Pain Medicine
PAIN MEDICINE
Volume 10 • Number 6 • 2009

PAIN MEDICINE POSITION PAPER

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Current Status

Since the 1950s, significant advances in the treatment of pain have resulted in greater relief for an increasing number of patients. However, the quality of pain care delivery in the United States continues to fall remarkably short of the current potential for optimal care. Pain medicine remains fragmented, and the absence of a unified organizational model of pain medicine hinders the effective provision of an integrated, cost-effective pain care, causing unnecessary and avoidable human suffering and societal expense. These consequences of fragmented care are unacceptable and threaten patient safety and well-being. Effective treatment of persistent pain requires the highest level of clinical reasoning, selectively coordinated medical skills, the strategic use of resources, and the orchestration of diverse areas of medical expertise. In order to close the gap between existing care and the potential for optimal pain care, significant institutional barriers to this goal must be addressed. To this end, the following position paper describes the history and context of this challenge, proposes recommendations to harness the collective abilities and knowledge within the discipline of pain medicine, and calls upon organized medicine to take action on behalf of patients and for the public health.

 1526-2375/09/$15.00/972 972–1000 doi:10.1111/j1526-4637.2009.00696.x

EXECUTIVE SUMMARY

Each year, $100 billion is spent on pain care, yet 40% of Americans experience daily pain, including 50 million people with chronic pain and 25 million people with acute pain. The prevalence of pain has a tremendous impact on business, with an estimated annual cost of $60 billion plus in lost productivity. Despite advances in the treatment of pain, the quality of pain care remains far below the potential for optimal care, and ineffective pain treatment continues to be a growing problem in the United States. The historic progress of pain care in the United States has encountered contemporary barriers that stand in the way of common sense change, and thus, pain medicine is fragmented, unable to provide integrated, comprehensive, and longitudinally cost-effective treatment. Fragmentation threatens patient safety because of inadequacies in 1) training programs, 2) number of qualified physicians, 3) federal funding of research, and 4) reimbursement policies. Closing the gap between the existing state of care and the potential for optimal pain care requires the removal of significant institutional barriers. Recommendations to achieve this include recognizing pain medicine as a primary specialty by the American Board of Medical Specialties (ABMS), creating a comprehensive residency training process accredited by the Accreditation Council for Graduate Medical Education (ACGME), and integrating diverse medical specialties to focus and improve research, diagnosis, and treatment of pain.

Despite meager funding for pain research in the United States, the field of pain medicine is highly active, as demonstrated by growth in the number of pain medicine publications and journals, development of pain medicine associations, passage of pain medicine legislation for the military and Veterans Affairs, and most recently, congressional activity to pass the National Pain Care Policy Act of 2009. Significant advances are also evident in pain research, diagnosis, and therapy, including new techniques such as neurophysiologic testing, central nervous system imaging and diagnostics, and discoveries at the molecular and genetic levels of pain. Thus, current research, technology, diagnosis, and treatment in pain medicine are paradoxically characterized by both important advancements and formidable barriers.

As the debate on the future of pain medicine unfolds, stakeholders at all levels are taking note of the exciting potential for an optimal system of pain care delivery. However, more delays in advancing the cause of pain medicine will place the United States further behind other countries, such as Australia and China, which have already recognized pain medicine as a medical specialty, and the European Union and Canada, which are also considering such a development. Therefore, in the interests of individual patients and the public at large, it is time to consolidate disparate interests in the pursuit of an optimal pain treatment. This goal can best be accomplished through the establishment of pain medicine as an ABMS-recognized primary medical specialty, the development of dedicated ACGME-accredited residency programs in pain medicine, and support for comprehensive, integrated pain care services.

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PART ONE

Introduction

Significant developments, especially in the past two decades, have resulted in greater relief from pain for an increasing number of patients. However, the overall quality of treatment for pain in the United States remains unacceptable for millions of patients with acute or persistent pain. While the potential for attaining a standard of optimal care within the discipline of pain medicine is considerable, contemporary pain care has not achieved the synergy that can be afforded through a comprehensive and integrated approach to research, diagnosis, and treatment of pain.

Contemporary medicine has had notable, but incomplete, success with investigating, diagnosing, and treating pain, especially when a one-to-one relationship exists between injury and pain. This type of pain, which serves as a useful early warning mechanism to protect organisms from further harm, is commonly known among medical practitioners as "physiological pain" or "eudynia" (further explanation in section 3.3).

Although such pain frequently is short lived and self-limiting, it can become persistent and intractable if the underlying disease process or injury is chronic or incurable, or if the activation of pain is unavoidable, as in the pain caused by movement or weight bearing in injuries of the spine or in diseases such as arthritis.

Making the Best of a Distressing Condition

Mary, 52 years old, had been treated for 2 years for breast cancer. She began to have major difficulties with the activities of daily living because of severe hip and low-back pain, not only when walking but also at rest, and shooting chest pain when breathing deeply. During her workup, it was found that she had developed bone metastases to the pelvis and ribs. Management with oral pain medication provided some relief but did not allow her to function, kept her awake most nights, and soon created severe emotional distress leading to chronic anxiety and significant depression. She and her pain medicine physician planned her care to optimize both pain control and quality of life. She chose to have an implanted drug delivery system for the spinal administration of an opiate, clonidine, and local anesthetic; with correct titration, this enabled her to be ambulatory again. At the same time, she underwent physical therapy to optimize physical activity, saw a pain psychologist for cognitive–behavioral treatment and muscle relaxation techniques, received psychopharmacology for her depression and anxiety, and underwent radiotherapy and chemotherapy, which soon controlled the spread of her cancer. Two years later, between ongoing treatments, she is able to have a more normal life. Studies have shown that appropriate treatment to control pain in this type of patients significantly prolongs survival [1,2]. "When I have no pain, I forget I have cancer," she said.

Sometimes pain signals from injured or disease-ridden tissues are persistent and cause changes in the peripheral pain receptors, nerves, spinal cord, or brain; these changes are often irreversible. As a consequence, the nervous system itself can begin to generate abnormal pain signals that are resistant to treatment. This pathophysiologic condition has been referred to as "pathological pain" or "maldynia" (further explanation in section 3.3). The inherent utility of maldynia is either absent or poorly understood. Contemporary medicine has struggled to understand and adequately treat "pathological pain." In fact, until the latter half of the 20th century, maldynia was not clearly recognized as a distinct category of pain.

Although pain is a universal phenomenon, the experience of pain is fundamentally individual for most patients. This is especially the case when patients experience pain not merely as a symptom of

Definition of Pain Medicine

The discipline of pain medicine is concerned with the prevention, evaluation, diagnosis, treatment, and rehabilitation of painful disorders. Such disorders may have pain and associated symptoms arising from a discrete cause, such as postoperative pain or pain associated with a malignancy, or may be a disorder in which pain constitutes the primary problem, such as neuropathic pain or headache.

an underlying disease or injury but as a chronic disease unto its own. The account of a patient with headache or neuralgia caused by cancer treatment, diabetic neuropathy, or herpes zoster (shingles) provides salient examples of this experience. Patients typically experience a variety of emotions that can activate pain, worsen pain, and even become indistinguishable from pain. The experience of pain can initiate a cascade of other emotional, physical, and social components of suffering—none of which can be ignored in our evaluation of current approaches to pain diagnosis and treatment.

Several inadequacies are responsible for suboptimal pain care. At present, conditions do not exist to 1) thoroughly and completely educate and train pain medicine physicians for managing the complexities of pain, for developing standards for the medical care of pain, and for teaching medical students; 2) strategically integrate medical specialties for providing comprehensive treatment; 3) expedite the response to increasing patient demand for improved outcomes; 4) effectively and safely satisfy the treatment needs for the growing volume of patients with pain; 5) reduce costs for the patient, payer, and provider; and 6) substantially advance the knowledge of pain medicine.

Each of these inadequacies represents a significant threat to patient quality of life and safety. Fortunately, organizations advocating specialization in the discipline of pain medicine have devised solutions that can help facilitate the development of pain medicine specialists adequately trained to meet the needs of patients.

In recent years, numerous organizations have been established with the purpose of advancing pain care delivery. Among these, the AAPM and the American Board of Pain Medicine (ABPM) have been at the forefront of the challenge to optimize pain care delivery. The mission statement of the AAPM describes a comprehensive platform to work with existing stakeholders in the advancement of the discipline of pain medicine. As the practice of pain medicine has grown, a defined body of knowledge and scope of practice have emerged, and today, pain medicine is acknowledged as a separate discipline by the American Medical Association (AMA). The AAPM is comprised of a professional community of physicians with a sustained interest in pain disorders and their management. Although members share a common practice orientation, they represent a variety of specialty origins, including anesthesiology, family practice, internal medicine, neurology, neurosurgery, orthopedic surgery, physiatry, and psychiatry; the membership of AAPM has representation in the AMA House of Delegates. As a major force in advancing the practice of pain medicine in the United States, the AAPM focuses its efforts on 1) providing pain medicine physicians with the most up-to-date information available on the practice of pain medicine, 2) advocating for pain medicine physicians, and 3) increasing the visibility and credibility of the specialty of pain medicine.

American Academy of Pain Medicine Mission Statement

The mission of the American Academy of Pain Medicine (AAPM) is to advance the specialty of pain medicine and the comprehensive care of patients with pain through promotion of the best clinical practices, research, advocacy, and continuing medical education.

As described in detail by the definition provided in this paper (refer to "Definition of Pain Medicine"), pain medicine is a discipline that focuses on all aspects of symptomatic pain and pain as a disease. Within this position paper, the AAPM and ABPM present their recommendations to close the gap between today's unrealized potential for optimal pain care and a future that harnesses our greatest imagination for the effective delivery of pain medicine.

These recommendations include the following:

1. Recognizing pain medicine as a primary medical specialty by the American Board of Medical Specialties (ABMS).
2. Creating a comprehensive Accreditation Council for Graduate Medical Education (ACGME)-accredited residency training process for pain medicine specialists.
3. Providing a comprehensive system of pain care delivery that excels by integrating diverse medical specialties in the research, diagnosis, and treatment of pain.

PART TWO

Highlights of Pain Care History

2.1—Religion, Mysticism

Pain has been an inescapable part of the human condition since the beginning of time. Our knowledge of pain has a long history of development, characterized by various beliefs, models and theories, research tools, diagnostic methods, and therapeutic practices. Humans initially understood little about pain, often looking to the mystical and religious realms for answers. Within these early contexts, pain was understood not just as a part of life that must be tolerated but also as a means to punish wrongdoers and to purify evil souls. Such primitive notions of pain continued well into modern times. Progress in understanding pain in a more contemporary context began only in the past two centuries, in parallel with advances in scientific thinking generally.

2.2—Advancements in Anesthesia in the 1800s

William Morton's discovery of ether in the 1840s, used initially for tooth extractions, represented a critical milestone in the development of anesthesia—the ability to temporarily render a person insensate so that surgery could be performed without accompanying pain perception. Opium, morphine, and other derivative alkaloids had been used for thousands of years; however, the invention of the syringe in the mid-1800s allowed medicine to be administered by routes other than by mouth, greatly improving local and general anesthetic techniques and significantly reducing intraoperative and postoperative pain.

2.3—Diagnostic Value of Acute Pain

In past centuries, the diagnostic value of acute pain gradually began to be acknowledged and to be used by physicians and health care practitioners. The understanding of chronic pain disorders remained limited, however, focusing primarily on peripheral somatic pathology and processes, as opposed to processes involving the central nervous system. Drugs, surgery, and physical therapies, such as the use of heat or cold treatments, gradually replaced mysticism or prayer as the primary approaches to treatment.

War Leads to Treatment Advances

During World War II, the pharmaceutical company, Squibb, introduced the morphine syrette, a device that enabled medics for the first time to quickly administer a controlled amount of morphine to wounded soldiers on the front lines. The syrette needle was designed for the quick and convenient puncture of the seal. The syrette was then pinned to the casualty's collar to prevent overdosing of unconscious patients. Usually, the half-grain injection from the toothpaste tube-shaped syrette, combined with physical exhaustion, was sufficient to knock the patient out, with the casualty often waking up in the hospital. This important advance would eventually lead to other preloaded disposable medical devices for emergency use in pain control [3].

Today, the necessity for an improved pain care is no less crucial to the United States military. It has been shown that a considerable proportion of veterans of Operation Enduring Freedom and Operation Iraqi Freedom will experience clinically significant chronic pain following their military service [4].

Recently, the Army has been running trials on a nasal inhaler of ketamine to determine if it provides an alternate for the battlefield that provides a strong, fast-acting analgesia that is immediately absorbable and blocks the development of opioid-induced hyperalgesia [5,6].

Additionally, the Army recently introduced regional anesthesia techniques to the front line to block nociception [7] and to prevent secondary changes leading to maldynia [8].

2.4—War Leads to Improvements in Pain Control, Treatment

World War I and World War II, conflicts that saw the horrible battlefield injuries associated with modern warfare, further advanced our understanding of surgical anesthesia and operative techniques, and spurred additional interest in pain management. At this point, medical advances in pain management, as signifi-

cant as they were, still focused almost entirely on intraoperative pain, specifically somatic pain generated by a peripheral tissue injury or disease. Postoperative, nonsurgical, or persistent pain problems were, for the most part, given little attention, with the exception of persistent pain following injuries to nerves, a concept first outlined by Silas Weir Mitchell who described causalgia in veterans of the American Civil War.

2.5—Era of More Specialization, Pain Recognized as Symptom and Disease

A new era of scientific medicine in the 20th century included drastic changes in medical education in the United States, initiated by Abraham Flexner, which led to increased specialization in medicine. Certain specialties, particularly in the neurosciences, became more involved in the evaluation and management of pain disorders. Neuroscientists were the first to recognize that the nervous system contained the substrate for pain transmission and awareness. They attempted to remove pain and suffering by devising techniques to interrupt the pain pathways. Although based on sound principles, these techniques frequently were inadequate because they failed to recognize the complex, causal interaction of biopsychosocial factors in the phenomenological pathway to chronic pain conditions and diseases and the inherent plasticity in the nervous system, which allowed the development and propagation of pain even after a noxious stimulus was removed or a nerve from a painful body area was severed.

Specialties such as anesthesiology, psychiatry, oncology, physiatry, and rheumatology also developed a special interest in pain disorders. Although pain disorders began to be treated by a variety of different specialties at this time, physicians generally had little scientific training in pain, and communication with one another and integrated care were virtually absent.

Concurrently, the growing development of palliative care, closely aligned with pain care, created the need to integrate the two fields and contributed to the maturation of both [10].

CONCEPT OF "TOTAL PAIN"

Cicely Saunders defined the concept of total pain as the suffering that encompasses all of a person's physical, psychological, social, spiritual, and practical struggles. Saunders entered a lifelong quest to understand and treat pain at St. Thomas' Hospital, where she trained as a ward nurse in 1941. Her life took her through several decades of new developments in the field, and she went on to become a leading expert in the treatment of pain. Saunders has been a catalyst for many advances in pain medicine throughout her career, especially in the area of palliative medicine. Saunders taught that the whole experience for a dying patient includes anxiety, depression, and fear; concern for the family who will become bereaved; and oftentimes, includes a need to find some meaning in the situation, some deeper reality in which to trust [9].

2.6—Multidisciplinary Approach to Treating Total Pain

An important breakthrough occurred in 1953 with the publication of *The Management of Pain* [11], a 1,500-page textbook written by John Bonica, MD, who espoused a multispecialty and multidisciplinary approach to "total pain," (a term introduced by Dame Cicely Saunders, the founder of the Hospice movement). This book had a significant impact on pain management and ultimately contributed to the creation of pain medicine as a separate medical entity. Bonica's approach resulted from his experiences as a young anesthesiologist when he turned to three colleagues—an orthopedist, a neurosurgeon, and a psychiatrist—to help him treat pain cases he could not understand. He clearly recognized that complex pain disorders were multidimensional, with biopsychosocial components. He also recognized the futility of a fragmented, sequential approach, and so he proposed and developed the concept of a multispecialty team to treat pain.

2.7—Neurophysiology of Nociception

The publication of the *Pain Mechanisms: A New Theory* by Patrick D. Wall and Ronald Melzack in 1965 [12] represented another important breakthrough, in this case, with the introduction of the concept of nociception and an integrated model of understanding pain, which ultimately replaced the traditional specificity and pattern theories of pain. Radical for its time, the article set forth the Gate Control Theory of Pain, a concept of spinal, segmental, and descending modulation of pain transmission that led to an interest in the basic neurophysiology of nociception and the pathophysiology of chronic pain conditions and maldynia.

About 25 years ago, an understanding of the neurobiologic basis for complex, persistent pain problems began to emerge. Important scientific advances, such as neuroimaging, helped to establish the fact that persistent pain in certain instances was a disease and not just a symptom. During the final two decades of the 20th century, the new medical discipline of pain medicine emerged as the result of changes in clinical practice and public expectations. Today, the advent of modern functional brain imaging has created new possibilities for exploring the brain mechanisms that underlie acute and persistent pain. It is now possible to examine how specific aspects of the pain experience are represented in the brain, the impact of certain pain diseases and individual attributes on these representations, and the impact of treatments, which aim to remodel the pathological representations associated with maldynia.

GATE CONTROL THEORY OF PAIN

Why can some athletes seemingly play through injuries but succumb to incredible pain immediately after the competition ends? The explanation is thought to be related to the intense motivational states that may interfere with the perception of pain. The effects of emotional states may also explain why individuals with clinical depression report more pain than their counterparts without depression, and why anxiety increases pain perception. To explain why thoughts, emotions, and life experiences influence pain perception, Ronald Melzack and Patrick Wall proposed that a gating mechanism exists within the dorsal horn of the spinal cord where cells that project pain sensation in the spinothalamic tract to the brain are innervated by both small peripheral nerve fibers (pain receptors) and by inhibitory interneurons that are activated by both large peripheral nerve fibers (normal receptors) and descending fibers from the brain. The interplay among these connections determines when and how much of a painful stimulus is transmitted as a pain sensation to the brain.

2.8—Neuromatrix Theory of Pain

In the past 5 years, contemporary pain medicine has witnessed the evolution of pain theories through the current framework of the Neuromatrix Theory of Pain, which proposes that pain is a multidimensional experience produced by characteristic "neurosignature" patterns of nerve impulses generated by a widely distributed neural network—the "body-self neuromatrix"—in the brain [13,14]. Sensory inputs may trigger these neurosignature patterns, but they may also be generated independently of sensory information. The neuromatrix, which is genetically determined and modified by sensory, emotional, cognitive, and memory experience, is the primary mechanism that generates the neural pattern that produces pain. Its output pattern is determined by multiple influences, of which the somatic sensory input is only a part, that converge on the neuromatrix.

Acute pain problems evoked by brief noxious inputs have been carefully investigated by neuroscientists, and their sensory transmission mechanisms are generally well understood. In contrast, chronic pain syndromes that are often characterized by severe pain associated with less obvious injury or pathology involve more complex systems in the central nervous system that are more difficult to penetrate and comprehend. Moreover, chronic psychological or physical stress is often associated with persistent pain, but the relationship between these stresses and persistent pain remains poorly understood. The Neuromatrix Theory of Pain provides a new conceptual framework to examine these mysteries.

PART THREE

Contemporary Pain Medicine: Advances in a "Decade of Pain Control and Research"

3.1—Advances in Research, Technology, Diagnosis, and Treatment

Most primary specialties have experienced significant advancement through the development of a broad spectrum of tools and techniques used in the research, technology, diagnosis, and treatment of a disease. Likewise, the discipline of pain medicine has experienced dramatic advances in these areas.

DECADE OF PAIN CONTROL AND RESEARCH

In 2000, in response to the advocacy efforts of the Pain Care Coalition (PCC), Congress declared a "Decade of Pain Control and Research," beginning on January 1, 2001. Despite structural obstacles, significant advances have occurred in many areas of pain medicine treatment and research.

Some of the advances in diagnosis include psychometric testing, neurophysiologic testing, central nervous system imaging techniques, and magnetic resonance imaging (MRI) diagnostics. Research in pain medicine has been expanded by the use of functional MRI (fMRI), pharmacologic functional MRI (phfMRI), and other imaging technologies, as well as techniques in molecular biology that help describe genetic mechanisms of pain processing and modulation. The use of advanced imaging technology and techniques, including fMRI and phfMRI, has established that pain modulation occurs at multiple levels of the neuroaxis and likely plays a role in the development and maintenance of complex, persistent pain states [15]. These same imaging technologies are also used in the diagnosis and in the evaluation of new treatments. Pharmacologic advances have occurred in intraspinal, transdermal, and transmucosal delivery systems, as well as abuse-deterrent opiate formulations. Research is also pursuing new analgesic compounds that impact specific receptor systems involved in pain perception and modulation. Improved understanding of neuropathological conditions, such as hyperalgesia, has allowed a better comprehension of neuropathic pain states and has had a direct impact on treatment [16,17].

Research at the molecular and genetic levels has revealed exciting knowledge about the origins of pain. For example, scientists have identified a gene whose absence can help reduce pain. Known as the downstream regulatory element antagonistic modulator gene, the gene blocks production of dynorphin, a chemical with pain-relieving effects produced in response to pain or stress [18]. Tests on genetically engineered mice, which lacked the gene, showed a dramatic loss of sensitivity to all types of pain, appearing to feel up to 50% less pain compared with mice that had the gene [19].

Another example of recent research involves the isolation of the gene responsible for the complete inability to sense pain in an otherwise healthy individual. Researchers found that the mutation of a gene involved in pain, *SCN9A*, caused the congenital inability to experience pain. The mutation affects the gene responsible for the subunit of an important sodium channel. The findings suggest that *SCN9A* is an essential and nonredundant requirement for nociception in humans. These findings may lead to the development of novel analgesics that selectively target this sodium channel subunit [20].

In other research, scientists have designed a molecular delivery system (gene transfer vector) used to carry genes into cells for the production of enkephalin, an opioid peptide that is naturally produced in the body. A clinical study to test the pain-relieving abilities of this technology is underway in 12 patients with cancer pain [21]. Also, the role of "molecular epidemiology" of pain has been recently emphasized as potentially useful for the development of new drugs to prevent or treat pain [22].

Exploring the Role of the Brain

After three decades of neuroscience research focused primarily on the functions of the spinal cord in pain modulation, as well as peripheral mechanisms of pain, pain research in 2009 is increasingly focused on the brain. The decades of epidemiologic and experimental research dedicated to establishing the salience of emotional states, cognition, and psychiatric comorbidities in pain perception and in chronic pain outcomes are now supplemented by a new brain imaging technology. Imaging is leading to the better under-

standing of the role of the brain in pain perception, as well as potential new diagnostic tools and new therapeutic approaches. Research has revealed several associations of pain with rearrangement of the neuronal activity, neuronal connections, and structural brain changes. These advances have led to a revitalization of brain-mind therapies, such as using biofeedback from advanced imaging techniques and body sensors. In addition, research and treatment are focusing on the emotional components of pain. There has been a return to the interest in developing coping skills for pain and antistress techniques involved in muscle pain and nociceptor activation, and the use of therapies that increase the activity of the descending pain inhibition system [23–26]. In parallel to this development in behavioral neuroscience, there has been a significant focus on somatic sources of pain and means of interrupting or reducing nociceptive signals from the periphery [27].

NEUROMODULATION

Neuromodulation is a form of therapy in which neurophysiologic signals are initiated or influenced with the intention of changing the function and performance of the nervous system to achieve therapeutic effects. This therapy consists mainly of stimulation of the nervous system or of local administration of medications around the central nervous system, usually into the cerebrospinal fluid, by means of an implanted drug delivery system.

SPINAL CORD STIMULATOR

A spinal cord stimulator, also known as a dorsal column stimulator, is an implantable medical device used to treat chronic neuropathic pain. An electric impulse generated by the device produces a tingling sensation that alters the perception. The device is implanted into the epidural space either by percutaneous approach or by surgical laminectomy or laminotomy. A pulse generator or radiofrequency receiver is implanted in the abdomen or buttocks. A wire harness connects the lead to the pulse generator.

3.2—Advances in Therapy

Today, pain medicine research has led to significant pharmacologic, behavioral, and rehabilitation advances, including the development of neurobiologic therapies targeted at specific neural networks and systems. Major progress in the understanding of opioid pharmacology has offered to clinicians a wider range of indications for these drugs, especially in noncancer pain [28–30]. Other advances in therapeutic interventions include intrathecal drug delivery systems, neuromodulation therapies, and the use of fluoroscopy or computed tomography for the anatomically precise injection of drug therapies. Brain, peripheral nerve, and spinal cord stimulation are being used to treat an increasing number of persistent pain conditions through advances in better targeting techniques [31–33].

Knowledge has proliferated about musculoskeletal causes of pain, including myofascial pain, and how common comorbidities such as poor posture and disturbed gait perpetuate musculoskeletal pain. Sophisticated use of exercises, prosthetics, and physical therapies specifically tailored to individual patients can restore muscle function and remediate factors associated with deconditioning. Functional restoration programs that integrate pain control, physical exercise, and cognitive–behavioral techniques help restore the ability to participate in activities across all domains of life that are beneficial physically, psychologically, and socially, and thus enhance the central modulation of pain. Health services research has found that such rehabilitation programs demonstrate both efficacy and cost-effectiveness [34].

Neurobehavioral therapies, the most recent area of development in the practice of pain medicine, aim at the interface between nociception, cognition, emotion, behavior, and pain symptoms, and are based upon advances in the behavioral neurosciences as mentioned in this section. Specific treatments aimed at reducing stress and the stress response, such as cognitive–behavioral interventions, relaxation training, meditation, biofeedback, and hypnosis, have proven to enhance pain control, well-being, and coping [35,36].

The benefits of these neurobehavioral therapies are threefold. First, they promote self-efficacy by arming patients with the ability to deactivate central and peripheral catecholaminergic arousal (stress response) that stimulates sympathetically activated neuropathic pain, muscle contraction, and nociceptor activation. Second, they facilitate self-efficacy through the acquisition of new and more effective chronic-disease coping skills (such as avoidance of stress and specific behaviors that activate pain generators) and adherence to regimens of physical, behavioral, and medical treatment. Third, they enhance descending pain modulation and appear to reorganize pathophysiologic neuronal activity in the brain.

Outside of traditional medicine, complementary and alternate medicine has also flourished [37]. The ubiquity of persistent pain, combined with the treatment failures of Western biomedicine, has led to the proliferation of such treatments for pain. For example, the efficacy of acupuncture is supported by well-designed studies of its benefit in reducing pain of several different types [38]. Medicine is now challenged to find cost-effective ways of integrating these techniques into the management of pain.

3.3—Terminology Changes in Contemporary Pain Medicine

Recognition of a more precise and functional taxonomy is another recent important development in the discipline of pain medicine. This new identification system, developed and introduced by the AAPM, includes the terms "eudynia" and "maldynia" [39].

"Eudynia" is a Greek term denoting "physiological pain" that describes a nociceptive process beginning with a noxious stimulus and then ascending from the point of tissue stimulation to the brain through the peripheral and central nervous systems. It refers to pain as a symptom of an underlying pathological disorder, either an illness or an injury. Treatment consists primarily of palliative symptom management to control pain, while at the same time managing the underlying injury or disease process. Although such pain frequently is short lived and self-limiting, it can become persistent and intractable if the underlying disease process is chronic or incurable. This type of pain serves as a useful early warning mechanism of disease and injury to protect organisms from further harm.

CHRONIC BACK PAIN

Initially, acute back pain is a manifestation of an underlying somatic problem of the spinovertebral axis (eudynia). However, despite and perhaps in spite of treatment, back pain can persist but can no longer be adequately explained based on the underlying somatic pathology. At this point, the individual has developed a neurobiologic disease (maldynia) that coexists with the nociceptive pain problem. "When this kind of hurt (neuropathic) continues, it is not symptomatic of some ongoing disease; it is itself a disease of the nervous system" [40].

The evolution of pain from a neurobiologic response to a neurobiologic disease is supported by research that has demonstrated reduced volumes of neocortical gray matter in patients with chronic back pain [41].

"Maldynia" is a Greek term denoting "pathological pain," referring to pain as a neuropathological disorder or disease process that occurs due to changes at cellular and molecular levels [42]. Maldynia is usually the result of an injury to the nervous system; however, maldynia also can result from a persistent and intractable eudynia, and can persist due to neuropathological changes in the nervous system even when the initial tissue pathology is no longer present. It serves no useful purpose and is destructive to the organism. It can shorten life span, inhibit function and ability to work, frequently cause psychiatric disorders, and is associated with suicidal ideation and suicide. This form of pain is complex, and its effective treatment requires a comprehensive, eclectic, and unified approach.

It is important to recognize that in clinical practice, both eudynia and maldynia can, and do, coexist. Chronic, intractable low-back pain, the failed back syndrome, is an example of this coexistence of both types of pain.

ALGIATRY

Derived from the Greek words for "pain" and "medical practice," algiatry is a new term for the medical discipline that deals with the comprehensive management of persons experiencing pain from any cause [43]. The term was suggested in 2003 by members of the ABPM as a means of distinguishing the medical discipline of algiatry from the various other medical and related subspecialties that have been referred to as pain management. Physicians who practice algiatry are referred to as algiatrists™ [44].

3.4—Increased Presence of Pain Medicine Associations

The number of associations promoting pain medicine continues to grow throughout the world. Founded in 1973, the International Association for the Study of Pain (IASP) is the world's largest multidisciplinary organization focusing specifically on pain research and treatment. The IASP currently has more than 6,500 members from 114 countries and 74 chapters. The Association hosts the largest international pain conference, providing research grants and awards that facilitate international collaboration in advancing pain medicine. The global prominence of the IASP parallels the growing progress in the development of

pain medicine that has been achieved in several other countries. For example, pain medicine has already been officially designated as a medical specialty in Australia and China.

Although a number of countries have progressed beyond the United States in terms of pain medicine initiatives, American associations continue to forge ahead in the quest for a better pain care. The AAPM has been supporting patients and pain medicine clinicians by advocating for a balanced approach to the safe and effective treatment of pain, for policies that lead to improved pain training of all physicians, and for better funding of research on pain mechanisms and treatments. In recognition of the need for policies that support effective control of prescription drug abuse without harming the appropriate treatment of pain, AAPM collaborates with its members, other pain societies [45], and other public and nonprofit organizations [46–48] to establish programs and to educate the public in these matters. AAPM, taking the lead in the field of pain care ethics, has also provided to its members and the pain community at large, through its Council on Ethics, the "AAPM Ethics Charter," ethical guidelines that apply specifically to the practice of pain medicine [49,50] and are updated yearly.

The AAPM is a member of the PCC, which was founded in 1998 by the AAPM along with the American Pain Society (APS) and the American Headache Society, and was joined in 2004 by the American Society of Anesthesiologists. The PCC is a coalition of professional organizations committed to developing federal health care policy on behalf of persons with pain by addressing quality of care and access to care issues through legislative, regulatory, and research mechanisms. In response to the advocacy efforts of the PCC, Congress declared a "Decade of Pain Control and Research" beginning on January 1, 2001—this is only the second congressionally declared medical decade, after the Decade of the Brain, in the 1990s.

3.5—Research Funding, Pain Organizations, and Growth in Pain Publications

Research, technology, diagnosis, and treatment in pain medicine are paradoxically characterized at the same time by both important advancements and formidable barriers. Progress is evident in the steep increase in the number of peer-reviewed articles and publications in pain medicine, as well as organizations advocating for improvements in pain care [51,52] (refer to Figures 1 and 2, and Table 1).

In the face of entrenched barriers, the field of pain medicine is highly active, producing daily advances in not only research, diagnosis, and treatment, but also, very importantly, in pain care policy. For example, governmental entities, such as Medicare and Medicaid, are shifting their focus to evidence-based medicine and cost-effectiveness outcomes in order to determine priorities related to pain treatment. Congress is rapidly moving forward to address barriers in pain care through the National Pain Care Policy Act of 2009 (HR 756) [53]. The Bill would combat pain by 1) authorizing a Pain Consortium at the National

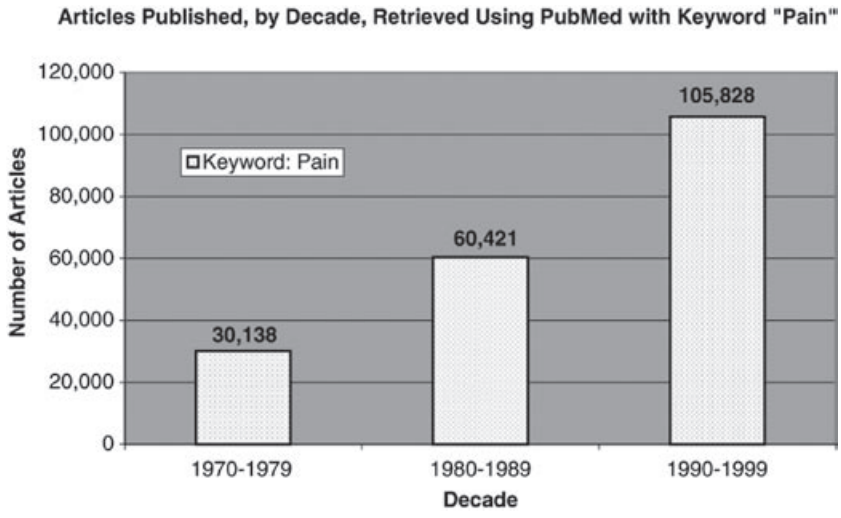

Figure 1 Peer-reviewed publications using the key word: pain. Source: [51].

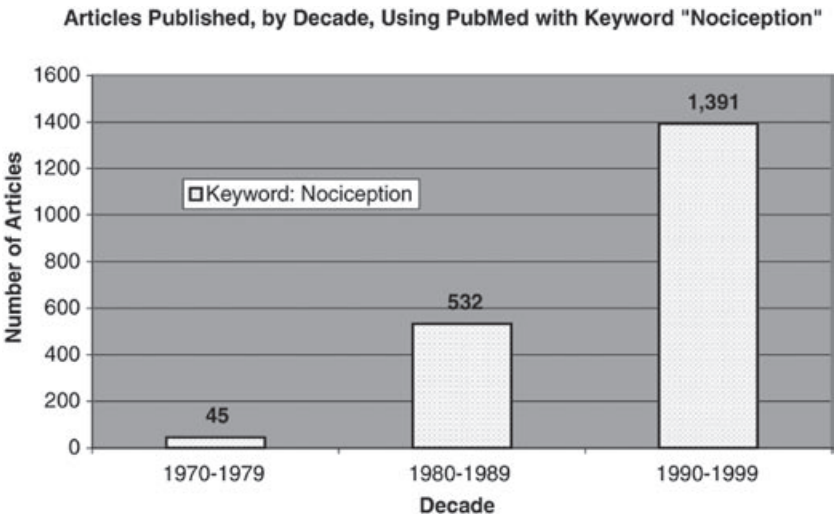

Figure 2 Peer-reviewed publications using the key word: nociception. Source: [51].

Table 1 Pain journals and related publications

Name	Year	Sponsor
Headache	1961	American Headache Society
Pain	1975	International Association for the Study of Pain
Cephalalgia	1981	International Headache Society
ABS Newsletter	1982	American Back Society
Journal of Pain and Palliative Care Pharmacotherapy	1985	Commercial
Clinical Journal of Pain	1985	American Academy of Pain Medicine
The Pain Clinic	1986	World Society of Pain Clinicians
Journal of Orofacial Pain	1986	U.S. Cancer Pain Relief Committee
Dolor	1986	Commercial
Journal of Orofascial Pain	1987	American Academy of Orofacial Pain
Der Schmertz	1987	(German)
Douleur et Analgesie	1988	(France) Commercial
Pain Practitioner	1990	American Academy of Pain Management
APS Bulletin	1990	American Pain Society
Pain Forum	1991	American Pain Society
Journal of Pharmaceutical Care in Pain and Symptom Control	1991	Commercial
Journal of Musculoskeletal Pain	1992	International Myopain Society
Revista De La Sociedad Española del Dolor	1993	Sociedad Española del Dolor
ISIS Newsletter	1994	International Spine Intervention Society
Pain Research and Management	1996	Canadian Pain Society
Reviews in Analgesia	1996	Commercial
European Journal of Pain	1997	European Federation of IASP
Current Pain and Headache Reports	1997	Commercial
Midwest Pain Society Update	1997	Midwest Pain Society
Le Journal La Ligue Belge Contre Les Céphalées	1997	Belgian Headache Society
Neuromodulation	1998	International Neuromodulation Society
Pain Reviews	1998	Commercial
Pain Physician	1999	American Society of Interventional Pain Physicians
Journal of Pain	2000	American Pain Society
Clinical Journal of Pain	2000	Eastern Pain Association
Pain Medicine	2000	American Academy of Pain Medicine
Pain Management Nursing	2000	American Society of Pain Nurses
Journal of Headache and Pain	2000	European Headache Federation
Practical Pain Management	2000	Commercial
Pain Practice	2001	World Institute of Pain
Journal of Pain and Palliative Care Pharmacotherapy	2002	Commercial
Topics in Pain Management	2003	Commercial
British Pain Society Newsletter	2003	British Pain Society
Seminars in Pain Medicine	2003	
Pain Europe	2003	
Pain Medicine News	2004	Commercial
Journal of Opioid Management	2005	Opioid Management Society
PainView	2005	American Society of Pain Educators
Neuropathic Pain and Symptom Palliation	2005	Commercial
Cancer Pain and Symptom Palliation	2005	Commercial

The increasing volume and complexity of knowledge and skills that need to be mastered as part of a comprehensive residency training program are often reflected in the growth of peer-reviewed literature and textbooks available in the field. Peer-reviewed content has grown steadily in the field of pain medicine for the past 50 years.

Institutes of Health (NIH), 2) providing comprehensive pain care education and training for health care professionals, 3) creating a national public awareness campaign on pain management, and 4) creating an Institute of Medicine Conference on pain management and research. The legislation is a reintroduction of HR 2994 [54], which was passed by the House of Representatives in the 110th Congress but was not voted on by the Senate before the inauguration of the 111th Congress in 2009. In addition, Congress passed and the President signed two laws that require both the Department of Defense and the Department of Veterans Affairs to establish substantial pain care programs at all levels of care and to support the necessary education and research to improve pain treatment for all wounded warriors. The Department of Veterans Affairs has established a separate Program Office for Pain Management to accomplish this task.

Ineffective pain treatment continues to be a growing problem in the United States. Yet, research to advance pain medicine remains grossly underfunded. Despite distinctive growth in 1) pain-related medical organizations, 2) peer-reviewed publications, and 3) the awareness of the specialized nature of pain medicine, public funding of pain research pales in comparison to the unmistakable need for an increased research activity. In fact, public funding for pain research is in a decline. In the wake of recent economic disasters in the financial and real estate sectors, this disturbing trend has only worsened.

Funding of pain medicine research has never kept pace with the magnitude of pain studies and publications, which continues to increase in the 21st century. A recent study of the NIH funding reveals an alarming, sharp decline in federal funding for pain research: the report found a decrease of more than 9% in NIH funding since 2003, a magnitude of decline significantly greater than that encountered by the majority of other medical specialties relative to NIH funding. The study, presented in the *Journal of Pain*, a publication of the APS, found that federal funding of pain medicine accounts for only 0.6% of all grants awarded, despite the high prevalence of chronic pain in the United States [55]. Both the APS and AAPM view the government's meager investment in pain research as seriously out of proportion with the widespread chronic pain incidence in our society, which accounts for more than 20% of all physician office visits and affects an estimated one in four Americans [56]. Many now attribute this inequity to the lack of a unified, consolidated effort on behalf of the specialty, without which this trend of underinvestment is likely to continue.

THE NATIONAL PAIN CARE POLICY ACT OF 2009

Brief Highlights

The Bill (HR 756) is designed to address significant barriers that can prevent the proper assessment, diagnosis, treatment, and management of pain. On March 30, 2009, the Bill was passed by the U.S. House of Representatives and will now be considered by the U.S. Senate.

The Bill calls for the establishment of an Institute of Medicine Conference on Pain Care to increase awareness and evaluate the current status of pain care. An action agenda would include improving pain care research, education, training, and clinical care, and identifying undertreated populations. These findings and recommendations would be reported to Congress.

HR 756 proposes an aggressive program of basic and clinical research, and establishes the coordination of all efforts within the Department of Health and Human Services. The Bill provides funding for programs to educate and train professionals in pain assessment and treatment [53].

Competition for limited research funds will intensify as the needs for improving economic conditions continue to increase. Untreated and undertreated pain is the nation's most pervasive health problem that is worsening as the population ages and accrues risk for pain-causing diseases and disorders. Pain research is the key to learning more about pain mechanisms and possible new treatments; however, it is difficult to make significant progress if pain studies continue to comprise just half of 1% of all NIH research grants [57,58].

PART FOUR

Threats to Patient Safety

4.1—Demand for Effective Pain Treatment Is Growing among U.S. Patients

According to a 2004 survey, at any given time, approximately one out of two Americans is in pain and one out of four has persistent or chronic pain [59]. The leading causes of recurrent or persistent pain affecting Americans are headache pain, back pain, and neck pain.

Data from the Agency for Healthcare Research and Quality estimate that in 2002, 26% of American adults had back pain and 14% had neck pain that limited normal function. In 2005, health care expenditures for spine problems totaled an estimated $85.9 billion, including spending for prescription drugs, surgery, outpatient, and emergency room care. In 2003, health care expenditures for arthritis totaled an estimated $81 billion [60]. Other alarming statistics include the following [61–65]:

- Twenty-six percent of Americans over 20 years of age experienced pain in the last month that persisted for more than 24 hours.
- Nearly 30% of U.S. adults report some joint pain in the last month.
- Fifteen percent of U.S. adults report having had a severe headache or migraine in the past 3 months.
- Almost half of all cancer patients have undertreated pain.
- About 3.8 billion hours of work are lost annually to pain.

4.2—Cost of Pain to American Business

Pain has been shown repeatedly to have a significant adverse effect on work and productivity. In a major study published in the *Journal of the American Medical Association* [63], it was found that 13% of the total workforce in the United States experienced a loss in productive time (a mean of 4.6 h/week) during a 2-week period due to a pain condition. Headaches, back pain, and arthritis were the most common conditions. This loss in productive time among active workers costs employers an estimated $61.2 billion per year. More than three-fourths of this lost productive time occurs in the form of reduced performance while employees are at work.

4.3—Physician Supply Fails to Meet Demand

There are not enough pain medicine specialists to treat the population of patients suffering with pain conditions today, and the supply of pain specialists is declining [66]. The American Board of Anesthesiology (ABA) has recently modified its standards of training for existing fellowship programs in pain medicine, attempting to provide pain training through specialties other than anesthesiology. However, the changes may have unintended adverse consequences. The addition of "non-anesthesia" rotations to the 12-month fellowship reduces fellows' exposure to interventional pain therapies that are important components of pain training and that require a significant time commitment in order to develop and perfect the complex skills demanded by these therapies. The addition of these rotations resulted in the inability of 20 existing anesthesia fellowship programs to meet the ABA requirements. Fewer programs, and possibly fewer trainees, mean that a growing population of patients with persistent pain, a number that has been estimated at up to 75 million [67] people in the United States alone, will rely on a more slowly growing and inadequately trained pool of pain medicine physicians. Moreover, it means that there may be fewer available opportunities in teaching hospitals to provide instruction in pain medicine to trainees from specialties other than anesthesiology. Within the 12-month fellowship, adequate exposure to the other contributors to pain science and practice, particularly with the rapidly growing and inevitably dominant focus on brain neuroscience in pain medicine, is necessarily meager, so that comprehensive training in the multidimensionality of pain mechanisms and treatment modalities is grossly inadequate.

At a time when we need more, not fewer, pain specialists, efforts to improve the breadth of current fellowship training by lengthening the duration of the fellowship, to 24 months for example, may be a

disincentive for medical students and physicians to enter pain medicine. The time required for training in a primary ABMS specialty followed by a prolonged fellowship training may be perceived as unacceptably long for students who need to pay back loans for medical education and raise families. Moreover, most of the present training of pain specialists, focused in anesthesia, does not provide adequate preparation for caring for the many millions of patients with persistent pain.

4.4—Quality of Training Is Insufficient

The current system for training physicians in the discipline of pain medicine leads to a fragmented, inefficient, and incomplete approach to pain medicine training in which no single physician trained in pain medicine possesses the full scope of medical training and knowledge that has become necessary in the modern treatment of pain conditions. The supply of knowledge that led to the development of pain medicine as a discipline several decades ago has since grown tremendously, making the current training paradigm outdated. As our knowledge and understanding of pain grow and become more sophisticated, so must our methods of training and preparing physicians for modern pain medicine practices. In practice, pain medicine is a discipline that is distinct from primary care and from any other existing specialty in the depth and complexity of knowledge and skills required to deliver competent care to patients with pain. However, current accredited training for physicians in the specialty is limited to a narrow subspecialty focus and is not of sufficient length to expose trainees to the breadth of knowledge and skills necessary to practice comprehensive pain medicine.

Most pain fellowships are administered through the Departments of Anesthesiology. The process for selecting fellows gives preference to those candidates who have completed anesthesiology residencies [68,69], and thus this process perpetuates the present situation in which the preponderance of fellowship-trained pain specialists are from anesthesia backgrounds. While this background provides excellent training in interventional approaches to pain management, training is minimal in clinical, diagnostic, and therapeutic neurosciences, which are increasingly central to understanding pain. Training in internal medicine—which includes subspecialties essential to developing the clinical reasoning and skills of chronic disease management that are the core of chronic pain care, such as geriatrics, rheumatology, and oncology—is also minimal, as it is in pediatrics, neurology, psychiatry, or physiatry. Conversely, graduates of most of the non-anesthesia and nonsurgical specialties who wish to pursue pain medicine as a career path (for which fellowship training is the only current means) lack foundational training in most of the interventional approaches that are essential to comprehensive pain medicine.

The current training paradigm is weak, and as a result, the discipline of pain medicine risks becoming increasingly unidimensional and increasingly irrelevant to the needs of the public. Patient safety may be compromised by the inadequate training of physicians and health care providers. Practitioners who "fill the gap" between patients who need expert pain medicine care and physicians who are trained to provide specialized pain medicine will almost certainly be underqualified. These practitioners will lack the requisite knowledge and skill sets to manage the broad spectrum of pain disorders safely and competently. Additionally, they will lack the skills, experience, and standing within the "system of care" necessary to coordinate the multidisciplinary treatment that many patients with persistent complex pain require. Frequently, those with unidimensional training provide unidimensional care. This exposes patients and society to the risk of excessive and unnecessary unimodal therapies, such as interventions or opioids.

4.5—Health Care Delivery of Pain Treatment Is Poor

Fragmentation of pain care is perpetuated by the consecutive, and even the concurrent, evaluation and management of complex pain disorders by multiple physicians with diverse training skills and competencies. As an individual case is parsed into various organ systems or disease states, each specialist views and describes the patient and the pain disorder from a unique specialty focus. Under the current system, multiple physicians may contribute to a patient's "pain management." Some have a limited focus or perhaps a limited repertoire of interventions or primary reliance on opioid prescribing, which, when applied alone or in a non-coordinated fashion, may be inadequate to effectively address persistent pain as a disease process and, when employed as the "sole" treatment, is associated with significant societal expense and treatment failure. Yet, none sees the patient as a whole human being with a particular disease problem. This fragmented, often sequential, approach will continue to lead to a major divergence of opinions regarding diagnosis and treatment, even when some form of integrated care is attempted via the pain

clinic. Such an approach leads to suboptimal patient care, significantly increases risk to patients, and fails to be cost-effective. This compartmentalized approach to patient care also makes it difficult to identify a single physician who is willing to assume the responsibility and to advocate for the patient's overall care. This situation is a function of the training system and is not inevitable; a change in the approach to pain medicine training will lead to a different approach to care in practice.

With the demographic shift in our society to an older population with multiple chronic conditions and comorbidities that are accompanied by pain increases, there is a strong need for physicians who have both specific expertise in pain medicine and broader training in the needs of an aging population. Formal training in the disciplines of palliative medicine and end-of-life care, and a myriad of health care settings, including long-term care and hospice, is a necessity for a credible pain specialist. The current training model is deficient in this regard.

Poor quality in the delivery of pain medicine also has a larger societal impact. The effect of suboptimal pain treatment in one institution initiates a broad ripple effect on people and policies. Poor delivery of pain medicine leads to escalating costs for care, causing regulators to take notice of the current systems. For example, a variety of agencies within the federal government, including the Centers for Medicare and Medicaid Services, the Social Security Administration, and the Institute of Medicine, have prioritized the escalating costs of treating pain and the effectiveness of the current training system for physicians within their research and policy initiatives. Regulatory groups such as The Joint Commission and large health systems such as those administered by the Departments of Veterans Affairs and Defense have also taken notice of the costs of inadequate pain care and of advances in pain medicine, and have begun to adapt their own policies and procedures to accommodate new standards of care in the pain medicine discipline.

4.6—Failure to Adequately Treat Pain Results in an Escalation of Medical Problems

It is important to recognize that persistent, intractable pain problems, irrespective of their pathological basis, are almost invariably associated with epiphenomena or comorbidities. Secondary musculoskeletal changes in the form of atrophy, contractures, and postural aberrations become pain generators in themselves. Emotional and spiritual changes become manifest by alterations in behavior and mood. Depression, anger, anxiety, fear, and suicidal ideation are commonly seen in such pain problems. In fact, persistent pain may be viewed as a fatal disease because of its association with suicide and accidents [70]. Socioeconomic consequences secondary to prolonged dysfunction and disability include disruption of social bonds, impairment in activities of daily living, unemployment, and invalidism.

4.7—Lack of a National Standard for Training and Board Certification Allows Too Much Influence from Market Pressures and External Regulatory Forces

The discipline of pain medicine has reached a point in its development at which the interest in being identified as a specialist is so high that there is now competition for control over pain medicine training, accreditation, and certification processes. Many organizations exist, and standardization among organizations is variable. Important differences in certification and credentialing are confusing for patients, elements of the health care community, payers, and the legal system, and do little to improve the perception of unity of Pain medicine in the training of medical students, fellows, and specialists.

Without the recognition of pain medicine by the ABMS as a primary medical specialty and the development of ACGME-accredited residency programs, wide-reaching policy changes can be driven almost exclusively by market pressure and external regulatory forces [71]. Market pressure may be positive, resulting in better overall quality of care or improved reimbursement for some therapies, such as evidence-based interventional procedures, or negative, resulting in barriers to coordinated complementary care or lower reimbursement for proven therapies, such as pharmacologic therapy, cognitive–behavioral procedures, and integrated, intensive rehabilitation. Either way, pain medicine will not have the benefit of organized, coordinated, and physician-controlled oversight. The result will be further fragmentation and segregation of training, inefficient use of resources, and suboptimal quality of care.

PART FIVE

Recommendations

5.1—Establish Pain Medicine as a Primary Medical Specialty

Pain medicine is at present practiced mainly as a subspecialty—a subspecialty with no single, most appropriate parent specialty. One of the key steps in the pathway to better training, research, and treatment of pain is the recognition of pain medicine as a primary specialty of medicine.

Relative to other medical specialties, pain medicine is a "late comer." The other disciplines of medicine evolved earlier around diseases of specific organ systems or patient populations. Many were differentiated from parent specialties within the larger spheres of general medicine and surgery; as each developed primary specialty status, a definition of that specialty's intellectual and clinical knowledge, scope of practice, and standards of training and practice began to emerge.

Pain medicine's specialized knowledge, education, training, and multidisciplinary approach suggests that the evolution of pain medicine from a medical discipline to a primary medical specialty may parallel that of emergency medicine. Prior to the development of the emergency medicine as a specialty, patients arriving in an emergency department were seen by a succession of different specialists. Patients were literally divided among various specialists focusing on organs or systems relevant to their medical specialties, while disagreeing about priorities of care. Such fragmentation of care—focused on treating specific organs or systems rather than people—was less than ideal, although the medical profession was slow to recognize such difficulties.

BACKGROUND ON MEDICAL SPECIALTIES

The ABMS describes a medical specialty as "a defined area of medical practice, which connotes special knowledge and ability resulting from specialized effort and training in the special field" [72].

There are 25 approved medical specialties recognized in the United States. Pain medicine is not among these recognized specialties. Instead, the discipline of pain medicine is recognized as a subspecialty of anesthesiology, physical medicine and rehabilitation, neurology, and psychiatry, which are recognized as primary specialties in the United States. Board certification in these 25 specialties is carried out by member boards of the ABMS. For clarification throughout this document between the terms "primary specialty," "specialty," "subspecialty," "field of," and "area of," *pain medicine* will be acknowledged and referred to as the "Discipline of Pain Medicine."

The specialty of emergency medicine eventually became established and recognized, and in most hospitals, patients are now seen by emergency physicians who provide an integrated approach. The patient's multiple diverse problems are identified, the patient is stabilized, and priorities of care are established. The emergency physician does rely on other specialties with their greater scope of knowledge of particular pathological conditions and refers the patient to a number of specialists if necessary. The care provided by different specialists from the disciplines of general surgery, radiology, orthopedics, plastic surgery, dermatology, and cardiology, among many others, is coordinated by the emergency physician until an appropriate discipline is identified. Should the patient require hospital admission, the patient's care is transferred to a specific specialty service or a hospitalist, who in turn may consult with additional specialists. The realization of an integrated, comprehensive, and eclectic approach in the field of emergency medicine may serve as an analogy for a new model of pain care.

5.2—Develop a Dedicated Residency Program for Pain Medicine

As contended in section 4.4 of this paper, the current system of training consists of a fragmented, inefficient, and incomplete approach to pain medicine training in which no single physician trained in pain medicine possesses the full scope of medical training and knowledge that has become necessary in the modern treatment of pain conditions. At one point, this compartmentalized approach may have been suf-

ficient, but it is not any longer; as our knowledge and understanding of pain grow and become more sophisticated, so must our methods of training and preparing physicians for modern pain medicine practices.

Several major flaws exist in current training paradigms that require that a medical student complete full residency training in an ABMS-recognized specialty and then complete an appended 1-year fellowship. First, as noted previously, most pain management fellowships are anesthesia-based, which means that most pain medicine physicians will have a decidedly anesthesia-based practice focus. In many or most cases, this means the practitioner will focus on interventional pain therapies, such as injections, to the relative exclusion of the general chronic-disease management skills and the numerous other proven modalities of pain care that might be appropriate for the management of a given patient.

Second, it is unreasonable to expect that physicians coming from such diverse parent specialties as anesthesia, neurology, psychiatry, and pain medicine and rehabilitation (PM&R)—the current sponsors of ACGME-accredited pain training—can all be funneled into 1-year pain fellowships and emerge equally competent in pain care. Much time spent during the 1-year fellowship must focus simply on bringing each of those diverse trainees up to a uniform level of knowledge and skills before delving into the intricacies of pain care. This renders impractical or impossible the goal of true pain medicine training, which is to provide the trainee with knowledge of the full breadth and depth of pain care modalities. Yet, efforts to improve the comprehensiveness of current pain training by lengthening the duration of fellowship training may be counterproductive to the needs of the discipline—which needs more, not fewer specialists—by increasing the overall duration of training (4–6 years for an ABMS-recognized specialty residency, plus 2 years for a pain fellowship) to a point at which medical students find the duration of training unacceptable despite the rewards of practice in the field.

Third, the current system is grossly inefficient. Most or much of the time spent in the primary ABMS specialty training that is required currently as a prerequisite to pain fellowship is ultimately irrelevant to the practice of pain medicine. This view is reinforced by the results of a recent survey of physicians active in the practice of pain medicine, developed by Michael Whitworth, MD, and Kenneth Follett, MD, PhD, for use by the Pain Medicine Residency Review Committee (M. Whitworth, electronic comm., January 2008). Results of this 2008 survey show that 40% or more of respondents indicated that they believe that their residency training had failed to provide "good training" in the following critical areas of pain medicine:

- Psychosocial aspects of pain.
- Psychiatric/psychological/behavioral aspects of pain.
- Addiction medicine.
- Hospice and palliative care.
- Medicolegal aspects of care.
- Ethical issues in pain care.
- Organization and management of a pain center.
- Pathophysiology and clinical aspects of a wide range of pain conditions.
- Use of pain assessment tools.
- Diagnosis and management of rheumatological disorders.
- Mental status examinations.
- Diagnosis and management of cancer pain.
- Interpretation of diagnostic studies.
- Physical medicine and rehabilitation.
- Psychiatric/psychological therapies.
- Multidisciplinary medicine.
- Complementary and alternate therapies.
- Implantable pain techniques.

Time within a new training program could be better spent focusing on pain training, providing more comprehensive and uniform training in a shorter length of time than is possible under the current approach. This can be accomplished by developing dedicated pain medicine residency training programs.

Dedicated residency programs in pain medicine would follow a curriculum, developed and published by the ABPM, that would provide trainees with the full spectrum of knowledge and skills needed to prac-

tice pain medicine. Additionally, a pain medicine residency program would accomplish this training in a duration of time shorter than that which is obligatory under the current ACGME-accredited approach to pain training, a program that requires completion of residency training in an ABMS-recognized specialty followed by an add-on fellowship [73,74]. Specialty training in pain medicine would be acquired either through a comprehensive 48-month full-time training program for those entering pain medicine following graduation from an accredited medical school in the United States or Canada, or through a transitional pathway for those entering pain medicine following training in another medical specialty.

Programs would offer a multidisciplinary curriculum. To ensure adequate multidisciplinary training, collaborative relationships with other disciplines and programs that contribute to pain care would be maintained.

Pain medicine residency programs would instead train physicians to treat the most complex pain conditions, assuring competence in the biopsychosocial "whole person" perspective and the development of the interdisciplinary approach to pain care that is so lacking in today's treatment environment. Accreditation of pain medicine residency programs by the ACGME, therefore, is vital to the continued development of this specialty and to ensuring the highest standard of care and protection for patients seeking pain medicine services, as well as to developing a system of care that meets the needs of society.

5.3—Provide Comprehensive Integrated Delivery of Pain Care

As health care systems attempted to treat pain more systematically, new models of organization emerged based on innovations in the specialized delivery of pain medicine. In the 1960s, John Bonica, MD, first organized coordinated care provided by different disciplines in his multidisciplinary pain clinic at the University of Washington. Eventually, such multidisciplinary clinics flourished in the United States. However, the entrenchment of managed care did not afford chronic-disease management with an incentive to improve long-term outcomes—such as return to work. In the wake of the resulting managed care imbalances in health care delivery, much of the multidisciplinary approach to pain treatment was eliminated, which led to the near collapse of multidisciplinary pain clinics. A new model of more efficient collaborative care—the "pain medicine and primary care community rehabilitation model" [75–77]—combines the efforts of the primary care provider, other community resources, including the patient and their family, and the pain medicine specialist, who embodies the knowledge and skills of the multispecialty team that Bonica envisioned. Although the benefits of a multidisciplinary approach to treating pain are now much more widely accepted, pain treatment in practice remains far too fragmented. Primary care physicians, as documented by recent publications focusing on the Veterans Affairs' system pain care initiatives [78,79], are often unwilling to treat chronic pain conditions and tend to ignore them. They are often confused about where to turn for help and advice relative to pain care, which creates a void around pain treatment that places primary care physicians in difficult positions. Anesthesiologists, psychiatrists, oncologists, and other specialists who treat pain generally are still not communicating well enough or working together often enough.

The consecutive or even concurrent evaluation and management of complex pain disorders by multiple physicians lead to fragmentation of medical care, poor outcomes, and higher costs. Divergence of opinions regarding the diagnosis and treatment can also occur that contributes to a less-than-ideal care that is not cost-effective, which perpetuates the passing of patients from physician to physician. Several models of pain medicine are summarized in Table 2 and Figures 3–6.

The Present Model

This model depicts the evolution of the specialty of algiatry over the past several decades. Until about the mid-1900s, pain management, consisting mostly of the treatment of eudynia, was in the hands of physicians dealing primarily with the injury or disease of a specific organ system causing pain (Stage I). In the next several decades, the multidisciplinary approach to pain management became popular, which led to the emergence of anesthesiologists, neurosurgeons, physiatrists, neurologists, and psychiatrists subspecializing in pain management (Stage II). The focus was on the management of pain from the vantage point of the particular competence of the treating physician. However, this introduced considerable variation and fragmentation of care. With the advance of scientific knowledge in the last 2–3 decades, the recognition of maldynia, and the development of a precise and rapidly expanding body of knowledge, a new specialty of pain medicine emerged, the specialty of algiatry (Stage III). Algiatry focuses on the

CURRENT STRATIFICATION OF PAIN MANAGEMENT (see Figure 3)

In asking the question "Who should treat pain disorders?" the simple answer is "The one who is most competent." The most competent provider in any given care situation can vary, however, depending upon any number of factors, including training, education, type of pain disorder, comorbidities, venue, and physician availability, not to mention numerous sociological and financial considerations. The following model, which reflects the present situation, sets forth three pain management domains: primary, secondary, and tertiary.

Primary Domain. Pain is ubiquitous and an ever-present companion of most illnesses. It is the single most common reason for patients to seek medical care. Pain disorders in this domain are short lived and perhaps self-remitting, and will generally be classified as eudynia. The proper medical response includes symptom palliation and the diagnosis and treatment of the primary underlying somatic problem. This primary stage is the domain of the primary treating physician and encompasses most pain disorders ("Primary Care" in Figure 3).

Secondary Domain. Pain at this stage is more persistent and can be intractable. The pain is associated with an underlying chronic-disease process such as cancer, AIDS, or sickle cell anemia. Usually the pain can be characterized as eudynia, but sometimes the transition to maldynia may be present. Management of these pain problems is somewhat more complex and requires various modalities of intervention, including pharmacologic, physical, behavioral, and surgical interventions. This secondary stage is the domain of the pain management subspecialist who is primarily trained in another discipline, such as neurology, psychiatry, PM&R, anesthesiology, or oncology, and acquires an interest in pain care as an outgrowth of clinical encounters ("Sub-Specialty" in Figure 3).

Tertiary Domain. The pain disorder at this stage is invariably persistent and intractable, complex, and confounding. It almost invariably qualifies as maldynia, although there may be elements of eudynia present as well. Management requires an eclectic, unified, and comprehensive approach, and frequently calls for interdisciplinary treatment. The tertiary stage is the primary domain of the specialist in pain medicine [80] ("Algiatry" in Figure 3).

Table 2 Organizational models in pain medicine

Model	Description and Outcomes
Sequential Care model	• Patients are referred from one expert to another, as each seeks to identify and treat a pain generator according to his/her specialty training. • The process takes many months and accrues high costs. • No provider attends to controlling the patients' pain during this process, allowing the progression of the neuropathophysiologic and psychosocial pathologies of chronic pain, such as sensitization, depression, and disability. • Outcomes are poor, medical, and societal costs are very high.
Multidisciplinary Pain Center model	• Patients fail the Sequential Care model so that the chronic disease of pain and its complications are established. • They require a specialized center, usually far from home, where they receive expert treatment from a variety of specialists. • Costs are very high, so very few centers exist, and delays of approval worsen clinical conditions. • Outcomes are usually good (return to work and function), but patients are sent home without expert follow-up, increasing risk of relapse. • Long-term outcomes are determined by the availability of expert follow-up treatment.
Managed Care model	• Patients are denied referral to specialized pain medicine centers. • Behavioral and physical therapies are "carved out" to nonexpert psychologist and physical therapists whose efforts are not coordinated with the pain medicine specialist. • Procedures that pay well and take little time are emphasized in clinical practice. • Medical management consists of polypharmacy without chronic-disease management. • Patients often deteriorate, losing jobs and insurance, depending on public assistance for their income and treatment. • Collectively, patients increase the tax burden on society and the longitudinal costs of hospitals and clinical care, straining the system.
Pain Medicine and Primary Care Community Rehabilitation model	• Evidence-based clinical care algorithms for specific pain diseases/disorders guide evaluation and management for primary care providers (PCPs). • Responsibility for outcomes is shared among PCPs, patient, family, and pain medicine specialist. • Easy, timely access is provided to pain medicine physicians for consultation and referral. • Pain medicine specialists support care algorithms and coordinate treatment for complex cases. • Early referrals lower the risk of developing chronic pain disease and its complications. • The system has the capacity to monitor patient outcomes through PCPs. • The system coordinates longitudinal care among PCPs, physical therapy, behavioral, mental health, and community support and resources. • Lower total costs, fewer hidden costs.

Source: [51].

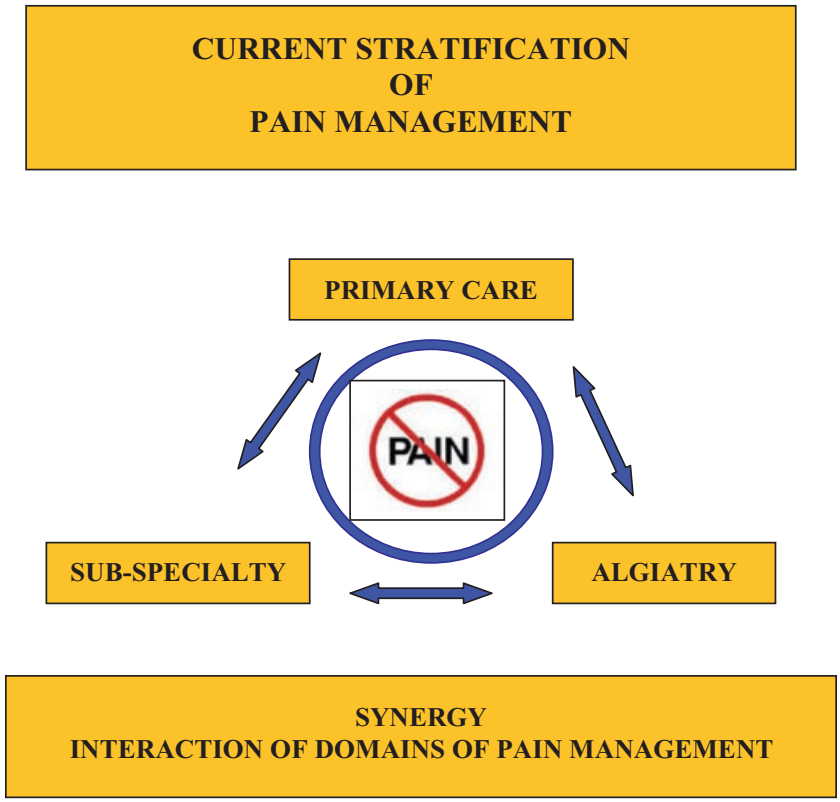

Figure 3 Current stratification of pain management. Source: [81].

comprehensive evaluation and multimodal care of complex pain problems, generally persistent eudynia and maldynia, in a coherent and comprehensive manner.

The irony of this evolutionary process is that a new specialty (algiatry) emerged from several diverse subspecialties of pain management—a process of fusion. This is contrary to the usual developmental process wherein new subspecialties emerge from an established specialty—a process of fission (Figure 4).

The Future Model

This model depicts the conceptual development of physicians specializing and subspecializing in pain medicine or algiatry. It is congruent with the well-established developmental schema of the medical profession wherein specialties emerge from areas of primary care, and subspecialties emerge from specialties.

As it relates to pain care, patients would initially consult a primary care physician for evaluation and management (Stage I). If the problem cannot be adequately resolved, the patient would be referred to secondary medical care or a specialist (Stage II). If the pain problem is acute or clearly related to an organ system or disease process (eudynia), then referral most likely would be to a specialist in the appropriate field (Stage IIa, Path 1). If that specialist deems that the pain problem is beyond the competence or scope of his/her practice because of complexity or persistence, the patient would be referred to a pain medicine specialist or algiatrist (Stage IIb, Path 2). However, if the primary care physician recognizes that the pain problem is complex, persistent, and a primary complaint, such as maldynia, the patient would be referred directly to the algiatrist (Stage IIb, Path 4). Finally, if the algiatrist deems that the patient is in need of specialized pain care, such as neurosurgical invasive treatment or pediatric pain care, a referral would be made to an appropriate subspecialist in algiatry at the tertiary level (Stage III, Path 3) (Figure 5).

Evidence-Based Continuum of Care, 2020

The future model of pain management will provide timely, expert care at different levels depending on complexity, evidence basis, and need. The specialty of pain medicine will help direct the research and evidence-based training and education that determine the care at all levels, much like cardiovascular care,

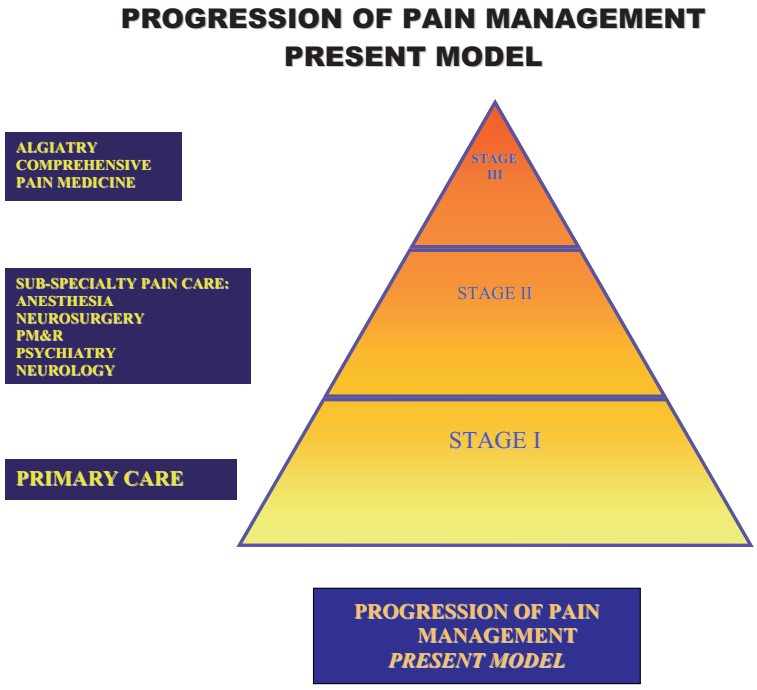

Figure 4 Progression of pain management: present model (PM Lippe, MD, electronic comm., March 2009). Specialty = a defined area of medical practice that connotes special knowledge and ability resulting from an advanced effort and training in the specialty field. A unique core knowledge. Sub-Specialty = an identifiable component of a specialty, focusing on a specific segment of the primary specialty. The core knowledge of primary specialty is linked. PM&R = pain medicine and rehabilitation.

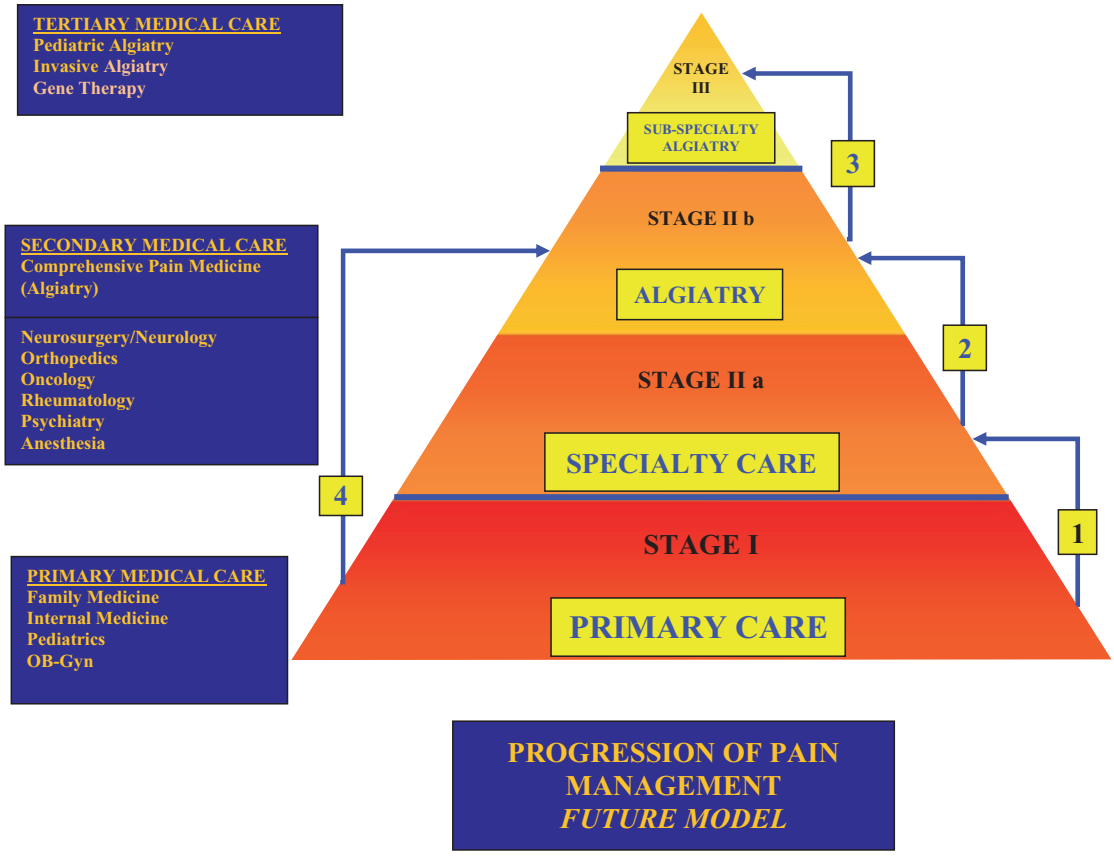

Figure 5 Progression of pain management: future model (PM Lippe, MD, electronic comm., March 2009). Specialty = a defined area of medical practice that connotes special knowledge and ability resulting from an advanced effort and training in the specialty field. A unique core knowledge. Sub-Specialty = an identifiable component of a specialty, focusing on a specific segment of the primary specialty. The core knowledge of primary specialty is linked.

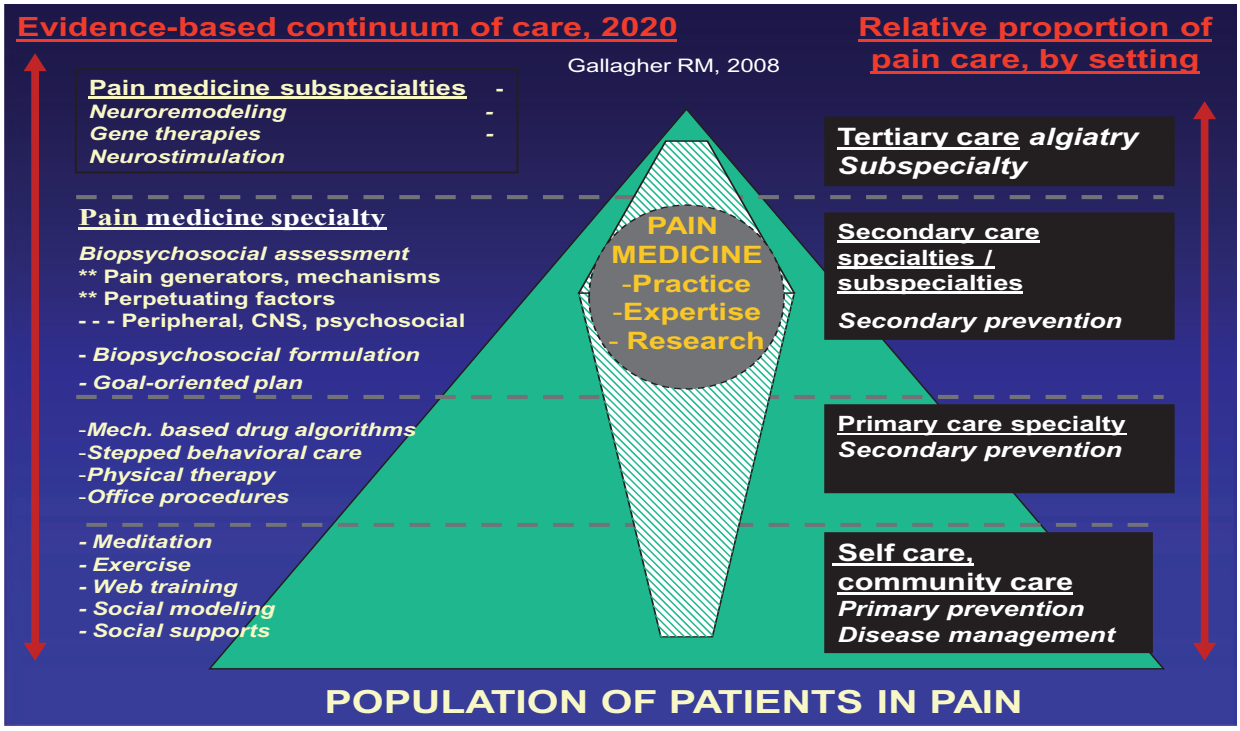

Figure 6 Population of patients in pain. Source: [82]. CNS = central nervous system.

which starts with evidence-based self-management to reduce risk (e.g., diet, exercise, and cessation of smoking) for the primary prevention of disease and then progresses to primary care, specialty care, and subspecialty care. Other specialists will continue caring for uncomplicated cases of pain involving their organ system, whereas cases of increasing chronicity and complexity will engage specialty and subspecialty pain medicine. The key to success of this model is timely access to levels of care to prevent chronicity or, when chronicity occurs, minimizing morbidity through effective care (Figure 6) [51].

PART SIX

Overcoming Barriers

The unusual evolution of the discipline of pain medicine, which began as a series of subspecialties and has grown in breadth, depth, and complexity to the level of primary specialty, has encountered political and economic barriers that have slowed its maturation. In fact, surprisingly, the physicians and organizations responsible for the accreditation and certification of a specialty medicine have been the slowest segments of the health care system to implement changes in their structures and policies to accommodate advances in this discipline. Access to pain treatment is uneven in our society, depending on the race, gender, and socioeconomic status of the patient, as well as on the education and training of the physician [83–87]. Despite medicine's traditional mandate ". . . to relieve often, to comfort always," physicians often harbor mistaken or negative attitudes about treating pain [88–90]. Reimbursement for pain-relieving treatments is often refused by insurance payers, and access to comprehensive and interdisciplinary pain rehabilitation is almost nonexistent in many areas of the United States. There continues to be an inadequate access to pain care despite compelling data to support the effectiveness of comprehensive pain care (in comparison with conventional medical care) in reducing pain, restoring function, and returning injured persons to work [78,91–94]. Access to reimbursement for individualized care related to pain and pain-related drug abuse is also inadequate [95,96]. Unnecessary barriers to treatment impose needless suffering on patients and their loved ones, and shift the financial burden of disability from the health insurance sector to businesses and taxpayers.

Recent actions by regulators, major health care organizations, courts, and legislatures suggest that society is increasingly intolerant of organized medicine's inattention to pain and suffering [45,53,97]. The Veterans Affairs' medical system was the first large-scale system to respond to this trend by designating pain as the "fifth vital sign" in all its hospitals [97], and more recently, by developing a Program Office of Pain Management separate from other specialty offices (e.g., anesthesiology, neurology, and mental health) to assure an appropriate focus on providing effective pain management of veterans in all clinical settings as well as a detailed plan for implementing a population-based stepped-care approach to pain care [98]. The Joint Commission followed the Veterans Affairs' lead by designating pain as the "fifth vital sign" and by requiring health care institutions to provide organized pain assessment and management.

Although pain and suffering abound throughout the United States, an incomparable reservoir of resources is available to adequately train physicians on the problem of pain. Yet, the United States lags behind several countries in implementing a comprehensive, integrated, and unified approach to pain care. Pain medicine has already been officially adopted as a medical specialty in Australia and China; the European Union and Canada are also considering such a development. In the United States, however, recognition of pain medicine as a primary medical specialty is impeded by formidable institutional and social barriers. These entrenched obstacles prevent common sense change that could begin the development of an integrated delivery of pain care, augmented by growing numbers of specially trained experts in pain treatment. Fortunately, considerable forces appear to be converging at a nexus for the advancement of pain medicine: 1) the historic path of this discipline; 2) the advances in technology, diagnosis, and treatment; 3) the unmet patient needs; and 4) the natural momentum in the evolution of pain medicine—the current, collective force of these components may lead to an elevated, unified, humanistic approach to the problem of pain. Overcoming the barriers to change in the discipline of pain medicine must begin with appreciating the magnitude of the problem, recognizing the need for optimizing our resources, and reinvigorating our commitment to the patient's and public's interests for the delivery of a safe, effective, and affordable pain treatment.

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