

THE EVOLUTION OF INTERVENTIONAL PAIN MANAGEMENT

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Interventional pain management dates back to the origins of neural blockade and regional analgesia. Over the years, it evolved into a distinct specialty with the application of interventional techniques beyond those of simple neural blockade. The first therapeutic nerve block in pain management was described in 1899 by Tuffer. Subsequently, numerous techniques of interventional pain management with neural blockade were de-

scribed. Diagnostic blockade in pain management was pioneered by von Gaza with the use of procaine for determining the pathways of obscure pain. Interventional pain management has entered into the modern era in the twenty-first century, driven by contributions from pioneers including Bonica, Winnie, Raj, Racz, Bogduk, and others.

This historical review examines the origins of interventional pain management,

its pathophysiologic basis, the role of precision diagnostic interventional techniques, therapeutic interventional techniques, and the future of interventional pain management.

Keywords: Interventional pain management, evolution, regional anesthesia, neural blockade, precision diagnostic interventional techniques, therapeutic interventional techniques, future

Albert Schweitzer, the humanitarian, physician, and Nobel laureate in 1931, elegantly described the nature of pain and the obligation and privilege of the physician and other healthcare professionals to relieve it (1). He eloquently stated, "We must all die. But that I can save him from days of torture, that is what I feel is my great and ever new privilege. Pain is a more terrible lord of mankind than even death itself." Today, proper management of pain remains one of the most important and pressing issues of society in general and the scientific community and the health professions in particular (2). Many have described the concept and treatment of pain from primitive times to recent advances in pain research and therapy, along with goals for improving the management of chronic persistent pain (2-9).

As history repeats itself, pain has been a major concern of mankind since our beginnings, and it has been the object of continual efforts to understand and control it. Fulop-Mueller (4) described pain as being even older than mankind, as pain is inherent in any life linked with consciousness. According to a World

Health Organization study, 22% of primary care patients reported persistent pain (10). Harstall (11) noted that the prevalence of chronic pain ranges from 10% to 55%, in a review he made of 13 studies published between 1991 and 2002. Seven other studies (10, 12-17) using the International Association for the Study of Pain (18) definition of chronic pain, reported a prevalence of 11.5% to 55.2%. Chronic widespread pain has been reported to range from 10.1% to 13% (19-21), utilizing the American College of Rheumatology definition of chronic widespread pain (22). The prevalence of chronic pain in the elderly has been reported to be 23.7% to 50.2% (17, 23). Schnitzer (24) found that in the United States alone, 75 million adults experience chronic pain. In modern times, chronic pain not only continues to be an epidemic but is coupled with claims of inadequate treatment (10-17, 19-58). Chronic pain affects people from all walks of life, including men and women of all ages, working and non-working, from all countries, physically fit and disabled, suffering all types of injuries, working in every occupation, with or without psychological problems, and with or without drug abuse (10-17, 19-58). The social and economic impact of chronic pain on society is enormous (59-69).

There has been a growing scientific interest in pain over the past several decades. The field of pain management has undergone a revolution, particularly in the last 40 years. The understanding

of pain has moved forward, occasionally with leaps and bounds, from Descartes' early conceptions of the pain pathway to Melzack and Wall's gate control theory (8, 70). Advances have been made by basic scientists and clinical researchers alike, representing numerous disciplines -- including anesthesiology, surgery, rehabilitation, epidemiology, nursing and psychology -- making immense contributions (71). Despite the advances (8, 72, 73), even in 2003, our understanding of pain, and its diagnosis and treatment, remains cursory at best.

Over the years, pain management has taken on many forms. Chronic pain has been recognized as not only a multifactorial disorder with many possible etiologies, but also as a multidimensional problem with sensory and affective components. The father of the field of pain management as we know it today, was John Bonica who tirelessly pioneered the development of the multidisciplinary concept of pain research and treatment from the end of World War II until his death in 1994 (74).

The biopsychosocial model, which emerged in the 1980s, views chronic pain as a biopsychosocial phenomenon, in which biological, psychological, and social factors dynamically interact with each other. In the 1990s, functional rehabilitation emerged as the dominant mode of therapy in chronic spinal pain. Thus, the approach to pain management currently includes psychological, behavioral, functional, and interventional pain therapies.

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Funding: There was no external funding in preparation of this manuscript.

HISTORICAL CONSIDERATIONS

Interventional pain management dates back to the origins of neural blockade and regional analgesia. Fundamental to modern neural blockade and interventional techniques is the concept that pain is a sensory warning conveyed by specific nerve fibers, amenable, in principle, to modulation or interruption anywhere in the nerve's pathway. The concepts of neural blockade and interventional techniques are founded on the structural basis of chronic pain.

The origins of neural blockade and regional anesthesia date back to September 15, 1884, when Koller (a colleague of Sigmund Freud) reported the numbing effect of cocaine on the tongue (74). This observation took the world by storm. By the year's end, cocaine was used to provide effective local anesthesia for ophthalmology, urology, and general surgery. In 1899, Tuffer (75) described a therapeutic nerve block in pain management, using spinal cocaine to control pain from sarcoma of the leg. Further progress was advanced when Cushing (76) described pain relief with nerve blocks, caudal epidural injections were described in 1901 (77-79); trigeminal alcohol blockade was reported by Schloesser (80) in 1903; and by a rapidly growing list of interventional techniques (81-141).

Diagnostic blockade in pain management was pioneered when von Gaza (142) used procaine for determining the pathways of obscure pain (sympathetic or sensory). Following this, White (143) in 1930, and Steindler and Luck (144) in 1938, described applications for diagnostic interventional techniques.

The futility of treating pain without localizing the pain generator prompted Steindler and Luck (144) to employ procaine hydrochloride injections for identifying specific sources of pain in low back pain disorders. The application of clinical anatomy and an appreciation of the structural basis of spinal pain revolutionized diagnostic interventional techniques.

Recent advances in our understanding of key principles of clinical anatomy of the spine, particularly for interventionalists, are credited to Bogduk and others (145-159).

DIAGNOSTIC INTERVENTIONAL TECHNIQUES

A recent review of diagnostic interventional techniques for the spine (33) provided strong evidence of the value of facet joint blocks for diagnosis of facet

joint pain and lumbar provocative discography for discogenic pain. The review also showed moderate evidence for sacroiliac joint blocks in the diagnosis of sacroiliac joint pain and for transforaminal epidural injections in the preoperative evaluation of patients with negative or inconclusive imaging studies, but with clinical findings of nerve root irritation.

The emerging popularity of neural blockade as a diagnostic tool in painful conditions is due to several factors. Hogan and Abram (160) described several challenging clinical situations, including the characteristics of chronic spinal pain, which are purely subjective, inexactly defined clinically and uncertain pathophysiology. Precision diagnostic blocks are used to clarify these challenging clinical situations to determine the pathophysiology of clinical pain, the site of nociception, and the pathway of afferent neural signals.

Pivotal to the proper management of chronic pain is the ability to pinpoint an anatomical or structural diagnosis and identify one or more pain generators. Deyo and Weinstein (161) reported that precise anatomical diagnosis was elusive in low back pain and that diagnostic evaluation is often frustrating for physicians and patients. They showed that the history, physical examination, and imaging provide limited information (162). Others have shown that, for purposes of pinpointing an anatomical diagnosis, physical examination is neither reliable nor valid (163). It is often cited that a cause cannot be determined in 85% of patients with low back pain (161, 162, 164-166) or, conversely, that a diagnosis is possible in only some 10% to 15% of cases (166-168). No technique of physical examination has sufficient reliability and validity to allow a pathophysiologic diagnosis to be made (164, 166). Radiographic investigations, including magnetic resonance imaging (MRI), identify only a limited number of conditions with certainty (164).

As early as 1938, Steindler and Luck (144) recommended stringent fulfillment of five criteria to establish a causal connection between local pain and radiation of pain unrelated to direct nerve root compression. These principles of provocation-analgesic response have been integrated into the diagnostic armamentarium of the spinal interventionalist, serving to identify pain generators in the spine. Hirsch (169) in 1948 was the first to use this principle in localizing pain to lumbar

discs in subjects with back pain. Lindblom et al (170, 171) described concordant pain provocation with saline discal distention and no secondary disc damage on intraoperative disc injections. In the late 1950s, Smith and Nichols (172) and Cloward (173) developed cervical disc injection techniques for evaluating patients with cervical cephalgia and shoulder-girdle pain. Since then, the use of discography has fluctuated as a primary investigative measure for discogenic pain to its abolition and then re-emergence in diagnosing discogenic pain and internal disc disruption (174). In 1971, Mac nab et al (175) evaluated the value of diagnostic selective nerve root blocks in the preoperative evaluation of patients with non-diagnostic imaging studies and radicular symptoms. Since then, numerous developments in diagnostic interventional techniques in spinal pain (30) and other painful conditions have emerged (160). The International Association for the Study of Pain has developed standards for performing diagnostic blocks (176).

In the 1990s, new precision diagnostic tests were developed, and old ones refined, evaluated, and implemented. Thus, with the use of appropriate tests, a diagnosis of chronic spinal pain can be made in at least 50% of cases and perhaps in as many as 70% of cases (33, 146, 177-180). These precision diagnostic techniques include facet or zygapophysial joint blocks, provocative discography, and sacroiliac joint blocks.

Central to the understanding of the structural basis of chronic spinal pain is obtaining a physical diagnosis and validation of patient symptomatology whenever it is feasible rather than discounting emotional involvement. This improved diagnostic precision will remove many of the terms utilized in the past such as "psychogenic," "somatizing," "hysterical," and more recently, "medically unexplained," to describe many pain problems which heretofore have not been amenable to diagnosis. From the beginning, it has been proposed that all controlled blocks ideally should include placebo injections of normal saline. However, modern developments have shown that it may be neither logistical nor ethical to use placebo injections of normal saline in conventional medical practice in each and every patient. Thus, an alternative technique -- the use of comparative local anesthetic blocks on two separate occasions during which the same structure is anesthetized using two local anesthetics

with different durations of actions -- has been proposed (181-183). The use of comparative local anesthetic blocks with facet joint injections has been validated and found to be reliable against challenges with placebos (184, 185).

Hildebrandt (186) published an extensive review on the relevance of nerve blocks in treating and diagnosing low back pain. He described zygapophysial joint blocks, sacroiliac joint blocks, disc stimulation, and nerve root blocks, and concluded that the diagnostic use of neural blockade rests on three premises. First, the pathology causing pain is located in an exact peripheral location, and impulses from this site travel via a unique and consistent neural route. Second, injection of local anesthetic totally abolishes the sensory function of intended nerves and does not affect other nerves. Third, relief of pain after local anesthetic block is attributed solely to the block of the target afferent neural pathway. However, Hildebrandt (186) cautioned that the validity of these assumptions is limited by complexities of anatomy, physiology, and psychology of pain perception and by the effect of local anesthetics on impulse conduction. Hogan and Abram (160) and Raja (187) also cautioned against the indiscriminate use of diagnostic blocks, not only for spinal pain but also other painful conditions. Nonetheless, the rationale for diagnostic joint blocks, lumbar discography, and sacroiliac joint blocks is well established (33).

THERAPEUTIC INTERVENTIONAL TECHNIQUES

Recent evaluation of interventional techniques in the management of chronic spinal pain (33) showed moderate to strong evidence for numerous therapeutic interventional techniques, including medial branch blocks and medial branch neurotomy, caudal epidural steroid injections, transforaminal epidural steroid injections, lumbar percutaneous adhesiolysis, intradiscal therapies, and implantable therapies. The rationale for therapeutic interventional techniques in the spine is based upon several considerations. First, cardinal sources of chronic spinal pain, particularly discs and joints, are accessible to neural blockade. Second, removal or correction of structural abnormalities of the spine may fail to cure and may even worsen painful conditions. Third, degenerative processes of the spine and the origin of spinal pain are complex. Fourth, the effectiveness of a large variety of ther-

apeutic interventions in managing chronic spinal pain has not been demonstrated conclusively. Interventional techniques in the management of chronic spinal pain include neural blockade and minimally invasive surgical procedures, ranging from epidural injections, facet joint injections, and neuroablation techniques, to intradiscal thermal therapy, disc decompression, morphine pump implantation, and spinal cord stimulation.

Much of the early work with pain perception focused on nociceptive transmission from periphery to the brain. Nonetheless, shortly following the introduction of the gate control theory, another important observation was made, focusing on the descending modulation of pain perception. Parallel to the interest in nociceptive neurophysiology was a developing interest in clinical relief of obscure painful conditions. Causalgia from war-related nerve injuries and sympathetically mediated pain was recognized (188-190). Brunn and Mandl (81) in 1924, described therapeutic block in the management of visceral pain. In the same year, Royle (82) reported effectiveness for interruption of the sympathetic nerve supply to the musculature of the affected limbs in relieving deformity contractions and spastic paralysis in Little's disease. In 1926 Swetlow (83) reported long-term pain relief by neurolytic injection of alcohol to paravertebral sympathetic nerves in the treatment of severe intractable pain, particularly pain of malignant disease. In 1930 Dogliotti went further and injected absolute alcohol into the subarachnoid space to produce simple chemical posterior rhizotomy equivalent to that previously attainable only by surgery (74).

Sicard (77) first described injection of dilute solutions of cocaine through the sacral hiatus into the epidural space in 1901 to treat patients suffering from severe, intractable sciatic pain or lumbago. Cathelin (78) also described caudal administration of local anesthetic not only for surgical procedures, but also for the relief of pain due to inoperable carcinoma of the rectum (199). Pasquier and Leri (79), also in 1901, independently reported the use of caudal epidural injection for relief of sciatic pain (199).

In 1912, Kappis (85) described paravertebral somatic blocks for surgery and pain relief. In 1922, L wen (86) used paravertebral somatic block in the diagnosis of abdominal disease. Celiac plexus block

was first described by Braun (87), utilizing an anterior surgical approach in 1906, followed by Kappis (88) in 1914, utilizing a posterior approach. Similarly, stellate ganglion or cervical/thoracic sympathetic block was described initially by Labat (89) in 1930, utilizing a posterior approach. Since then, others have described an anterior approach (189) and a paratracheal approach (191). Brachial plexus block emerged following the description by Halsted (192) in 1884 with numerous modifications over the years (193). The evolution has continued with developments in the use of caudal epidural injections, transforaminal epidural injections, percutaneous adhesiolysis, spinal endoscopic adhesiolysis, facet joint interventions, and intradiscal therapies (33, 194-202).

EVOLUTION

In 1953 John J. Bonica nurtured an interest in pain medicine and published a seminal book -- *The Management of Pain* (198). At the time, much of pain medicine was focused on nerve block clinics. Vandam and Eckenhoff (199), a year after the publication of Bonica's text on the management of pain, suggested that the focus should not only be on pain relief from nerve blocks but also on the basic nature of pain and an integrated approach to treatment. Bonica (200) started a multidisciplinary clinic in 1960. In 1986, launching the era of interventional pain management, Privthi Raj (201) published the first edition of *Practical Management of Pain*. In 1993 Waldman and Winnie (202) published the textbook *Interventional Pain Management* and claimed that the subspecialty of interventional pain management was born. Since then, the specialty has blossomed, with publication of numerous textbooks and new journals concentrating on pain medicine, pain management, and interventional pain management.

Along with recognition and steady new developments, organizations representing diverse groups of pain physicians have emerged. In 1974, largely as a result of the efforts of John Bonica, the International Association for the Study of Pain (IASP) was born. The American Pain Society, the American chapter of the IASP was established in 1977. The American Academy of Pain Medicine (originally Algology) was founded in 1983. Established in 1988, the American Academy of

Pain Management is currently the largest multidisciplinary pain management organization in the United States. The largest physician specialty pain management organization in the United States is the American Society of Regional Anesthesia and Pain Medicine. The World Society of Pain Clinicians and the World Institute of Pain also emerged in 1990s. The American Society of Interventional Pain Physicians (originally the Association of Pain Management Anesthesiologists) was founded in 1998 to represent interests of interventional pain physicians and to preserve interventional pain management.

Specialty codes for pain management (-72) and interventional pain management (-09) have been recognized by the Centers for Medicare and Medicaid Services. The National Uniform Claim Committee defined interventional pain management as:

“The discipline of medicine devoted to the diagnosis and treatment of pain and related disorders with the application of interventional techniques in managing subacute, chronic, persistent, and intractable pain, independently or in conjunction with other modalities of treatments.”

The Board of Directors of the American Board of Pain Medicine defined the specialty of pain medicine as follows (203):

“The specialty 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 malignancy, or may be syndromes in which pain constitutes the primary problem, such as neuropathic pains or headaches. The diagnosis of painful syndrome relies on interpretation of historical data; review of previous laboratory, imaging and electrodiagnostic studies; behavioral, social, occupational and avocational assessment; interview and examination by the pain specialist; and may require specialized diagnostic procedures, including central and peripheral neuro-blockade or monitored drug infusions. The special needs of the pediatric and geriatric populations

are considered when formulating a comprehensive treatment plan for these patients.”

In an editorial, Lippe (203) wrote that physicians specializing in pain medicine may work in a variety of settings and is competent to treat the entire range of painful disorders encountered in the delivery of quality healthcare. Lippe (203) also stated:

“The field of pain medicine is primarily a nonprocedural specialty. It is not in conflict or in competition with anesthesiologists who subspecialize in pain management nor, for that matter, is it in competition with any other primary specialty that may choose to develop subspecialty expertise in pain management. At all stages of pain management, pain physicians function in a collaborative manner with other specialties and subspecialties. It is already evident that pain physicians have developed a symbiotic relationship with anesthesiologists specializing in pain management, thereby strengthening both fields by mutual cross-fertilization and referral patterns.”

Saal (204), describing the past, present, and future of spinal injections, concluded that over the past 20 years, some of the changes have been positive, whereas others have been deleterious. Saal (204) believed that the treatment algorithm currently incorporates injection procedures to facilitate functional improvement. The growing demand for therapeutic and diagnostic injections has given birth to the “injectionist” (i.e., the interventionist). However, Saal (204) felt that this evolutionary phenomenon had led to a departure from the original core values, as interventionists had begun to use or were presumed to use procedures outside of the established algorithm. It was described that many patients were being treated with procedures and medications but never provided rehabilitation to improve function. Likewise, patients with simple back pain were undergoing facet rhizolysis procedures and discography at the top of the algorithm rather than at later stages, as originally intended (204). Saal (204) complained that, “shoot first, ask questions later” was the prevailing motto, with some patients undergoing 20 to 50 epidural injections, and the cost of injection-

based work-ups before surgery increasing to as much as \$8,000 to \$10,000, without documented improvement in outcomes. However, there is no literature to support this negative view with regards to an algorithmic approach coupled with functional rehabilitation (33).

Board certification by the American Board of Anesthesiology with subspecialty designation by the American Board of Medical Specialties (certificate of added qualifications in pain management, recently changed to pain medicine) was first offered in 1993. The American Board of Pain Medicine (not recognized by the American Board of Medical Specialties) also offers a board examination. Competency certification in Interventional Pain Management has been offered worldwide by the World Institute of Pain since 2002.

PATHOPHYSIOLOGIC BASIS OF PAIN

The value of interventional pain management lies in the concept of a structural basis for pain. In the modern era, this structural basis of chronic pain is extremely important. The concept of psychogenic pain has sparked controversy in the field of pain medicine, not only regarding its prevalence but its very existence (205). Now, psychogenic pain is considered within the context that “since there is nothing wrong with your body, there must be something wrong with you”. Some state that the term psychogenic pain is fundamentally meaningless (206). The diagnosis of psychogenic pain not only fails to provide a valid organic diagnosis, but it also fails to provide validation of a patient’s symptomatology and complaints. In essence, psychogenic pain implies that persistent pain is either unreal or illusional. The concept of psychogenic pain is weakened by the fact that its diagnostic signs have been challenged. Gagliese and Katz (206) believed that medically unexplained pain is not a symptom of a psychological disorder and that it is time to abandon thinking that separates mind and body. Thus, the challenge remains for proponents of psychogenic pain to provide empirical evidence to support the contention that psychopathology causes pain and, in doing so, to specify the mechanism by which it is generated. Modern technology, including magnetic resonance imaging (MRI), computed tomographic axial scanning (CT), neurophysiologic testing, and comprehensive

physical examination with psychological evaluation, can identify the cause of low back pain in only 15% of the patients in the absence of disc herniation and neurological deficit (161-168). Further, overall inaccurate or incomplete diagnosis in patients referred to pain treatment centers has been described as ranging from 40% to 67%. The above arguments notwithstanding, the incidence of psychogenic pain is only 1 in 3,000 patients (207, 208). On the other hand, pain of organic origin was mistakenly branded as psychosomatic in 98% of cases. Staats et al (209) pointed out that human behavior and pain phenomena are complex, making it impossible to deal with pain in a simple way, referring only to some things but not to others. If, for example, the focus is on the biological aspects of pain, then much will be missed, for learning and personality play pivotal roles. The same thing is true when the focus is on the simple use of behavior principles. Thus, central to an understanding of the structural basis of chronic pain is the provision of a physical diagnosis and validation of the patient's symptomatology, whenever it is feasible, rather than simply discounting unexplained pain to emotional causes. This approach will remove many of the terms utilized in the past, including "psychogenic," "somatizing," "hysterical," and more recently, "medically unexplained," to explain many of the pain problems not amenable to diagnosis by present methodology utilizing physical examination, radiological testing, and electrodiagnostic testing. Identifying a structural basis of pain also will invalidate the theory that maladaptive psychological processes are primarily responsible for causing regional pain syndromes, which lead to the conclusion that psychological or behavioral interventions are the most logical primary treatment modalities.

A structural cause of pain may be identified in 70% to 80% of the patients with chronic spinal pain with precision diagnostic techniques following IASP criteria (33, 146, 178, 180, 210). In patients without neurological symptoms, disc herniation, and positive nerve conduction studies, diagnostic interventional techniques have shown that facet joints are the source of chronic spinal pain in 15% to 45% of the heterogeneous groups of patients with chronic low back pain, 48% of patients with thoracic pain, 54% to 67%

of patients with chronic neck pain; internal disc disruption in 39% of patients suffering with chronic low back pain, and primary discogenic pain in 26% of patients suffering with chronic low back pain demonstrated by provocative discography, and sacroiliac joint pain with controlled local anesthetic blocks in as low as 2% and as high as 30% of patients (33).

Interventional pain management, which started with neural blockade and regional anesthetic blocks, has progressed to include well-defined and effective interventional techniques. In modern medicine, with new innovative techniques, drugs, and imaging modalities, the scope of interventional pain management has increased substantially. New research grounded in evidence-based principles is contributing to the steady progress of interventional pain management.

PREDICTIONS ON THE FUTURE OF INTERVENTIONAL PAIN MANAGEMENT

The future of interventional pain management requires a proper understanding of the practice of interventional pain management, the appropriate use of interventional techniques, research aimed at elucidating the pathophysiologic basis of pain, studies validating evidence-based approaches for interventional pain management, and a good faith effort to eliminate fraud and abuse.

Interventional pain management is defined as the discipline of medicine devoted to the diagnosis and treatment of pain and related disorders by the application of interventional techniques in managing subacute, chronic, persistent, and intractable pain, independently or in conjunction with other modalities of treatments. It may be employed by pain medicine specialists, spine specialists, surgeons, psychiatrists, and rehabilitation specialists. Implied in the definition of interventional pain management are the terms multidisciplinary, interdisciplinary and comprehensive. The terms multidisciplinary or comprehensive cause significant confusion and are related to a physician's primary specialty. Thus, an interventionalist perceives a multidisciplinary or comprehensive program as one with interventional techniques as the primary modality and physical and psychological modalities as secondary components. In contrast, a psychiatrist, rehabilitation specialist, or surgeon may emphasize

psychology/psychiatry, physical therapy/functional rehabilitation or surgery, with multidisciplinary management provided by secondary application of other modalities, such as interventional techniques. However, no single approach to the treatment of chronic pain has been validated. Evidence-based guidelines for the management of chronic spinal pain have been published, though they are scarce. A few of these were considered as an overview of the large number of treatments currently available in managing chronic pain. It is easy to see that chronic pain management -- not interventional pain management alone -- is a diverse field, characterized by misconceptions, misunderstandings, personal bias, competing concepts and foundations, as well as various historical approaches to the management of pain.

The advent of evidence-based medicine has led to tensions among various specialties. From a historical perspective, the oldest strategies for chronic pain constituted conservative monotherapies and surgical interventions, usually for spinal pain. However, evaluation of monotherapies and multidisciplinary management (with numerous definitions) has yielded contradictory results. Thus, it is essential for interventionalists to define interventional pain management on evidence-based medicine principles.

An additional issue concerns research and publications. The volume of research performed by interventional pain specialists is miniscule compared to the general fields of pain medicine and spine disorders. There are few journals publishing articles on interventional pain management. Evidence-based medicine research, to a great extent, has not included interventional pain management studies; this may reflect the fact the many evidence-based reviews are performed by non-physicians and non-interventionalists. Thus, the need remains for raising the standards of interventional pain management by physicians who practice interventional pain management.

Several organizations have published guidelines for chronic pain management using interventional techniques. None have been universally accepted. Further, there have not been outcomes studies based on these algorithms, opinions, or consensus statements, except for a study published by The American Society of Interventional Pain Physicians (211).

As physicians, our primary goal is to improve the health and well-being of our patients. The future of interventional pain management is promising, because emerging clinical evidence supports the use of this technology. Yet, uncertainties and ambiguities remain. Increasing healthcare costs, involvement of federal government agencies, decreasing physician reimbursement, and an increasing number of patients with chronic pain create a complex, stressful healthcare environment, for patients and physicians alike. The future of interventional pain management depends on a good faith effort to develop and follow evidence-based standards. Integrity of the reimbursement system requires that physicians also make a good faith effort to comply with regulations and to avoid fraud and abuse. It should be pointed out that physicians who overuse resources, provide poor documentation, or employ "creative billing and coding" techniques, may have a major adverse impact on the future of interventional pain management. Physicians should realize that even in this era of evidence-based medicine, physician judgment, integrity, and patient safety should be placed ahead of profits.

CONCLUSION

Interventional pain management is a separate and distinct medical specialty, recognized by CMS. Pain management, since its inception, has taken many shapes and forms. Although interventional pain management dates back to the origins of neural blockade and regional anesthesia, it evolved into a distinct specialty with the development of new interventional techniques. Fundamental to modern interventional pain management are precision diagnostic and therapeutic interventional techniques, applied judiciously to improve the health and well-being of patients.

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