Nonpharmacologic interventions are important adjuncts to treatment modalities for patients with cancer pain. A variety can be used to reduce pain and comitant mood disturbance and increase quality of life. Physicians may feel relatively uninformed about which modalities have been used for patients with cancer and have scientific support. This article reviews several nonpharmacologic and complementary and alternative modalities commonly used by patients with cancer pain. It focuses on those having empirical support or promising preliminary evidence, with the goal of familiarizing physicians with therapies that may complement regular oncologic care. This review updates an article published in November 2005. An anecdotal case study has been added to illustrate incorporation of nonpharmacologic and complementary therapies in the treatment of a patient with cancer-related pain.

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Pain is a multifaceted phenomenon involving biological, psychological, and social consequences. The prevalence of pain in patients with cancer has been reported to be between 50% and 70% during cancer treatment1-3 and 65% for those with advanced disease.4-6 Etiologic factors of cancer pain include progression of disease, treatment modalities to arrest cancer (eg, surgery, chemotherapy, or radiotherapy), musculoskeletal pain from inactivity, and cancer-related infections that result in neuropathic pain (eg, herpetic neuralgia).7,8 A combination of pharmacologic and nonpharmacologic treatment modalities for cancer pain is the standard of care, as presented in current World Health Organization (WHO) guidelines.9

Adjuvant strategies combined with appropriate pharmacologic and interventional modes of treatment include nonpharmacologic and complementary medicine interventions. A complete review of all nonpharmacologic and complementary medicine treatment modalities used for cancer pain is beyond the scope of this article. Therefore, the focus is nonpharmacologic approaches and complementary medicine care presently used to treat patients with cancer pain.

Biopsychosocial Model
This model encompasses biological, psychological, and social aspects of care and has been applied to patients with cancer pain.10 There also exists a spiritual or existential aspect of pain for patients with cancer, especially those with a diagnosis of terminal illness. Pain-related quality of life has been classified into three variables of well-being corresponding to the biopsychosocial representation, i.e., physical well-being; psychological well-being (ie, cognitions, affect, spiritual factors, coping, communication, and the meaning of pain and cancer); and interpersonal well-being (eg, social support, role functioning).11

The prevailing model of pain, the gate control theory,12,13 postulates a spinal cord control mechanism in the dorsal horn that receives ascending and descending signals from nerve tracts and balances their integration. Pain perception is ultimately determined by biological evaluation of these inputs. The importance of the gate control theory to a discussion of treatment of patients with cancer pain is that descending cortical inputs that affect pain perception include psychological and psychosocial variables such as beliefs about pain, emotions, reactions to stress, and cognitions. Therefore, interventions that target modification of these factors can change pain perception and experience.

Physical Modalities
Specific nonpharmacologic physical modalities are often used to augment pain treatment plans. For example, rehabilitative treatment such as optimizing range of motion, strength, endurance, and neuromuscular control can reduce instability and pain associated with disuse.14 Another common physical treatment option, transcutaneous electrical stimulation (TENS), delivers mild electrical stimulation to painful regions. Research on TENS in non-
malignant pain shows positive results after 1 to 3 months, with approximately 25% reporting relief and continued use after 4 years.\(^5\) Few studies, however, have focused on the efficacy of TENS for patients with cancer pain.\(^16\)

Another commonly prescribed physical modality is application of heat or cold or a combination of both. The first method is most often used to alleviate postoperative pain and pain from inflammatory processes associated with cancer. Caution must be taken in use of heat for patients with insensate tissue, arterial insufficiency, metastatic tumors, bleeding diathesis, or cognitive deficits; such conditions may prevent a patient’s understanding of warnings of too much heat.\(^14,17\)

Finally, therapeutic exercise and massage can be used to improve range of motion and reduce muscle tension, respectively. Physical therapists with a specialty in management of chronic or cancer pain often have skills to encourage such patients to engage in exercise even when they observe minimal progress.

**Psychological Interventions**

Attention to psychological issues such as affective distress, coping, and beliefs about cancer is an important aspect of pain treatment programs. Cancer pain can be intensified by psychological distress, especially mood disturbance, depression, fear, and anxiety as shown by the large majority in 19 studies reviewed by Zaza and Baine.\(^18\) Fear of disease progression and a painful death is common, but the level of psychological distress varies among patients.\(^19\)

Psychiatric disorders for which patients require treatment are common in cancer, but appear to be more prevalent in those patients who also report clinically significant pain.\(^19\) Therefore, early consultation with a mental health professional who can diagnose psychiatric disorders (eg, major affective disorders, adjustment disorders, and anxiety disorders) and treat patients for them is important.

**Cognitive-Behavioral Interventions**

Cognitive-behavioral therapy (CBT) can be useful for patients with cancer pain.\(^19\) These interventions generally involve asking patients to do one of the following alone or in combination:

- track their pain
- record thoughts and emotions during prescribed periods of the day
- follow exacerbations of pain.

Patients then discuss the content of these thoughts and their relation to subsequent emotions with a therapist. Maladaptive coping, often stemming from dysfunctional automatic thoughts and beliefs, can be identified and modified through therapeutic intervention.

One of the more important maladaptive cognitive coping strategies related to management of pain is catastrophizing.\(^20\) This is the tendency to make negative cognitive and emotional evaluations of pain or circumstances (eg, “This pain is horrible, and I can’t stand it.”). Or, “This pain means I will die soon.”). Catastrophizing is associated with depression, increased pain intensity, and interference in life activities secondary to pain and anxiety.\(^21,22\) Perceptions of control over pain and high self-efficacy that patients with cancer can do something to affect their pain are associated with reduced pain in these patients.\(^21,22\)

**Behavioral Interventions**

This therapy involves analysis of behavior that has been learned or conditioned in order to evaluate and prevent pain, and treat patients for pain or psychological distress. Psychophysiological interventions such as biofeedback and relaxation have been categorized as behavioral. Other such procedures include modeling appropriate behavior, assigning tasks in a “graded” or hierarchical manner that promotes success and reinforcement, practicing tasks (eg, often to reduce fear), and managing attention or rewards given by significant others.\(^19\)

Combination strategies include meditation, hypnosis, music therapy, and systematic desensitization. The last method pairs relaxation with exposure to stimuli that produce anxiety; it can result in controlling anxiety.

Hypnosis is an especially focused state of concentration that can be used to alter painful sensations. It has been shown to be especially effective in control of pain after invasive procedures or surgery.\(^23\)

**Psychosocial Interventions**

Cancer pain also affects social well-being. Keefe et al\(^20\) describe several broad categories of interventions designed to treat patients with cancer pain, including education about cancer, hypnosis, and imagery-based methods, and training in coping skills. Educational involvement is focused on helping patients to understand pain assessment and to overcome barriers to treatment for pain.\(^20\) A National Institutes of Health (NIH) Consensus statement on symptom management in cancer\(^24\) details obstacles to pain management (Figure). Videos, role modeling, use of coaches, tutorials, and didactic sessions have been studied.\(^20\) Although some of these interventions show good results, others do not; further investigation is necessary to evaluate the efficacy of educational interventions.\(^20\)

An exciting new direction in teaching patients about pain is education directed toward caregivers. When learning about cancer pain was directed toward caregivers, Ferrell et al\(^25\) found that elderly patients described less discomfort with increased psychological and social functioning. Combining coping skills training and education, Keefe et al\(^26\) studied a partner-guided pain management training program for the end of life. They found that partners who participated in the cognitive-behavioral program reported improvements in self-efficacy for helping patients control pain and other symptoms; they also observed less caregiver strain. Patients in the study reported no differences in pain, but this finding was likely because they were very ill and near the end of life.

Keefe et al\(^20\) point to important future directions in studying biopsychosocial aspects of cancer pain. Referral to a psychologist remains more the exception than the norm for patients with disease-related pain. Access to services is also difficult at times. Therefore, Keefe et al\(^20\) recommend that future research be directed toward practical strategies for integration, including involving nurses in cognitive-behavioral training that can be accomplished during medical appointments, and using telephone or Internet systems to deliver self-management.
training. These methods have been used in studies of back pain\textsuperscript{27} and osteoarthritis\textsuperscript{29} with good results.

**Complementary Medicine**

Complementary and alternative medicine (CAM) treatment modalities have increased since 1993, when Eisenberg et al\textsuperscript{29} revealed in a first national survey that one in three respondents had used an unconventional or CAM treatment modality the previous year. However, studies have shown that patients frequently do not report their use of CAM to their physicians, often because of perceptions that their physicians are unreceptive to CAM treatment modalities.\textsuperscript{31} High-quality empirical data on CAM approaches are emerging from increased research due to the development of a National Center for Complementary and Alternative Medicine (NCCAM) by the National Institutes of Health; however, extensive research on a wide range of approaches is not yet available.\textsuperscript{31}

Several complementary treatment modalities have some supportive empirical evidence or promising preliminary data: traditional Chinese medicine, mind-body medicine, and therapeutic massage.

**Traditional Chinese Medicine**

Traditional Chinese medicine dates back more than 4000 years and regards health as a balance between individual and environment.\textsuperscript{32} According to traditional Chinese medicine, q\text{\textsuperscript{i}}, or ch\text{\textsuperscript{i}}, is a life energy force that flows in characteristic patterns (meridians) that correspond to five elements (earth, wood, metal, water, and fire).

Physical and psychological illness is conceptualized as an improper flow or blocking of qi along a meridian. Therefore, the goal of traditional Chinese medicine is to achieve a balance in opposite poles of meridians, referred to as yin and yang. Three aspects of traditional Chinese medicine are acupuncture, qigong, and the neuroemotional technique (NET).

**Acupuncture**—Acupuncture, acupuncture, and electroacupuncture are forms of traditional Chinese medicine in which physical manifestations of the meridians (eg, joint pain) are assessed, and qi is facilitated or rebalanced. Pressure on meridian points can be applied by insertion of small-gauge needles (eg, acupuncture) or a combination of needles and low-frequency electric current (electroacupuncture), or by manual pressure with a finger (acupressure).\textsuperscript{34} Auricular acupuncture is applied to the ear, thought in traditional Chinese medicine to contain points connected to internal organs.\textsuperscript{33}

Physicians trained in Western medicine and acupuncture are more likely to take a pragmatic approach and stimulate trigger points, tender points, or a mixture of segmental points appropriate to a disordered area, though these referral patterns resemble traditional meridian lines.\textsuperscript{33} Some evidence indicates that effects of acupuncture are due to release of multiple endogenous substances (eg, oxytocin, steroids, endorphins) that no single drug treatment could mimic.\textsuperscript{33}

Acupuncture has been found to help manage a wide variety of pain conditions. Evidence is particularly strong for use of this method in acute pain with limited support for treatment of post-procedure pain in patients with cancer. Filshie and Thompson\textsuperscript{33} reported that a majority of 250 patients with gynecologic cancer had enhanced analgesia when acupuncture was administered as an adjunct to anesthesia. A randomized controlled trial of auricular acupuncture for patients with cancer found substantial pain reduction in patients receiving acupuncture compared with those receiving placebo.\textsuperscript{34}

Acupuncture for cancer pain caused by primary or metastatic lesions has been studied, but most reports are retrospective and lack control groups.\textsuperscript{35-38} Two reviews of 339 patients with advanced cancer showed that 52% and 56% of patients, respectively, benefited from increased analgesia following three weekly acupuncture treatment sessions.\textsuperscript{35,36} In these studies, mobility, cancer treatment–related pain, muscle and bladder spasms, and vascular problems improved. Auricular acupuncture has also shown an analgesic effect in patients with cancer pain.\textsuperscript{34,38}

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**Barriers**

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<th>Provider Barriers</th>
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<tbody>
<tr>
<td>□ Lack of awareness of patient’s pain</td>
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<td>□ Inadequate cancer pain management training and education</td>
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<td>□ Lack of time and resources to address cancer pain</td>
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<td>□ Higher priority given to cure rather than treating patients for symptoms</td>
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<td>□ Concern about legal and regulatory sanctions for opioid use</td>
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<th>Patient and Family Barriers</th>
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<td>□ Belief that pain is inevitable in cancer</td>
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<td>□ Belief that nothing can be done for cancer pain</td>
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<td>□ Fear of addiction and dependence on opioids</td>
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<td>□ Fear drugs will lose their effectiveness</td>
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<td>□ Fear that reporting pain will exclude patient from clinical trials or cancer treatments</td>
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<td>□ Failure to mention pain to providers</td>
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<td>□ Lack of adherence to treatment regimens</td>
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<td>□ High cost of medications and treatments</td>
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<td>□ Cognitive impairment hindering symptom assessment</td>
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<th>System Barriers</th>
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<td>□ Lack of communication between specialists and primary care providers</td>
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<td>□ Lack of coordination of care, particularly during transition from cure to hospice mode</td>
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<td>□ A priority on curing cancer over caring for patients with cancer</td>
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<tr>
<td>□ Regulatory barriers to effective pain management</td>
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<td>□ Lack of reimbursement for symptom management</td>
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In addition to alleviating cancer pain, acupuncture has been used to treat patients with radiation-induced xerostomia, as well as those presenting with cancer-related conditions such as shortness of breath caused by a primary or secondary malignancy. Lower extremity edema secondary to intrapelvic lymph node dissection for malignant gynecologic tumors, and women with menopausal symptoms on tamoxifen therapy after previous breast cancer. Acupuncture has improved upper extremity mobility following axillary lymphadenectomy.

Side effects of acupuncture, acupressure, and electroacupuncture are generally limited to minor bruising or irritation at the point of contact. Acupuncture is contraindicated in the local area of an unstable spine, in persons with severe clotting disorders or neutropenia, and on limbs with lymphedema. Additionally, semi-permanent needles, placed with tape for days at a time, are contraindicated for patients with valvular heart disease.

Qigong—Qigong is an ancient practice of manipulating energy through slow body movements and meditation, with or without imagery, and breathing techniques. Like acupuncture and other traditional Chinese medicine modalities, the goal of qigong is to open blocked energy channels and facilitate qi. Although often taught in isolation for the purpose of healing and fitness, qigong is part of a cultivation practice or lifestyle system of Buddhism and Taoism aimed at spiritual enlightenment and longevity.

In a retrospective review of 344 patients in hospice where qigong was practiced as an adjunct to a traditional approach, Aung found reduced pain. In this study, excellent pain relief was measured by patient and therapist reports of increased freedom from pain, increased activity, improved mood, and less need for drugs. Good and fair ratings were determined by pain relief and the need for occasional or frequent treatment, respectively. Poor pain relief was determined by negligible or no improvement by both patient and therapist agreement of increased freedom from pain. Although studies of use of qigong in patients with cancer are rare, a well-designed study of patients with complex regional pain syndrome revealed positive results for short-term pain reduction and long-term anxiety reduction.

Neuroemotional Technique—Neuroemotional technique (NET) is an intervention grounded in traditional Chinese medicine and involves testing and manually holding the associated meridian pulse points, thereby facilitating cognitive and emotional processing and resolution of a past traumatic or anxiety-producing event. A preliminary outcome study of NET in female cancer survivors with related traumatic stress symptoms compared preintervention with postintervention responses to recalling a cancer-related event. Decreases in physiologic reactivity and subjective ratings of event-related distress were found in addition to decreased levels of pro-inflammatory cytokines in response to recalling the event.

Mind-Body Techniques

The term mind-body techniques is somewhat ambiguous and refers to a group of treatment modalities that involves acknowledging bidirectional effects of both systems. Some of these modalities are generally classified as more conventional modes of treatment, such as progressive-muscle relaxation. Hypnosis and meditation programs are generally considered CAM approaches and are reviewed here.

Hypnosis—Hypnosis is a complex process of attentive, receptive concentration characterized by a modified sensorium, altered psychological state, and minimal motor functioning. An NIH Technology Assessment Panel found strong evidence for use of hypnosis in decreasing pain, including that associated with cancer. Pain reduction is thought to occur through cognitive distraction, muscle relaxation, and alteration of perceptions. Hypnosis has been used to successfully relieve nausea and vomiting associated with chemotherapy. This application of hypnosis focuses on reducing anxiety and physical responses associated with conditioned responses to hospital cues.

Meditation and Mindfulness-Based Stress Reduction—Meditation is a practice extracted from more comprehensive traditional Eastern systems. For example, yoga is an ancient Eastern Indian system that prescribes an approach to living that includes proper diet, behavior, physical exercise, and sleep hygiene. In the United States, yogic meditation practice alone is more common, as are variations of yogic meditative practices.

Mindfulness-based stress reduction (MBSR) is one such practice that has shown therapeutic benefits for patients with a wide range of medical illnesses, including cancer. This process facilitates moment-to-moment awareness through regular meditative practice. Participants learn to respond to their awareness, including negative emotional thoughts and states in a nonjudgmental, accepting, and relaxed fashion.

The practice of MBSR has been found to improve patients' coping with prostate cancer, and to decrease stress and mood disturbances in a group of patients with mixed types of cancer. Shifts in immune system markers (reduction in T1 pro-inflammatory lymphocyte to T2 anti-inflammatory lymphocyte ratio) have also been found in patients with breast cancer and patients with prostate cancer following an 8-week MBSR program.

Mindfulness-based art therapy (MBAT) is a newly developed program for patients with cancer that integrates MBSR within a supportive-expressive group format. A randomized controlled trial of MBAT showed significant reductions in psychological distress and improvements in quality of life of women with mixed cancer diagnoses compared with control subjects on a wait list. MBAT is different from MBSR in that it is specifically designed for patients with cancer, provides a nonverbal creative-expressive component via art therapy, and is designed for smaller groups (eg, 7 to 10 participants compared with 30 or more MBSR participants per group).

Therapeutic Massage

Therapeutic massage dates back thousands of years to ancient cultures of China, Japan, and India. It is defined as the systematic manual or mechanical manipulations of soft tissues of the body by movements such as rubbing,
kneading, pressing, rolling, or slapping, or a combination of movements for therapeutic purposes including relief of pain, relaxation of muscles, and promotion of circulation. A review of 10 studies suggested that massage increases relaxation and decreased levels of cortisol levels and anxiety. Two studies reported decreased pain and relaxation in male patients with cancer following a massage intervention.

The Continuum of Treatment of Patients With Cancer Pain
An increasing number of individuals with cancer survive the primary treatment stage. Over the past 30 years in the United States, the number of cancer survivors has tripled, totaling slightly more than 10 million. Because of this dramatic rise, cancer is increasingly thought of as a chronic as opposed to a terminal condition. Emerging literature describes new difficulties for cancer survivors, highlighting the need for a continuum of care during primary treatment and beyond.

Psychosocial concerns for survivors include pain, fatigue, cognitive changes, body image, sexual functioning, infertility, financial trouble, and caregiver distress. Individuals may also develop psychiatric and psychological problems that include traumatic stress symptoms, depression, anxiety, and worry about recurrence. The need for increased attention and randomized-controlled psychosocial interventions for the difficulties of cancer survivors has recently been highlighted.

Little epidemiologic evidence exists for chronic pain in cancer survivors, though posttreatment pain syndromes are well known. Surgery, amputation, radiation therapy, and chemotherapy are all potential sources of nerve injury resulting in chronic pain. Slowly progressing cancer can also contribute to ongoing pain. Recognizing patients with chronic pain and treating them with the same multidisciplinary modalities that are used during primary cancer treatment and for people with nonmalignant pain are critical for increasing the quality of life for cancer survivors.

The following anecdotal case vignette describes a typical patient with cancer pain.

Case Presentation
Lori is a 65-year-old woman with a history of breast cancer. She underwent a right breast mastectomy and subsequent radiation therapy and chemotherapy. Lori complains of chronic chest pain that has continued 2 years after her cancer treatment. She states that she has had no return of her cancer, but that she is “tortured” by an intense “burning” pain in her chest and under her right arm. She describes her pain as a “constant” pain with an intensity of 7 on the scale of 0 to 10 on most days. In addition, Lori describes intermittent exacerbations of pain, in which her pain intensity is 9 on the 0-to-10 scale and the quality of the pain, “sharp.”

Lori’s pain increases with activity and decreases when she rests her arm. She has been treated with a variety of analgesic medications, including gabapentin and short-acting opioids for exacerbations of pain. She says that these medications do not seem to be “doing their job.”

Lori is a married woman with a former active social life. She played golf and worked part-time in a hospital gift shop. She can no longer participate in these activities. She notes that her hobby is gourmet cooking, but she has been unable to participate in cooking the past 2 years because of her constant pain. She describes increases of pain when she moves her arms to chop, stir, or cook. Further, she has difficulty reaching for and holding heavy cookbooks.

Lori says that her mood is “irritable.” She notices herself “snapping” at her husband. She believes he is growing tired of hearing her “complain” about her pain. She is also tiring of changing social plans because of her pain. She describes worry that she will lose all her friends and that her pain means her cancer will recur.

Lori denies drinking alcohol, except for rare occasions, and she does not smoke. Her medical history is not significant for alcohol or substance abuse or dependence. Lori has no other clinically significant medical difficulties.

Assessment and Treatment
Lori completed several standardized measures assessing her pain, mood, and pain-coping. The results of these measures revealed a greater-than-average level of pain and self-perceived disability in a variety of psychosocial areas. Lori described mild to moderate symptoms of depression and passive pain-coping strategies (eg, taking medication and resting). She described considerable worry about her pain and the impact of her pain on her life.

Treatment Recommendations
Psychological recommendations are for short-term cognitive-behavioral treatment focused on reducing Lori’s symptoms of depression, increasing her pain-coping skills, and developing purposeful activity for her. Increasing her active coping strategies would likely be beneficial. Special attention to her self-talk surrounding her worry about cancer recurrence may be helpful since her expectations likely contribute to her negative affect.

Lori would also likely benefit from an MBSR course, in which she could learn skills that might help her to relax and better cope with her physical status, pain symptoms, and sense of vulnerability. This intervention can complement cognitive-behavioral therapy by providing another means of observing and addressing the negative cycle of physical sensations triggering a cognitive schema of worry and fear, which in turn intensifies physical distress. Some mindfulness programs for patients with cancer, such as MBAT, also add creative arts modalities with the goal of enhancing healthful self-regulation.

Comment
Pharmacologic and interventional strategies are first-line modes of treatment for patients with cancer-related pain. However, adverse effects may limit the potential usefulness of these strategies. Further, pharmacologic and interventional strategies may be inadequate alone to treat the whole person with cancer. Adjunct treatment modalities include physical, psychological, and social interventions and complementary medicine techniques. Although many of these techniques have adequate empirical evidence when applied to other pain conditions (eg, nonmalignant pain), well-designed studies specifically addressing cancer pain are needed. Additionally, creative scholarship that addresses how to make practitioners more aware of these interventions and how to make the care more accessible to patients is critical.
Many of these interventions have little risk and can increase the capability of patients to have control over their pain and their lives, as well as increase their quality of life. In addition, the physician-patient relationship would likely benefit from discussion and incorporation of these strategies into cancer care. Perhaps there is no better example than a serious cancer illness for the need to provide a comprehensive biopsychosocial treatment approach that includes the broadest possible range of therapeutic modalities, particularly when pain is involved.

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