoking cessation, exercise), psychotherapy, and pharmacotherapy. Family participation was encouraged when possible. At least a 50% improvement in headache frequency was reported for 75% of the patients along with a decrease in headache medication use. Improvements also were observed in measures of depression, sleep disturbance, work, and functional status. A second study examined more specifically the self-management component of their in-patient treatment program [61]. The self-management program (221 patients averaging 12.9 hospital days) increased adherence to relaxation practice and lifestyle changes (eg, diet, exercise, sleep). It was the changes in behavioral self-management, rather than improvements in headache activity that were correlated with the improvements in depression scores.

Mitchell and White [62] carried out an intensive behavioral intervention based on the self-management model espoused by Creer *et al.* [4,56]. The behavioral self-management program was characterized as "...teaching people to analyze and identify problems in their own personal environments, and behaviors (both overt and covert), to work out their own management strategies, and to apply techniques aimed at modifying both their environment and their reactions to that environment" [62]. In keeping with the self-management model, the program included a number of interdependent steps, such as problem analysis, self-recording, self-monitoring, goal setting, and self-control skill acquisition and application. This intensive intervention was implemented independently of pharmacologic treatment and employed a sequential "dismantling" research design to isolate the contributions of each treatment component. Each additional treatment component sequentially added to headache improvement. At 3-

months post-treatment, the small subgroup receiving every phase of the intervention achieved an 83.2% improvement. Unfortunately, although highly effective, these more intensive interventions are not readily adapted to the primary care setting.

New directions for headache self-management

We wish to briefly outline what we deem to be essential elements of a comprehensive headache self-management training program designed for implementation in the out-patient physician's office. Such an intervention could be self-administered to a large extent, but it would be initiated in the physician's office and the staff would provide key input and assistance throughout the program. This effort would build on the foundation laid by Maizels *et al.* [57•] and other investigators [58•,59] working within the framework of disease management and it would extend those efforts by integrating components of well-established behavioral therapies tailored specifically for this therapeutic approach. Innovative integration of established behavioral therapies into such a self-management program could prove to have substantial benefit to headache sufferers who otherwise would not have access to this form of care.

A self-management training program suitable for implementation in the physician's office setting must accomplish several important objectives. These include formulating and validating an algorithm for distinguishing suitable candidates for self-management training, developing an intervention protocol that will allow busy physicians to efficiently integrate self-management training into time-limited patient encounters, identifying and training a principal coordinator or provider of self-management training within the physician's office, and adapting existing behavioral self-management interventions for this purpose. This will require production of headache self-management training materials designed specifically for this setting (for use in the office and by patients at home). Loosely paralleling the asthma work of Lahdensuo [63], Table 2 provides a listing of specific headache self-management skills development that would be targeted by such an intervention.

Drawing from the self-management model of Creer *et al.* [4,56] and from the HMO-based and other headache programs described previously, requisite components for a comprehensive headache self-management program include a patient registry and outcome-tracking mechanism, an algorithm for identifying program candidates, development of program-specific materials (including patient education information), individualized treatment plans and follow-up, and program evaluation. Table 3 lists characteristics of patients who are likely to be deemed suitable candidates for self-management training. A large proportion of patients with more substantial headache problems will possess a number of these attributes. In the authors' judgment, a patient possessing even one would be a candidate who potentially could derive substantial benefit from an efficient self-management intervention.

Table 2. Headache self-management skills

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|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Patients accept that headache is a chronic, but treatable condition |
| Acquire basic understanding of their own headache disorder and its treatment |
| Actively participate in the control and management of their headaches |
| Identify individual headache triggers |
| Be able to articulate strategies for avoiding, reducing, or managing headache triggers |
| Follow a prescribed written treatment plan |
| Recognize headache onset and engage the appropriate behavioral and pharmacologic treatment |
| Correctly use medications including acute analgesic, abortive, and prophylactic medications with optimal dose and schedule |
| Understand the phenomenon of medication overuse headache and limit medications as prescribed to eliminate risk for this headache complication |
| Use medical resources appropriately for routine and acute care |
| Monitor headache-related outcomes as agreed on necessary to evaluate the response to intervention |
| Identify barriers to compliance with the treatment plan |

Table 3. Characteristics of patients who are candidates for headache self-management

| |
|------------------------------------------------------------------------------------------------------------------------------------|
| Moderate to high headache frequency/severity |
| High level of health care use (emergency room visits for headache, unscheduled visits, or telephone calls to health care provider) |
| Pattern of increasing symptoms |
| Complex medication regimens, medication overuse, or insufficient adherence |
| Significant headache-related disability |
| Decreased quality of life secondary to headache |
| Not benefiting sufficiently from conventional medical management |
| Negative emotional stress associated with headache (eg, helpless, angry, frustrated, depressed) |
| Psychiatric comorbidity |
| Desire to reduce reliance on medications or health care system |
| Capable of observing, processing, and responding to information about themselves and their medical condition |

Conclusions

Three decades of behavioral research has yielded effective and empirically validated behavioral treatments for tension-type headache; those include relaxation training, biofeedback training and, cognitive behavior therapy. Meta-analyses of outcome studies indicate that behavioral treatments produce headache improvements on par with the gold standard of medication prophylaxis (ie, amitriptyline). Efforts still are underway to determine the optimal administration for behavioral treatments used in combination with medications. Behavioral treatments have tended

to retain their efficacy in altered and more cost-effective formats such as minimal therapist contact and group administration. However, only a small fraction of headache sufferers have access to behavioral treatments. Recent efforts to increase availability have attempted to accommodate behavioral treatments to newer technologies such as Internet and self-help applications; future research will determine if these applications retain their effectiveness. Much remains to be accomplished to make the effective behavioral treatments more broadly accessible.

Although not a psychological disorder, tension-type headache, similar to most chronic medical conditions, is influenced by a variety of psychological and behavioral factors. Most headache triggers or precipitants are behavioral (eg, stress, sleep disturbance, dietary patterns). Behavioral adherence to medication regimens can facilitate pharmacologic treatment, while nonadherence and medication overuse may exacerbate the condition and lead to complications. Psychiatric comorbidity may complicate treatment and lead to a poorer prognosis for headache treatment. These potentially modifiable behavioral and psychological factors clearly impact headache treatment and warrant greater attention in headache management.

This paper endorsed the application of a self-management model for chronic headache, ideally with treatment initiated in the primary care setting where most headache patients receive care. The model represents a fundamental shift in conceptualization and treatment. It is indicated because of the chronic nature and magnitude of headache and the substantial potential influence of behavioral and psychological factors in headache prognosis. A few studies have attempted to develop programs for self-management of headache. Although no controlled studies have been conducted in this arena, preliminary research from headache management programs in the HMO setting appear highly promising in improving headache outcomes and reducing health care costs. Unfortunately, none have fully addressed the potential of a comprehensive self-management approach. Future efforts to expand on these initial efforts will determine the use of self-management of headache and will improve the care and lives of headache patients in the future.

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