WEINER’S PAIN MANAGEMENT
A Practical Guide for Clinicians

SEVENTH EDITION

Edited by
Mark V. Boswell
B. Eliot Cole

AMERICAN ACADEMY OF PAIN MANAGEMENT
Dedication to Richard S. Weiner, PhD

While standing upon the shoulders of giants helped advances to occur, the genius of Richard S. Weiner, PhD was that he could see the finished puzzle within the constituent pieces. He took pre-existing parts and ideas that others had overlooked, pulled them together in altered ways and created new results. He created harmony from the chaos others perceived. He did more than talk about the developing field of pain management; he walked the walk and co-founded the American Academy of Pain Management with Kathryn A. Weiner, PhD. Together, the Weiners created a new organization that finally met the needs of its pain practitioner members through pain-related education, practitioner credentialing, pain program accreditation, outcome measurement, and many other offerings. Bringing together leaders in the field of pain management to create the American Academy of Pain Management’s textbook, *Pain Management: A Practical Guide for Clinicians,* was one of his greatest accomplishments and was a continuing source of pride for Richard. Revising six editions became his commitment to the advancement of the pain management profession.

For Richard editing each edition of the textbook was a challenging process that required more than a year of preparation. Richard weathered this process six times in 12 years to make certain that the American Academy of Pain Management’s textbook was clinically useful, current, and the best source for multidisciplinary information about the assessment, evaluation, and treatment of pain. For Richard, this was his labor of love and he gave his very best to this process.

Many might say that authoring textbooks is just too much work. It is far more effort than most people would ever willingly take upon themselves. Richard never saw the textbook as too much work for himself. He looked forward to the revision process and the updating of the chapters with each new edition. He enthusiastically called authors, new and old alike, to talk with them about their submissions, suggested points to discuss, and then called up others to tell them about what he had learned in the new chapters when he received them. No matter how many hours or how many authors were involved, he treated each of the authors with consideration, excitement, and respect. He asked of the authors more than some knew that they had within themselves, but always knew what they could accomplish if properly motivated. Richard was the consummate manager, who not only managed ideas, but the people bringing the ideas to fruition.

Knowing that he was quite seriously ill in 2001, Richard began to consider future goals for the American Academy of Pain Management. He knew that in another couple of years the seventh edition of the textbook would need to be written to maintain the currency associated with the book. In his own amazing way, and in his attempt to find goodness and humor even in the worst of circumstances, he speculated that he wouldn’t have to edit any more textbooks if he didn’t respond to his anti-cancer therapies. He even tried to cheer up those who were so concerned about him by telling us that the chemotherapy was easier than editing the textbook. He helped to identify the principal editor for the seventh edition of the textbook before his death in May 2002.

Practitioners fortunate enough to have personally known Richard, continue to mourn his passing. His hundreds of personal friends and members of his immediate family remember all that he gave to our evolving profession. Always the gentleman in his dealings with others, he shall best be remembered as the man who gathered together the many disciplines that constitute the modern field of pain management to improve the treatment of pain for so many unfortunate sufferers he never met. He never wanted special recognition, but wanted the profession to mature and to see the “mainstreaming” of pain management services.

We miss Richard. Not a day goes by when we do not think about something he said to one of us, some lesson he taught us, or some opportunity he created for all of us who now follow in his footsteps. Few men pass through our lives and have as significant an impact as he did for each of us personally and for so many of our colleagues. While his life was far too short, his accomplishments more than filled his lifetime and left a permanent legacy for all of us. It is only fitting that this *Seventh Edition* be dedicated to the outstanding work and life of Dr. Richard S. Weiner.

Mark V. Boswell, MD, PhD and B. Eliot Cole, MD, MPA
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PLEASE READ THIS PREFACE!

Few people ever bother to read the preface of a textbook, much less the preface of a book on the subject of pain management. This completely revised Seventh Edition is the most comprehensive rewrite of *Pain Management: A Practical Guide for Clinicians.* Unlike the previous six editions, every attempt has been made to offer evidence-based, clinically relevant information. This book is intended for pain practitioners and busy practitioners from other disciplines trying to provide relief for those suffering with pain.

Uniquely, the book unfolds the “story” of pain and its management just as those suffering present themselves to clinicians for help. Major perspectives and challenges are initially identified, leading to an appreciation of the various disciplines providing care. Common pain problems and diagnostic methods used in pain management next give “flesh” to the skeletal story. Treatment options unfold from least invasive to most invasive as we explore behavioral approaches, pharmacotherapy, procedural techniques and the integrative options. The needs of special populations, along with the legal aspects of care, belief systems and spiritual matters, and practice issues finally complete the book.

While no textbook is completely able to cover the entirety of a subject, the intent of this book is to give any reader the “fast take” on pain-related information needed for the next patient, the upcoming examination, or to satisfy some academic question. This book intends to be the “first and last” source for most clinicians needing to know something about pain management. The book has ample references to guide future self-inquiry, allowing readers to know the original source work and independently reach conclusions about the material presented.

The American Academy of Pain Management’s textbook remains a work in continuous development. As the Seventh Edition becomes available, budgeting and planning begin anew for the eighth edition to follow in five years. No one holds all of the truth, and the leadership of the Academy expects that in years to come this book will continue to evolve from one editor to the next, always fresh and current in its presentation, and true to the original charge given to each of us practicing in pain management by our late, founding Executive Director, Richard S. Weiner, PhD.

Please enjoy the material included within these pages. Make note of areas that were covered superficially and need more detail. Be willing to help your colleagues “push the envelope” in future editions by writing chapters, providing peer review, and offering suggestions for continuous improvement.
About the Editors

Mark V. Boswell, MD, PhD is chief of pain medicine, director of the Pain Medicine Fellowship Program, and associate professor of anesthesiology at Case Western Reserve University in Cleveland, Ohio. Trained in interventional pain management, medical acupuncture and end-of-life care, Dr. Boswell has been actively involved in clinical pain management, pain-related research, and academic medicine for more than 15 years. Dr. Boswell is editor-in-chief for *Pain Physician*, the official publication for the American Society of Interventional Pain Physicians (ASIPP).

Dr. Boswell earned his PhD in experimental pathology and MD from Case Western Reserve University. He completed an anesthesia residency after a categorical surgical internship, a research fellowship in neuroscience, and additional training in interventional pain management. Dr. Boswell was named the Outstanding Clinical Teacher in Anesthesiology in 1992 from CWRU School of Medicine and received the Outstanding Educational Achievement Award from ASIPP in 2004.

Dr. Boswell was vice-chair of the School of Medicine of CWRU, serves on numerous committees at University Hospitals of Cleveland, including pharmacy and therapeutics, QualChoice Medical Policy and the Rehabilitative Services Advisory Committee. He is a frequent presenter at local, national and international meetings, an accomplished author, and committed member of his community, family, and church.

Dr. Richard S. Weiner personally asked Dr. Boswell to serve as the principal editor for the Seventh Edition of the American Academy of Pain Management’s textbook. Under Dr. Boswell’s editorial leadership the Seventh Edition has been revised entirely to embrace the evidence basis for pain diagnosis and management. Dr. Boswell has introduced many new sections and made this edition the most diverse in the disciplines involved, the most comprehensive in scope of practice, and the most clinically relevant.

Dr. B. Eliot Cole earned his undergraduate degree in bacteriology from the University of California, his medical doctorate from Wake Forest University School of Medicine, and his master’s in public administration from the University of Nevada, Las Vegas. He performed residencies in psychiatry and neurology at North Carolina Baptist Hospital, and completed an anesthesia-based fellowship in pain management at the University of California, Los Angeles, Center for Health Sciences. The American Psychiatric Association awarded Dr. Cole Fellow status in 1995 and Distinguished Fellow status in 2002.

Dr. Cole has been active in pain management since 1985, as a pain management fellow, a clinician, and as an active member of many pain-related organizations. He served on the American Academy of Pain Management’s Board of Advisors, Board of Directors, numerous committees, was the organization’s President from January 1, 1994 until December 31, 1995, and was the Interim Executive Director from March 1 until December 31, 1998.

Currently, Dr. Cole is a consultant in pain management for the Hawaii Permanente Medical Group and for the American Academy of Pain Management, serves as the Executive Director for the American Society of Pain Educators, and vice-president for medical and scientific affairs for Aventine HealthSciences. Dr. Cole is the program dean for pain studies at the University of Integrated Studies. Dr. Cole enjoys lecturing and writing about pain management, care of the terminally ill, medical policy-making, and ethical issues.
Acknowledgments

The Editors wish to sincerely thank the people who directly and indirectly helped with the development of the seventh edition of this book. Without the help of all these people, and many others not formally mentioned, it would not exist. In addition to thanking every single author, the Editors especially want to thank and recognize the extraordinary efforts of:

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Section I

Perspectives of Pain

Mark V. Boswell, MD, PhD, Section Editor
A Brief History of Pain from a Personal Perspective

B. Berthold Wolff, PhD

Pain — The Fifth Vital Sign? Pain is a natural phenomenon of all humankind. Yet, until recently, it has been a sadly neglected field of behavior and medicine. In 1958, when I started to study human pain behavior, I was amazed to find how little knowledge of pain and its treatment was available. At that time, most clinicians believed that “real” pain had an underlying physical or physiological basis. Therefore, treating this underlying cause by appropriate therapeutic methods would cure or at least control the basic problem and the patient’s pain would be alleviated. Should the patient continue to complain of pain following “successful” treatment, except for malignancies, the patient was often told “it is all in your head” — or worse he would be called a malingerer. Actually, this may still occur occasionally.

In the 1950s, there existed no gate control theory, no real understanding of endogenous morphine-like substances (endorphins), no awareness of differences between acute and chronic (intractable) pain, and there was no generally accepted definition of pain. There also existed no national, international, or regional pain associations.

The ancient philosophers, such as Plato and Aristotle, placed pain together with pleasure among the passions of the soul. In his 1939 review, Dallenbach suggested that Aristotle’s great influence on Western scientific thought delayed the recognition of pain as a sensation for almost two thousand years. Eventually, however, the 19th century permitted much research into the neurophysiological basis of pain. In 1884, both Blix and Goldscheider, independently of each other, finally established that pain was a sensation by demonstrating specific pain points in the skin. In contrast, however, some other physiologists and psychologists believed that pain resulted from “overstimulation” of receptors (Wundt, 1874). Thus, at the end of the 19th century, three different “pain” theories co-existed. The old emotional (pain–pleasure) theory and two neurophysiological theories, the “specificity” theory (i.e., pain-specific receptors/fibers) and the “intensivity” theory (i.e., too much stimulation).

The early 20th century saw a shift toward specificity theory, such as Sherrington (1906), indicating that there are specific nerve endings for pain. Zotterman (1959) observed that in several “classical” experiments during the 1930s pain was apparently subserved by A-delta and C fibers. The faster-conducting A-delta fibers yield sharp and well-localized pain, whereas the slower C fibers yield dull and poorly localized pain sensations. This type of information led Lewis (1942; Lewis & Kellgren, 1939) to postulate the existence of two separate sensory pain systems, one transmitting pain from the skin and the other from deeper and visceral tissues. However, subsequent work by others, especially that of the Oxford group of anatomists (Weddell, Sinclair, & Feindel, 1948), indicated that the differences observed by Lewis, suggesting a two-pain system, could also be adequately explained in terms of pattern and density of innervation, which differ between skin and deeper tissue. Our own early work in my laboratory (Jarvik & Wolff, 1962; Wolff & Jarvik, 1961) demonstrated that two different pain responses could be elicited from the same tissue locus (gluteus medius muscle) and also tended to refute Lewis’s two-pain systems theory. Further work by the Oxford group (Feindel, Weddell, & Sinclair,
suggested that pain sensation may depend upon central analysis of space–time pattern of neural activity.

Eventually, this type of research led to the important gate theory of pain, published by Melzack and Wall in 1965, which revolutionized the field of human pain mechanisms. Simply stated, the gate theory postulated a “gating” mechanism that controlled the feedback of fast-conducting fibers from the central nervous system to advancing slower-conducting fibers either inhibiting or allowing progress through the “gate.” Thus, a central nervous system analysis is required allowing both physiological and psychological influences. Four decades have passed since the introduction of the gate theory and like all good science, progress has been made and the theory further modified. However, this chapter is not concerned with current concepts but with a historical background from my personal perspective.

It is relevant at this point to mention an interesting problem. While our knowledge of pain and pain mechanisms has significantly increased during the 20th and early 21st centuries, we still lack a generally accepted definition of pain. A century ago, Sherrington (1906, p. 229) defined pain as “the psychical adjunct of an imperative protective reflex.” Nearly all 20th-century pain researchers disagree with his definition, but they have eschewed defining pain themselves (Beecher, 1959). More recently, Merskey and Bogduk (1994) for the International Association for the Study of Pain defined pain as an “unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage” (p. 210). This definition, while passable, is in my opinion not completely adequate. Many years ago, I had the pleasure of personally discussing the problem of an adequate definition of pain with Dr. Harold Merskey and I applaud his courage and persistence in eventually coming up with a definition.

There are several problems. Pain, while almost always unpleasant, is not necessarily so. Occasionally, one pain may serve as a relief for another pain (e.g., counter-irritation). In an experimental study, we have observed that white noise is generally reported as more aversive than pain (Wolff et al., 1976). Another problem is that it is often difficult to communicate pain to others because we may lack appropriate words and may thus resort to analogy. This problem has recently been highlighted in a review by Schott (2004). Both clinically and in the laboratory, pain tends to be defined operationally, such as withdrawal from a noxious stimulus, the patient or subject saying “pain,” marking a point along a line, relaxing tense muscles. However, pain defined in this manner can strictly speaking only refer to the specific situation rather than act as an absolute. Consequently, it is yet premature to define pain in absolute terms.

My own work started in 1958, while I was a member of the New York University Rheumatic Diseases Study Group. Specifically the question was raised whether it is possible to (1) measure a patient’s pain level objectively and (2) predict a given patient’s ability to tolerate (clinical) pain during physical rehabilitation and postoperative exercises of an operated joint. Obviously, with that background and at that time, the emphasis was on deep somatic arthritic pain rather than on cutaneous or visceral pain. Consequently, I chose to utilize a strictly psychophysical approach to devise a technique and measure the patient’s pain response. Pain threshold determinations had been made by earlier investigators, such as von Frey (1897), on the skin, culminating in the “heroic” studies of Hardy, Wolff, and Goodell (1952), who used themselves as guinea pigs to measure pain threshold and pain discrimination with radiant heat on the skin. They developed the Dol scale of pain and introduced the radiant heat dolorimeter. Their work can be regarded as the first major psychophysical study of human pain. However, at that time, less psychophysical information existed for deep somatic tissues.

Kellgren (1937–38, 1938) had published some studies on muscle pain although his work was not strictly as psychophysical as that of Hardy et al. However, Kellgren’s studies served as a beginning for our own deep somatic pain research. After experimenting with several different body loci, we chose the gluteus medius muscle as the most suitable site (Wolff et al., 1961). We developed a single-blind psychophysical technique permitting the insertion of 32 hypodermic needles in rosette fashion through eight anesthetized blebs of the overlying skin. The muscle was stimulated at each different needle point with 0.2 ml of sterile iso-, hyper-, or hypotonic saline in randomized fashion and a lower and upper pain threshold was measured (Jarvik & Wolff, 1962; Wolff & Jarvik, 1951). We were able to demonstrate, as briefly mentioned previously, that the same body locus could produce two different pain responses, namely, well-localized, sharp pain intensity of short duration (from hypotonic saline and water) and a diffuse, dull ache after a relatively long interval of onset and long duration. This technique, while of scientific value, is rather cumbersome to be used routinely in a pain center. Therefore, few other studies had been published on human muscle pain until the 1980s (Capra & Ra, 2004).

Numerous studies involving experimentally induced pain in humans have been done during the second half of the 20th and the start of the 21st centuries. Different types of noxious stimuli have been employed, such as electrical, mechanical, thermal, and chemical. In the laboratory, attempts are usually made to have the noxious stimulus simulate clinical pain of some kind or other and then to investigate whatever parameter is relevant to the purpose of the experiment. In the mid-20th century a major stumbling block for experimentally induced pain studies in humans was the criticism that such laboratory pain was artificial and bore no resemblance to “real” (pathological) clinical pain, especially in terms of the emotional/psycho-
logical components of clinical pain, which were lacking in the experimental model. Dr. Henry K. Beecher (1959) of Harvard was one of the chief critics of experimental human pain and for years carried on a (published) dispute with the Cornell group of Hardy et al. on the latter’s dolorimetric work with humans. At that time, Beecher was an important figure with great influence in the pain arena and clinical pharmacology, who, in my opinion, had a major negative impact on human laboratory pain work. Eventually, Beecher changed his mind and announced that he and Smith et al. (1966) had developed an experimental method — the submaximum effort tourniquet technique — which had validity for clinical pain and could be used to study analgesic agents. Consequently, with Beecher’s “blessing,” experimental human pain studies became “respectable” again.

In our own work with experimentally induced pain in humans, we focused on several pain response parameters and not only on the pain threshold. In psychophysical terms, the latter is the point at which pain is first reported 50% of the time; i.e., it is really a measure of minimal pain. We applied experimental procedures that also allowed us to collect reports of maximal pain tolerated by the subject — the pain tolerance level. (There is some confusion in the literature about terms such as pain tolerance, but we use this term to denote the upper threshold). A third parameter, which we called pain sensitivity range (PSR) is the difference between the pain threshold and the pain tolerance, i.e., pain tolerance — pain threshold = PSR. A fourth response parameter is the just-noticeable-difference between successive levels of stimulus intensity.

Hardy et al.’s Dol scale is based on these just-noticeable differences. In a number of experimental studies in our laboratory using several different pain-induction techniques, we were able to demonstrate that the pain tolerance is the most sensitive parameter for analgesic assays with both mild and potent drugs, such as aspirin and morphine; i.e., it is a valid tool (Wolff et al., 1969). Some investigators have used yet another response parameter, namely, the drug request point, i.e., the stimulus intensity level at which the subjects would have requested a pain killer, had it been clinical pain. Single dose, as well as cross-over designs, have been used in these experimental studies. While the latter are statistically more powerful than single-dose designs, they suffer from an interaction effect, such as order of presentation or expectancy. In recent years, experimental pain in humans has been used less frequently for drug (analgesic) studies but animal models are still widely used.

The important contribution of Dr. W. Crawford Clark (1969) should be mentioned at this point, as he was the first to introduce signal detection theory or sensory decision theory (SDT) to the field of human pain studies in 1969. Clark’s approach originally was based on Swets’s work (1961) who publicized SDT in 1961. SDT was developed to detect a weak signal above background noise and essentially challenged the sensory threshold of classical psychophysics. In turn, Clark criticized the classical pain threshold as being contaminated by both sensory and judgmental components, while SDT permits separation. SDT caused considerable excitement among many pain researchers resulting in numerous publications, both pro and con. I reviewed this area (Wolff, 1978) discussing classical as well as “new” psychophysical parameters.

In human pain studies, both clinical and experimental, differences in pain behavior have been observed between and within various groups. Frequently, observed differences have been ascribed to ethnic differences, Afro-American, Irish, Scandinavian, Jewish, etc. Unfortunately, such “ethnic” differences have implied “racial” (a dirty word) or “genetic” differences for some authors and are eschewed politically. A good and brief review has been published by Morris (2001) in which he questions the scientific validity of so-called ethnicity. Many years before this publication, I also was interested in ethnocultural factors of pain and published a review with an anthropologist (Wolff & Langley, 1968). On the basis of our own studies, as well as those of several other investigators, it is my belief that pain behavior and pain responses are largely learned responses, molded by many variables, especially sociocultural, and that so-called “ethnic” differences simply reflect such learned behavior. Consequently, it is possible to modify such response under appropriate conditions (Horland & Wolff, 1973). This is not to deny that physiological and genetic differences may exist, but more evidence is required. Within homogeneous groups, age and gender differences are often observed, but again how much is learned and how much (if any) is genetic? We have also noted apparent lateral dominance differences in the same individual. The nondominant side appears to be more sensitive to noxious stimuli than the dominant side, but the latter is more discriminative (Wolff et al., 1965).

In recent decades ethical considerations have played an increasingly important role in experimental and clinical pain studies — both human and animal. Strict standards have been set by both institutional and governmental bodies to guard the rights of animal and human subjects, and funded investigations require approval from various “independent” and “impartial” committees. This is most laudable in spite of greater “red tape.” In the “old” days, many investigators paid little heed for the suffering of conscious animals being experimented upon. Now, the animal must be able to escape (avoid, terminate) the noxious stimulus. In laboratory human pain studies, it was considered appropriate for the experimenter to be his or her own first guinea pig, such as Hardy et al. in their radiant heat work, previously mentioned. In my personal experience, I was my first guinea pig when we tested various muscles for the hypertonic saline method. I well remember hobbling...
around for a few days after we used the gastrocnemius muscle and obviously decided against this muscle. The ethical problem in general is that the experimenter is not the best judge of noxious procedures to be “inflicted” on human volunteers. Historically, the famous Dahlem Konferenzen sponsored a symposium on “Pain and Society” in November 1979 in Berlin to which I was privileged to be invited and selected to be the rapporteur of a small group of other invited pain mavens, including Drs. Ronald Melzack, Hans Kosterlitz, Sir Michael Bond, Kenneth Craig, Giancarlo Carli, Jane Dum, Hartmund Brinkhus, and Wei-ming Tu. In terms of ethics, our group recommended that the Golden Rule, which states, “Therefore all things whatsoever ye would that man should do to you, do ye even so to them,” should be amended to “Do not do unto others what you would not have done to yourself, and do not do unto others what they would not have done unto themselves” (Wolff et al, 1980). It is only 25 years ago that such a statement had to be made, which may surprise many current pain specialists. Another major ethical problem in clinical studies is the use of placebo when there is pathology. A “good” experimental study with a new or untested treatment, e.g., an analgesic drug, should be double-blind and include placebo. Yet, if the experimental modality is therapeutically effective, what ethical right is there not to use it with the placebo group?

Historically, two animal techniques for measuring pain have been standard procedures in analgesic assays, namely, the Eddy hot plate method and the radiant heat tail flick method. In the former, the pain response is measured when the mouse lifts its hind paw and in the latter when the rat flicks its tail. In human experimental pain studies both verbal and nonverbal (e.g., withdrawal) responses are used. What about clinical pain? Obviously, both verbal (e.g., “I am in pain,” “Ouch!”) and nonverbal (e.g., wincing, rubbing, tensing) responses have been observed and are in daily use by the practitioner. However, for human analgesic studies, two methods have become standard, namely, a numerical rating scale (NRS) or the visual analogue scale (VAS). The former requires the patient to state his or her pain level along a numerical scale, usually from 5 to 10 points. Incidentally, many investigators consider a larger scale (e.g., 10 points) to be more accurate and discriminative than shorter ones. However, scaling has several inherent errors well known to psychophysicists, such as clustering, and therefore, a shorter (say, 5 points) scale may often be more valid because it is easier for the patient to do the ratings. The VAS has become very popular. I remember its being introduced into the field of human pain by Dr. E. C. Huskisson in 1974. It consists of a straight line, generally horizontal and 10 cm in length. One end represents no pain and the other the most extreme pain. The patient is requested to mark a point along the line to represent his or her pain level. An unmarked rather than a graded line tends to be more valid for human analgesic assays. There are many other measures of human pain, such as questionnaires, among which the McGill pain questionnaire is probably the best known.

The discovery of morphine-like opiates in the brain in the 1970s was another major advance in the second half of the 20th century. Endorphins, as these endogenous opiates were named, have been studied extensively since that time. A number of investigators in different laboratories across the Western world pursued this line of chemical investigation making it difficult to pinpoint the originator. Many of us in the pain field felt that this work deserved a Nobel prize, but perhaps there were too many researchers. The endorphins are involved in various aspects of analgesia and a variety of receptors have been identified. Pharmaceutical companies have and are studying a variety of potential drugs that may act upon such receptors or modify related chemical processes to produce better analgesics.

The use of opiates, such as morphine, for clinical pain has been practiced for a long time. They have been used for immediate postoperative acute pain as well as for palliative care in cancer patients. However, morphine or other opiates were not considered suitable for long-term treatment of nonmalignant intractable pain. In the mid-20th century, when I first started to study pain, many physicians were afraid to prescribe adequate doses of morphine for patients for fear they would become addicted. In fact, this fear also permeated the nursing profession and occasionally a nurse would question a doctor’s prescription of morphine. In other words, patients were frequently undermedicated as far as opiates were concerned. Yet, the irony is that undermedication can still produce addiction under certain circumstances. Fortunately, in recent years, pain practitioners have attempted to change this medical attitude and insist that if morphine or other opiates are prescribed, it should be done in adequate doses to relieve pain properly.

A newer question relates to the use of opiates for long-term care of nonmalignant chronic pain. Some pain specialists advocate the use of opiates for such patients, claiming good results. However, other practitioners have seriously questioned such an approach. I like to mention aspirin at this point. This non-narcotic, nonsteroidal, anti-inflammatory drug has been around since the late 19th century. It has serious side effects; it can certainly burn holes in tissue because it is an acid and can cause Reye’s syndrome in children. Yet, in spite of that, aspirin is an effective analgesic for many pain conditions. Acetaminophen is now used more frequently and tends to replace aspirin in pain management.

Historically, it is worth mentioning amitriptyline, a tricyclic antidepressant, which has been used by psychiatrists for a very long time to treat depression. In the 1960s and 1970s, several clinicians experimented with various psychotropic drugs including amitriptyline to control pain.
Amitriptyline in low doses appeared to have analgesic effects. Originally, many psychiatrists criticized pain physicians for using such low doses for pain management, well below the generally recommended doses for depression. In fact, I know some psychiatrists who referred to such low doses as producing nothing else but a placebo effect. It took several years for the analgesic effect of amitriptyline to be “officially” recognized, although many clinicians still prescribe the higher psychiatric doses rather than the lower analgesic doses. Other tricyclics for pain relief have also been studied and are used frequently. The American Pain Society publishes a short guide on “Principles of Analgesic Use in the Treatment of Acute Pain and Cancer Pain,” at the time of writing already in its fifth edition, which is very useful for the practicing clinician.

I indicated at the beginning of this chapter that in the mid-20th century, we lacked knowledge in several areas. As stated before, at the time, pain was generally regarded as what we now call acute. Dr. John J. Bonica was one of the first to stress that acute and chronic pain must be differentiated. He termed chronic pain as a malefic state and said that it makes no sense to talk about “benign” chronic pain to separate it from cancer pain. While it may now seem obvious to classify pain into three major groups, namely, acute, cancer (or malignant), and chronic (or intractable) nonmalignant, it is Bonica who must be credited for promoting such distinctions. Many pain mavens call Bonica the “father of chronic pain,” although I am not sure if he really would have liked that title. Recent and current research on pain based on neurophysiological and chemical investigations has demonstrated the plasticity of the brain and neural circuits involved in pain behavior. However, the above classification still has practical value.

I have always stressed the importance of communication both within and between professions for clinical practice and research. Initially, I worked in the field of arthritis and rheumatology and learned about the important contributions of nurses, physical therapists, orthopedic surgeons, and other health professionals in addition, of course, to the rheumatologists. In 1965, I was privileged to become a charter member and later president of the now-called Association of Rheumatology Health Professionals, joining forces with the rheumatologists in the American College of Rheumatology. As the name implies, the association brings together professionals from many fields working in arthritis and the rheumatic diseases. I considered this to be a good example for pain professionals. In 1964, just before the creation of the Association of Rheumatology Health Professionals, my colleague Dr. Thomas Kantor and I invited several pain “specialists” of whom we knew and who worked within a radius of about 100 miles from New York City to come to monthly luncheon sessions at New York University School of Medicine in order to network. We thus formed the New York Pain Group. It was disappointing, however, that only about 30 individuals, who were actively engaged in pain management and research, participated. Therefore, after 4 years of seeing each other, we stopped these meetings. It must be noted that at that time in the 1960s, there was still little interest in pain and the above group essentially comprised all then-active pain investigators in the greater New York City area. It was also a really interdisciplinary group with neurosurgeons, nurses, psychologists, physiatrists, rheumatologists, neurologists, statisticians, and others.

It was with great interest that I learned in 1973, that Dr. Bonica had invited many pain investigators to a meeting in Issaquah, Seattle, which eventually led to the formation of the International Association for the Study of Pain (IASP). This was indeed a very courageous and highly significant endeavor by Bonica to bring together pain clinicians and researchers from all across the world to exchange knowledge and communicate with each other. The first International Congress of IASP was held in Florence, Italy, in 1975 and was highly successful; other congresses are now held every 3 years in different countries. The IASP also publishes a journal, Pain, originally under the editorship of Dr. Patrick Wall, which has become the most influential scientific journal in the field of pain.

Stimulated by Bonica’s success in forming an international pain organization, I decided to review what had originally been the New York Pain Group, especially after receiving enthusiastic support from many colleagues in the greater New York City area. Therefore, in 1974, I started the New York Pain Society, which almost immediately became the New England Pain Association following strong urging from Bonica. Rapidly thereafter, we enlarged to become the North-Eastern Pain Association and, as such, supported the IASP as one of its first chapters. Concurrently, the West Coast pain scientists formed the Western Pain Association and also joined the IASP as a chapter. In view of the steadily increasing interest in pain across the United States, both American societies enlarged, the Western including states west of the Rockies while the Eastern included states east of the Rockies. The latter again changed its formal name to Eastern Pain Association and has been functioning as such ever since.

In view of the rapidly rising interest in pain, I continued to feel that we should have a national pain organization in the United States in addition to the regional societies, a view shared by many of my Eastern colleagues. We considered it important that we have support for such a national U.S. organization from our Western U.S. colleagues as well as from the IASP. In 1975, during the First International IASP Congress, Dr. Pierre L. LeRoy and I discussed this issue with Dr. Bonica. The latter was concerned that an American pain organization might overshadow the IASP both financially and numerically and recommended that we wait some time until the IASP became a stronger organization. However, the success of the IASP, as well as the need to have a national society
that could represent pain scientists nationally rather than regionally, encouraged me to form a national U.S. pain organization. Therefore, I started informal discussions with Dr. Bonica, mainly by telephone, and we had Dr. Arthur F. Battista and Dr. B. Raymond Fink negotiate on our behalf — successfully. Thus, with Dr. Bonica’s support, a national society could be started in the United States. In 1977, a meeting was arranged in Chicago to which Dr. Bonica and I invited 12 participants each, representing various interests. This meeting successfully supported the idea of a national organization and the American Association for the Study of Pain, shortly thereafter changed to the American Pain Society (APS), was formed, and I was elected as its first president. The Eastern and Western groups became chapters of the APS, which now has several regional chapters.

The APS has steadily grown and is representative of U.S. pain clinicians and researchers. The APS is truly multidisciplinary and includes all professions involved with pain. In view of its multidisciplinary structure, I decided that it could not have “trade union” functions but had to be predominantly scientific and educational. However, some physicians felt pain medicine had become important and that there should be a new specialty (or subspecialty) and eventually this led to the formation of the American Academy of Pain Medicine (AAPM). Fortunately, this did not pose a threat to the aims and goals of the APS. Furthermore, other professions can have pain specialists with their own guidelines within their profession. There always has been and still is concern that the APS is too scientific and research oriented and fails to cater to the practicing clinician while at the same time basic scientists often complain that the APS is too clinical. It is difficult to satisfy both views.

Because the APS gives no certificates or diplomas for proficiency in pain control, Dr. Richard Weiner years ago decided that there should be an organization to do so. Dr. Weiner had discussions with APS Board Members, including myself, and realized that this could not be a function for the APS. He thus formed the American Academy of Pain Management — the other AAPM — which focuses on the practicing health professional, provides education, and awards credentials of proficiency. It has now become one of the major pain organizations in the United States.

In this chapter, I have rambled along various historical paths often associated with my own functions and role. It is thus a little autobiographical although I hope not too boring. Detailed histories of pain may be found in other publications. Here I have cursorily reviewed the historical background leading up to the Melzack and Wall gate theory of pain and focused on the mid- and second half of the 20th century. In my opinion, the gate theory and the discovery and role of endorphins were the two most significant scientific contributions to pain in the latter half of the 20th century. Clinically, the realization that pain is a specialty of its own and requires a multidisciplinary as well as multimodal approach should be regarded as another significant contribution. Associated with both the clinical and scientific contributions has been the much greater interest in pain, its mechanism, and management. Better communication and networking, largely due to the formations of regional, national, and international pain societies followed by the publications of several pain-oriented journals, have also contributed to our constantly increasing better understanding of pain — now often regarded as the Fifth Vital Sign.
REFERENCES


pinothalamic pathways. Stress-induced analgesia and morphine-produced analgesia: lack of cross-tolerance. Evidence for a physiologically novel population of spinal cord neurons. Evidence that an excitatory connection between the PAG and NRM mediates stimulation-produced analgesia. Evidence that an excitatory connection between the PAG and NRM mediates stimulation-produced analgesia. Evidence that an excitatory connection between the PAG and NRM mediates stimulation-produced analgesia. Evidence that an excitatory connection between the PAG and NRM mediates stimulation-produced analgesia. Evidence that an excitatory connection between the PAG and NRM mediates stimulation-produced analgesia.

References:


Handwerker, H. O. (1976). The influences of algogenic substances serotonin and bradykinin on the discharge of unmyelinated cutaneous sensory fibers as nociceptors. In J. Bonica, & D. Albe-Fessard (Eds.),


Kenshalo, D. R., Giesler, C. J., Leonard, R.


LeBaron, D. R., Giesler, C. J., Leonard, R.


Clinical Practice Working Group, Veterans Health Administration, Department of Veterans Affairs and Health Affairs, Department of Defense (2003). \[100-CGP-OIT-03\]. Washington, DC: Office of Quality and Performance.


Alonso, N. C., & Bayer, B. M. (2002). Opioids, immunology, and host defenses of intraoperative hyperalgesia during withdrawal. The American Journal of Medicine, 113(Suppl. 1A), S18–S24.


Lane, N. E. et al. (1986). Long-distance running, bone density, and osteoarthritides. 255, 1147–1151.


Central neurohormonal systems are key to understanding fibromyalgia and chronic fatigue syndrome.


A diathesis of control to pain coping strategies and psychological distress in chronic pain patients. Evidence of a disposition toward fearfulness and vulnerability to posttraumatic stress in dysfunctional pain patients. Beyond pain: The role of fear and avoidance in chronicity.


Snyder, S. H. (1971). Tetrahydrocannabinol acts as a partial agonist to modulate glutamatergic synaptic transmission between rat hippocampal neurons in culture. Journal of Neuroscience, 16(14), 4322–4334.


Rozin, L. et al. (2003). Death during transforaminal epidural steroid nerve root block (C7) due to perforation of the left vertebral artery.


Manchikanti, L. et al. (2002). Effectiveness of caudal epidural injections in discogram positive and negative chronic low back pain. Anesthesiology, 97, 1003.


Sequeiros, R. B. et al. (2002). MRI-guided periradicular nerve root infiltration therapy in low-field (0.23-T) MRI system using optical instrument tracking. Interdisciplinary Neurosurgery, 12, 1331.


Delaney, T. J. et al. (1980). Epidural steroid effects on nerves and meninges. 58, 610.

MacKinnon, S. E. et al. (1982). Peripheral nerve injection with steroid agents. 69, 482.


Manchikanti, L. et al. (in press). Evaluation of spinal endoscopic adhesiolysis in chronic refractory low back pain with a randomized, double-blind trial with one year follow-up. 7, 259.


Hammer, M. (2002). Safety of spinal endoscopy is contingent on basic image interpretation. 27, 621.


Manchikanti L. et al. (2003). Evidence-based practice guidelines for interventional techniques in the management of chronic spinal pain. 6, 3–81


Gnostic facet joint injection.

Lumbar facet joint nerve blocks in chronic low back pain: A randomized clinical trial.

Effectiveness of protective measures in reducing risk of radiation exposure in interventional pain management: A prospective evaluation.

Chemical meningism after lumbar facet joint block.

Role of neura
xial steroids in interventional pain management.

The effect of neura
xial steroids on weight and bone mass density. A prospective evaluation.

Percutaneous radiofrequency facet rhizotomy — Experience with 118 procedures and reappraisal of its value.

Principles and practice of radiofrequency neurolysis.

Clinical features of patients with pain stemming from the lumbar zygapophysial joints. Is the lumbar facet syndrome a clinical entity?

The diagnostic validity and therapeutic value of medial branch blocks with or without adjuvants.

Prevalence and clinical features of lumbar zygapophysial joint pain. A study in an Australian population with chronic low back pain.

The inability of the clinical picture to characterize pain from facet joints.

Prevalence of facet joint pain in chronic low back pain.

Facet joint pain and the role of neural blockade in its management.

Evaluation of the relative contributions of various structures in chronic low back pain.

Evaluation of the role of facet joints in persistent low back pain in obesity: A controlled, prospective, comparative evaluation.

Contribution of facet joints to chronic low back pain in postlumbar laminectomy syndrome: a controlled comparative prevalence evaluation.

Role of facet joints in chronic low back pain in the elderly: A controlled comparative prevalence study.

Influence of psychological factors on the ability to diagnose chronic low back pain of facet joint origin.

Evaluation of influence of gender, occupational injury and smoking on chronic low back pain of facet joint origin.

Is there correlation of facet joint pain in lumbar and cervical spine? An evaluation of prevalence in combined chronic low back and neck pain.

Chronic low back pain of facet (zygapophysial) joint origin: is there a difference based on involvement of single or multiple spinal regions?

Prevalence of facet joint pain in chronic spinal pain of cervical, thoracic, and lumbar regions.


Accuracy of diagnostic blocks in the diagnosis of chronic spinal pain of facet or zygapophysial joint origin.

Induced pain referral from posterior elements in normal subjects.

Distribution of pain provoked from lumbar facet joints and related structures during diagnostic spinal infiltration.

Distribution of referral pain from the lumbar zygapophysial joints and dorsal rami.

A controlled trial of corticosteroid injections into facet joints for chronic low back pain.

Computed tomography and fluoroscopy guided anesthesia and steroid injection in facet syndrome.

Clinical evaluation of intra-articular injections for lumbar facet joint pain.

Lumbar facet joint syndrome. A randomized clinical trial.

Effectiveness of lumbar facet joint nerve blocks in chronic low back pain: A randomized clinical trial.

The ability of computed tomography to identify a painful zygapophysial joint in patients with chronic low back pain.

Lumbar facet joint injection: indication, technique, clinical correlation and preliminary results.

Facet joint block for low back pain. Identifying predictors of a good response.


Bonica, J. J. (1989). Local anesth


Dahm, P. et al. (2000). Comparison of 0.5% intrathecal bupivacaine with 0.5% intrathecal ropivacaine in the treatment of refractory cancer and noncancer pain conditions: Results from a prospective, crossover, doubleblind, randomized study. *Journal of Pain and Symptom Management*, 20, 241.


Electroacupuncture suppression of a nociceptive reflex is potentiated by two repeated electroacupuncture treatments: The first opioid effect potentiates a second non-opioid effect.

References:


Hyodo, M. (1980). Osaka, Japan: Pain Clinic, Department of Anesthesiology, Osaka Medical College.


Gall, C. M. et al. (1987). Events for co-existence of GABA and dopamine in neurons of the rat olfactory bulb.


Cholinergic and GABA-ergic projections to the olfactory bulb in the rat. Brain Research, 599(1), 131–139.


The works of Hahnemann are widely referenced in the text, including:


Chung, U. L. et al. (2003). Effects of LI 4 ad BL 67 acupressure on labor pain and uterine contractions in the first stage of labor. Archives of Internal Medicine, 163, 251.


Ironson, G. et al. (1996). Massage therapy is associated with enhancement of the immune system’s cytotoxic capacity. European Journal of Cancer Care, 5, 142.


Harris, W. S. et al. (1999). A randomized, controlled trial of the effects of remote, intercessory prayer on outcomes in patients admitted to the coronary care unit. 159, 2273.


