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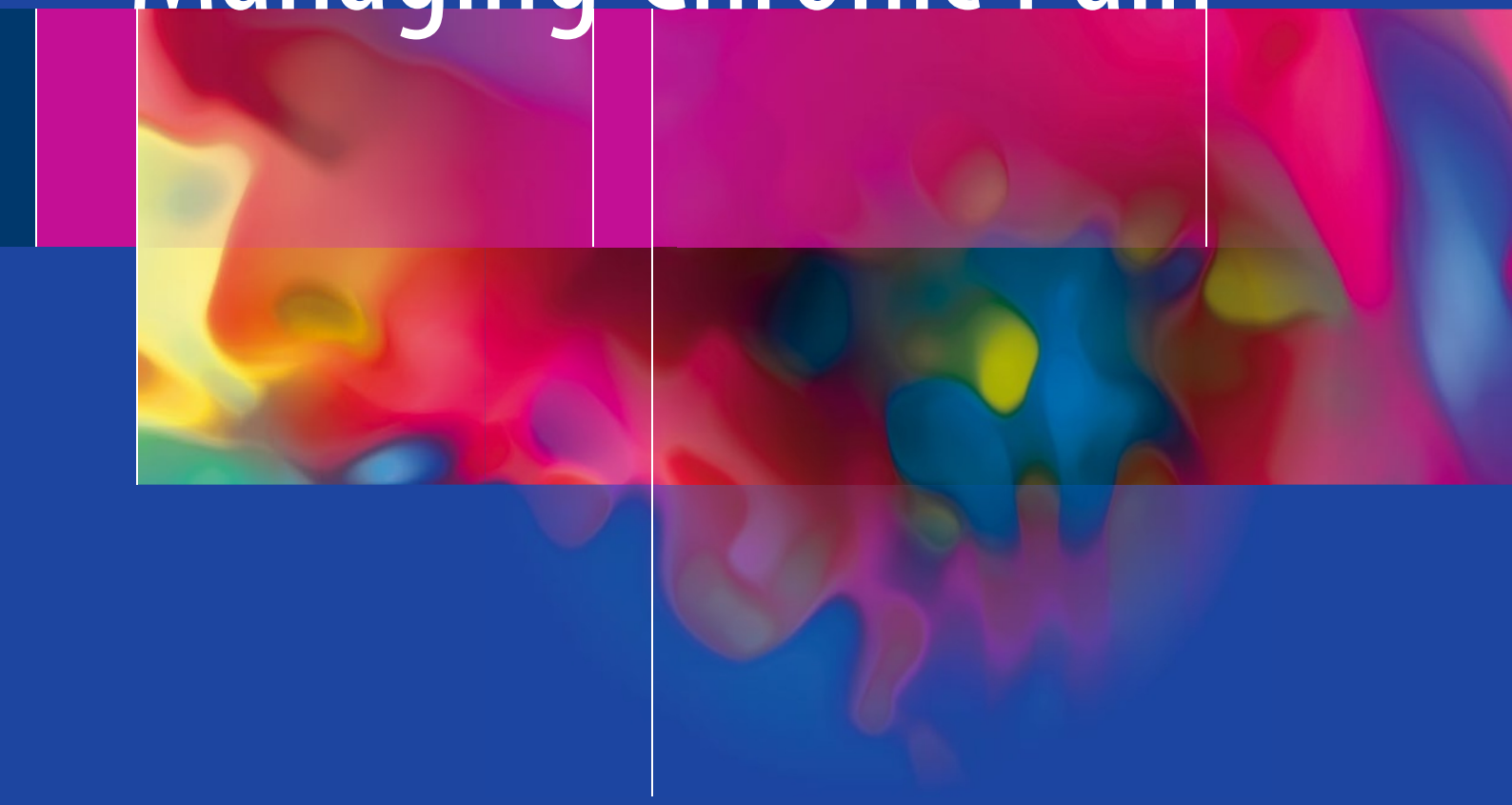
Essentials of Interventional Techniques in Managing Chronic Pain



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Foreword

Drs. Laxmaiah Manchikanti, Alan D. Kaye, Frank J.E. Falco, and Joshua A. Hirsch, all internationally renowned interventional pain physicians, have written *Essentials of Interventional Techniques in Managing Chronic Pain*. They have devoted most of their lives to improving the pain management of patients globally. I am honored to write a Foreword for this monumental undertaking.

To emphasize the importance of this book, I need to reiterate the definitions, statistics, and the multiple modalities of treatments available to us for treating chronic pain today and their potential adverse consequences. Chronic pain exists globally. The prevalence of chronic, persistent, disabling pain seems to be increasing with low back pain, neck pain, and other musculoskeletal disorders occupying the top five categories of disability with escalating costs, and numerous modalities of treatments ranging from over-the-counter acetaminophen to complex surgical fusions [1–12]. In addition to the costs and health economy impact, there are multiple issues related to diagnostic accuracy and therapeutic efficacy, as well as numerous complications related to these therapies with almost over 16,000 deaths due to opioid poisoning in 2012, an increase of 300% since 1999 [8, 13]. Methadone alone contributed to 4418 deaths in 2011 [13], and there were over 8000 unintentional drug poisoning deaths from heroin in 2013, a 39% increase from 2012, and nearly doubling the 4400 deaths in 2011 [13].

Acetaminophen has been implicated in 1000 deaths a year [14]. Nonsteroidal antiinflammatory drugs (NSAIDs) have been reported to be responsible for almost 17,000 deaths with numerous gastrointestinal complications [9]. Spinal surgical fusions caused over 1000 deaths in 2008 [7]. Sadly, all modalities of treatments are increasing rapidly with evidence lacking for many of them. There are also numerous considerations, explosive use and safety, including the interventional techniques that are the subject of this book [11, 15, 16]. While accurate data is available in the United States and other developed countries, in many countries pain may be undertreated and have a higher prevalence than thought; these people may be unable to enjoy the benefits of new advances in interventional pain management.

Chronic pain is a complex and multidimensional problem. Chronic pain is defined as pain that persists 6 months after an injury and beyond the usual course of an acute disease or a reasonable time for a comparable injury to heal; is associated with chronic pathologic processes that cause continuous or intermittent pain for months or years that may continue in the presence or absence of demonstrable pathologies; may not be amenable to routine pain control methods; and healing may never occur [17]. Interventional pain management is defined as the discipline of medicine devoted to the diagnosis and treatment of pain-related disorders principally with the application of interventional techniques in managing subacute, chronic, persistent, and intractable pain, independently or in conjunction with other modalities of treatment [17]. Similarly, interventional techniques have been defined as minimally invasive procedures, including percutaneous precision needle placement, with placement of drugs in targeted areas or ablation of targeted nerves; and some surgical techniques such as laser or endoscopic discectomy, intrathecal infusion pumps, and spinal cord stimulators for the diagnosis and management of chronic, persistent, or intractable pain [17]. Interventional pain management's origins go back to 1884 with neural blockade and regional analgesia [18]. Since then, regional anesthesia and interventional techniques have evolved by leaps and bounds, now reaching

numerous claims of overuse, abuse, and fraud [17, 19]. Consequently, due to the changing dynamics of interventional pain management with the explosive increase in interventional techniques, accountable interventional pain management, and value-based practice, the performance of evidence-based, cost-effective, and clinically effective techniques are coming into play, which are enlightened in this book [17, 19].

Pain practice today is fortunate to have many physicians making this practice a professional part of their career. They come from all specialties, and education now has to reflect the advances pain practice has made in all those specialties, not just those in anesthesiology.

The challenge today is to train pain physicians in such a way that they have a standardized curriculum during their residency and pain fellowship programs, followed by skilled practical training in anesthesiology, neurosurgery, physical medicine and rehabilitation, or psychiatry. Once trained, they need to be examined and tested periodically for their competency. This will raise the standard of pain practice, not only in the United States, but all over the world. Evidence-based medicine or evidence-based practice aims to apply the best available evidence gained from scientific methods to clinical decision-making [17, 18]. It seeks to assess the strength of evidence of the risks and benefits of treatments (including lack of treatment) and diagnostic tests. Evidence quality can range from meta-analyses and systematic reviews of double-blind, placebo-controlled clinical trials at the top end, down to conventional wisdom at the bottom. However, in the modern era, even with the development of comparative effectiveness research with numerous changes in health care philosophy, and without involvement of clinicians, evidence-based medicine has been minimized with overwhelming conflicts of interest, inappropriate analysis and lack of application of the principles of evidence-based medicine, focusing more on cost savings and policy decisions rather than evidence itself .

This book, *Essentials of Interventional Techniques in Managing Chronic Pain,* fills the void where literature should conform to local necessities for information to be useful in that society. The format of the book is excellent; each chapter is consistent in describing an interventional technique in simple terms from history to complications and efficacy, stressing at all times technique and safety, encompassing evidence-based, cost effective, and value-based practice.

Essentials of Interventional Techniques in Managing Chronic Pain accomplishes the ambitious goal of directly addressing the field writ large.

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Foreword

Interventional Pain Management (IPM) is effective when it is practiced as intended and when there is an understanding of pain-triggering mechanisms. IPM's foundation comes from clinical and basic science research and publications. What is known about IPM has been widely reported in multiple books, articles, and journals; however, a lot of them have not covered all aspects of IPM. The authors of this book have been key figures in the evolution of IPM and the American Society of Interventional Pain Physicians (ASIPP). They deserve our gratitude for their major effort in making this book, *The Essentials of Interventional Techniques in Managing Chronic Pain*, possible. The editors, Drs. Laxmaiah Manchikanti, Alan D. Kaye, Frank J.E. Falco, and Joshua A. Hirsch, have taken on a challenge that future readers will appreciate.

It is evident that the intent is to present a body of work that includes evidence, outcomes, and basic and clinical research in the best interest of the patients that we all serve, as well as for providers of the best possible care. Complications and medico-legal consequences are not touched upon in a comprehensive manner because of the nature of the information. Looking at avoidable complications, one cannot rely upon one person's experience alone. One experience tends to be just one opinion regarding a low frequency of recurring complications. One physician may go through a lifetime of practicing without complications, and another physician may have two or more disasters in a short period of time. The field has very little evidence regarding complications from so-called evidence-based studies; rather it comes from poorly collected and published medico-legal and clinical experiences.

The cost-effectiveness of IPM is favored when it is done appropriately, rather than when it is done because that is the only way that the practitioner approaches the problems of patients seeking help. Treatment algorithms continually need to be updated as new therapeutic interventions and convincing evidence surfaces. Evaluating evidence is a peer-reviewed process and it is not an insurance company's God-given right to deny therapy without compelling negative evidence. Some clinical studies may take 5–6 years from the preliminary data gathering to the conclusive multi-center prospective randomized double-blind placebo-controlled trials [1].

The contributors have accepted responsibility for their part of presenting the material, as it has become an essential component of IPM as a distinct medical specialty. ASIPP has grown and matured since its founding in 1998 from a handful of leaders under the relentless leadership of Laxmaiah Manchikanti and numerous individuals that have grown professionally and contributed their time and effort freely. There has not been a vested interest as a reason for the above, except the obvious love of the specialty.

The contributors to this book have been chosen for their experience and knowledge of the field. The book is well structured. It represents and recognizes a long journey from John Bonica's first major effort of a similar-sized book entitled, *The Management of Pain* [2]. The current book reflects much more pathophysiology, principles, new technologies, and pain-related interventions. The reader appreciates more neurosurgical type principles that go back to the pragmatic approaches of Harvey Cushing. Cushing recognized major reasons for neurosurgery and operating on the brain because of the development of local anesthesia and radiofrequency thermocoagulation. Cushing also made a comment that a good neurosurgeon is a

good traveler. What he was implying was for a neurosurgeon to learn, go in, and visit those that were known to be excellent at whatever they were doing. Similarly, we can say that a good IPM physician attends many conferences, reads many articles, and reviews many other modern therapeutic educational opportunities to improve their safety and efficacy for providing care to their patients [3].

Throughout the book, the significance of evidence that comes from publications is evident. One has to remember that the evidence gathered is only as clinically relevant and valid as the question posed to gather the evidence. Studies may look statistically significant and be published in a highly rated journal, only to realize years later that the foundation of the study was flawed. Such an example is a study by Kemler et al., published in *The New England Journal of Medicine* on the usefulness of neuromodulation in upper extremity complex regional pain syndrome 1 (CRPS 1), as compared to conservative therapies [4]. Five years later, in a Letter to the Editor, the authors commented that there was no difference in the two therapies. However, every study subject had a surgical thoracic sympathectomy and not a single one of them returned to work. The study, after the fact, made it appear that neuromodulation is no better than conservative therapy, rather than the fact that individuals conducting the study did not know how to treat CRPS 1 [4]. Appropriate use of neuromodulation in treatment of upper extremity CRPS 1, published in *Neurosurgical Treatment of Pain* [5, 6], showed over 50% returned to work and had many years of effectiveness from the use of neuromodulation in spinal cord and peripheral nerve stimulation.

The current book reflects the turning tide against the overuse of opioids and the increasing death rate from prescription use, abuse, and diversion. This restriction should be followed by a reduction in mortality figures; however, one has to remember that medications are needed, and if they are restricted, appropriately carried out IPM procedures will lead to a much improved quality of life in our patients. The perceived morbidity and mortality from IPM procedures are low; however, not acceptable. The incidence of complications is similar to anesthesiology mortality statistics in the 1960–1970s, when it was 1 in 10,700. Because of the Anesthesia Patient Safety Foundation's recommendation of using improved monitoring with pulse oximetry, carbon dioxide, and oxygen monitoring and alarms, mortality has been reduced 20-fold.

So far, in the medico-legal arena, every single complication from cervical, lumbar, thoracic, and transforaminal injections has been from a sharp needle intraneural and/or intra-arterial injection of local anesthetics, plus particulate steroids in the case of arteries. Blunt needle use is increasing worldwide but has not gained acceptance as the evidence would dictate. The incidence appears to be similar to the anesthesiology mortality rates before the Anesthesia Patient Safety Foundation's recommendations.

It is surprising that even major studies have virtually no recognizable incidence of complications. New therapeutic modalities are coming, and with them, complications will follow. A previous example is the heat lesioning of discs without the ability to determine a safe location for the lesioning electrode within the disc (IDET). The device had no motor stimulation capability, and inadvertently a misplaced intraspinal cannula electrode caused paralysis from the burning of the cauda equina. Simple motor stimulation prior to lesioning would have revealed proximity to the nerves.

A new evolving field is the use of ultrasound guidance for regional anesthesia. The field is also expanding into chronic non-spinal pain procedures. The field of chronic pain medicine has grown dramatically in a different direction from ultrasound. Up-to-date experience, inappropriate needle placement, and injection complications will follow as the use of ultrasound increases. Such examples include brachial plexopathy from interscalene injections. Also, the preoccupation for looking for targeted nerves and avoiding arteries has led to overlooking the proximity of the level of the injection. In a practice that has never seen a pneumothorax from an interscalene block, there have been two cases of pneumothoraces following ultrasound-guided procedures. The level of injection was overlooked.

The most impressive aspect of this book is the vision of Laxmaiah Manchikanti for working with an impressive group of pain physicians in gathering all this information into one location.

Nevertheless, it is also important for each practitioner to build a network of respected colleagues and practitioners within the same field so they can turn to them for the best advice, especially in times of need.

Neuromodulation came from humble beginnings and has blossomed with ever-improving technology. The procedure has grown unnecessarily complex and expensive but technology is also keeping up with the need for complex pain problems such as the recent successful US trial for high-frequency stimulation matching European outcome data. Even more exciting is minimizing the use of equipment with micro technology where a battery is not implanted. The receiver is so small that it is implanted within the electrode. Hopefully the outcome will exceed patient and practitioner expectations with fewer complications, better outcomes, and reduced costs.

I strongly recommend this book. As one that has visited many homes of physicians that I have trained, instead of finding hungry young doctors eager to learn, nowadays I am finding experienced, respected, graying-haired physicians who are looking forward to going to work the next day. As each day brings new challenges, these challenges demand them to have an up-to-date library and *The Essentials of Interventional Techniques in Managing Chronic Pain* belongs there.

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Preface

During the course of our training and practice, the dynamics of what we today call interventional pain management have changed from simple bedside injections to a full-fledged specialty with its own specialty designation (−09), explicit definition of interventional techniques, and mandated representation on the Centers for Medicare and Medicaid Services (CMS) Carrier Advisory Committee (CAC). Since the formation of the American Society of Interventional Pain Physicians in 1998, there has been a dramatic increase in publications showing scientific basis, effectiveness, and cost utility analysis. However, this fledging specialty has faced and continues to face multiple hurdles, ranging from inappropriate application of interventional techniques to abuse patterns and escalating growth patterns without demonstrated efficacy for some procedures and settings, and a convergence of regulations and policy making.

Interventional pain management is an evolving and dynamic specialty with a history dating back to 1901, with descriptions of epidural injections in managing pain. Today, a large body of literature has evolved related to the use of interventional techniques for the management of chronic pain. Even though there are numerous publications available for a clinician to reference, some texts have focused mostly on the technical aspects, whereas others have focused on the theoretical aspects without providing appropriate succinct information. Raj's *Practical Management of Pain,* with its multiple editions since 1986, has provided readers with a great resource for the study of pain. However, until the publication of *Interventional Techniques in Chronic Spinal Pain* and *Interventional Techniques in Chronic Non-Spinal Pain* by the present authors, there has not been a quick reference to the clinical and technical aspects of interventional techniques in the modern era. In 2007 and 2009 the American Society of Interventional Pain Physicians published two separate books describing interventional techniques in chronic pain. This ambitious project, undertaken by the editors and the American Society of Interventional Pain Physicians, exceeded everyone's expectations.

Interventional Techniques in Chronic Spinal Pain and *Interventional Techniques in Chronic Non-Spinal Pain* have provided a comprehensive approach with intellectual and practical coverage describing the appropriate role of interventional techniques in chronic pain management, but as the literature has evolved, some of the concepts have been changed and others have become outdated. Consequently, on behalf of the American Society of Interventional Pain Physicians, we, the editors of this publication, have undertaken the task of revising and updating our previous publications, resulting in an entirely new publication with comprehensive, evidence-based, practical coverage of the specialty, while keeping the original intent of providing a clinician with technical information.

With this encyclopedic work, covering the entire field of interventional pain management with a special focus on technical aspects, we have attempted to provide a comprehensive understanding without being cumbersome or long. From across the nation, leading experts in their respective fields have contributed chapters on specific topics following a single format to present a cogent and integrative understanding of the field of interventional pain management.

We have maintained the overall unique structure of the previous publications with an introduction of the subject, historical background, pathophysiology, evidence base, indications,

anatomy, technical aspects, side effects and complications, precautions, and synoptic key points for each topic when available and applicable. This book consists of 46 chapters, 932 figures, and 87 tables under the major sections of Basic Considerations, Spinal Interventional Techniques, Non-Spinal and Peripheral Nerve Blocks, Sympathetic Interventional Techniques, Soft Tissue and Joint Injections, and Implantables.

The administrative and logistic exercise of developing this monumental task in the form of a publication and bringing it to the final stage has placed considerable responsibilities and demands on the editors, their families, the staff of the American Society of Interventional Pain Physicians, and finally, the staff of Springer International Publishing. The editors wish to thank all of the players involved from development to publication for their time, efforts, and devotion. Apart from the editors, contributors, and publishers, significant efforts were afforded by Tonie Hatton, Diane Neihoff, Holly Long, and Vidyasagar Pampati, MSc. In addition, many others deserve mention and thanks including radiological technologists, Kimberly Cash and Marilee Johnson, for their contributions in providing high quality fluoroscopic images. We are also indebted to many of the world leaders in interventional pain management and our families without whose guidance and patience, this work would have never been completed.

Even though this is an entirely different text, it is a work in progress as a second edition. The overall focus continues to be patient safety and interventional therapies to reduce pain and suffering. We continue to hope that this book maintains practicality and durability and continues to be meaningful to the interventional pain management community. To help make this sustainable, please help us with your comments and suggestions to improve future publications to provide you with the best information in ways that are most suited to your needs.

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Part I

Basic Considerations