

contraindications to ultrasound therapy

Contraindications to Ultrasound Therapy: What You Need to Know

Contraindications to ultrasound therapy are an essential consideration for healthcare providers and patients alike before beginning treatment. Ultrasound therapy is a widely used modality in physical therapy and rehabilitation, known for its ability to promote tissue healing, reduce pain, and improve mobility. However, like any therapeutic intervention, it is not suitable for everyone or every condition. Understanding when ultrasound therapy should be avoided is crucial to ensure safety and maximize its benefits.

In this article, we'll explore the main contraindications to ultrasound therapy, why they matter, and what alternative treatments might be considered. We'll also discuss some precautions and tips to help you navigate the decision-making process surrounding this common treatment option.

What Is Ultrasound Therapy?

Before diving into contraindications, it's helpful to briefly review what ultrasound therapy entails. This treatment uses high-frequency sound waves to penetrate deep into soft tissues, generating heat and mechanical vibrations. The effects include increased blood flow, reduced muscle spasms, accelerated tissue repair, and pain relief. It's commonly used for conditions like tendonitis, bursitis, muscle strains, and joint inflammation.

Despite these benefits, ultrasound therapy involves energy transmission into the body, which means there are specific situations where its use could be harmful or ineffective.

Why Are Contraindications to Ultrasound Therapy Important?

Safety is the top priority in any medical or therapeutic intervention. Ultrasound therapy's contraindications are based on clinical evidence and physiological principles that suggest harm or lack of benefit in certain cases. Ignoring these contraindications can lead to complications such as tissue damage, worsening of symptoms, or interference with medical devices.

Being aware of these limits helps therapists tailor treatments appropriately and empowers patients to make informed decisions about their care.

Key Contraindications to Ultrasound Therapy

1. Malignant Tumors or Cancerous Areas

One of the most absolute contraindications to ultrasound therapy is the presence of cancer. Applying ultrasound waves over malignant tumors could potentially promote the spread of cancer cells or increase tumor growth due to enhanced blood circulation and cellular activity. Therefore, ultrasound should never be applied directly over known or suspected cancerous lesions.

2. Pregnancy, Especially Over the Abdomen or Pelvis

Pregnant women should avoid ultrasound therapy over the abdominal or pelvic regions. The effects of ultrasound on a developing fetus are not fully understood, and there may be risks related to heat generation or mechanical effects that could affect fetal development. While diagnostic ultrasound used in prenatal care is safe at controlled settings, therapeutic ultrasound is generally contraindicated in these areas during pregnancy.

3. Areas with Impaired Sensation or Circulation

When the patient has reduced sensation due to neuropathy or other conditions, they may not be able to detect excessive heat or discomfort caused by ultrasound therapy. This increases the risk of burns or tissue damage. Similarly, poor circulation, such as in severe peripheral vascular disease, compromises tissue healing and may make ultrasound therapy unsafe.

4. Over Open Wounds or Infected Areas

Ultrasound should not be applied directly over open wounds, ulcers, or infected tissues. The heat and mechanical vibrations can exacerbate infection or delay healing. In cases where ultrasound is used to promote wound healing, special low-intensity, pulsed settings may be applied, but only under close medical supervision.

5. Over the Eyes, Heart, or Reproductive Organs

Certain sensitive areas require caution. Ultrasound therapy is contraindicated over the eyes because the

energy could damage delicate ocular structures. Similarly, applying ultrasound over the heart, especially in patients with pacemakers or other cardiac devices, is generally avoided to prevent interference. Reproductive organs also warrant caution due to potential risks of heat and mechanical effects.

6. Presence of Pacemakers or Electronic Implants

Patients with implanted electronic devices like pacemakers or neurostimulators should generally avoid ultrasound therapy near the site of the device. The ultrasound waves may interfere with device function, leading to unpredictable outcomes. Always consult with a healthcare professional before proceeding.

7. Acute Inflammation or Bleeding

During the acute phase of injury, when active inflammation or bleeding is present, ultrasound therapy may worsen the condition by increasing blood flow and swelling. It's better to wait until the inflammation subsides and the healing phase begins before initiating ultrasound treatments.

Additional Precautions and Considerations

While the above are primary contraindications, there are other situations where caution is advised. For example, individuals with implanted metal hardware (like joint replacements or screws) might tolerate ultrasound safely, but care must be taken to avoid overheating metal implants. Also, conditions such as deep vein thrombosis (DVT) demand careful evaluation, as ultrasound could dislodge clots.

Another important consideration is the dosage and mode of ultrasound. Continuous ultrasound produces more heat and is generally avoided in contraindicated areas, while pulsed ultrasound reduces thermal effects and may be safer in some borderline cases.

How to Identify Contraindications Before Treatment

Proper patient assessment is critical before starting ultrasound therapy. Healthcare providers typically perform a thorough medical history review and physical examination to identify any contraindications. Questions about existing medical conditions, implants, pregnancy status, and current symptoms help guide safe treatment planning.

In some cases, additional diagnostic tests or consultations with specialists may be necessary to clear the patient for ultrasound therapy or suggest alternative modalities.

Alternatives When Ultrasound Therapy Is Not an Option

When ultrasound therapy is contraindicated, other treatment options can be considered depending on the patient's condition. These may include:

- **Electrical Stimulation:** Techniques like TENS or NMES can help with pain relief and muscle activation without the risks associated with ultrasound.
- **Manual Therapy:** Hands-on techniques such as massage, mobilization, or manipulation can improve circulation and reduce muscle tension safely.
- **Cold Therapy:** Applying ice packs can reduce inflammation and pain, especially in acute injuries where ultrasound is contraindicated.
- **Laser Therapy:** Low-level laser therapy offers another option for stimulating tissue repair and pain control with minimal risks.

Discussing these alternatives with your healthcare provider can ensure you receive appropriate care tailored to your specific needs.

Understanding the Risks: Why Safety Comes First

It's easy to be excited about the benefits of ultrasound therapy, especially since it's non-invasive and widely accessible. However, understanding the contraindications to ultrasound therapy reinforces the importance of using this modality responsibly. Misuse or ignoring contraindications can lead to adverse effects ranging from mild discomfort to serious tissue injury.

Patients should always communicate openly with their therapists, reporting any unusual sensations or concerns during treatment. Likewise, clinicians must stay updated on best practices and contraindications to provide the safest and most effective care.

Exploring the contraindications to ultrasound therapy helps demystify the treatment and encourages a balanced approach—maximizing benefits while minimizing risks. Whether you're a patient considering ultrasound or a practitioner administering it, knowing when to avoid this therapy is just as important as knowing how to use it well.

Frequently Asked Questions

What are the primary contraindications to ultrasound therapy?

Primary contraindications to ultrasound therapy include areas over malignant tumors, pregnancy (especially over the abdomen or pelvis), over active infections, over the eyes, over the heart or carotid sinus, over areas with impaired sensation, and over areas with vascular insufficiency or thrombophlebitis.

Why is ultrasound therapy contraindicated over malignant tumors?

Ultrasound therapy is contraindicated over malignant tumors because the increased blood flow and cellular activity stimulated by ultrasound may potentially promote the growth and spread of cancer cells.

Is ultrasound therapy safe during pregnancy?

Ultrasound therapy is generally contraindicated over the abdomen and pelvic region during pregnancy due to the potential risk of harming the developing fetus. However, it may be used cautiously in other areas if necessary and under professional guidance.

Can ultrasound therapy be used over areas with impaired sensation?

Ultrasound therapy should be avoided over areas with impaired sensation because the patient may not be able to feel excessive heat or discomfort, increasing the risk of burns or tissue damage.

Why should ultrasound therapy be avoided over areas with active infections?

Ultrasound therapy is contraindicated over areas with active infections as it may exacerbate the infection by increasing circulation and spreading infectious agents, potentially worsening the condition.

Additional Resources

[Contraindications to Ultrasound Therapy: A Professional Overview](#)

Contraindications to ultrasound therapy are critical considerations for healthcare professionals employing this modality in physical therapy, rehabilitation, and pain management. Ultrasound therapy, which uses high-frequency sound waves to promote tissue healing, reduce inflammation, and alleviate pain, is widely regarded as a safe and non-invasive treatment option. However, like any therapeutic intervention, it carries specific risks when applied inappropriately or in patients with certain medical conditions. Understanding these contraindications is essential to maximize benefits while minimizing potential harm.

Understanding Ultrasound Therapy and Its Mechanisms

Ultrasound therapy operates by delivering sound waves at frequencies typically between 0.7 and 3.3 MHz. These waves penetrate soft tissues, causing microscopic vibrations that generate heat and mechanical effects such as increased cellular permeability and enhanced blood flow. The resulting physiological changes can accelerate tissue repair and reduce muscle spasms, making ultrasound a versatile tool in managing musculoskeletal disorders, post-surgical recovery, and chronic pain conditions.

Despite these advantages, the therapy is not universally suitable. Contraindications to ultrasound therapy exist primarily because the heat and mechanical energy can exacerbate certain pathologies, interfere with medical devices, or pose risks to vulnerable tissues.

Key Contraindications to Ultrasound Therapy

Malignancy and Cancerous Tissue

One of the most unequivocal contraindications is the presence of malignant tumors in the treatment area. Ultrasound's ability to increase cellular metabolism and blood flow could potentially accelerate tumor growth or metastasis. Consequently, practitioners avoid applying ultrasound directly over known or suspected cancerous lesions. This precaution aligns with oncological safety protocols, emphasizing caution in any therapeutic modality that influences cellular activity.

Pregnancy and Abdominal Area

Ultrasound therapy is generally contraindicated over the abdomen and pelvic regions of pregnant women. While diagnostic ultrasound is safe during pregnancy, therapeutic ultrasound's higher intensities and longer exposure raise concerns about fetal tissue exposure. The possibility of inadvertent heating or mechanical disruption to fetal structures necessitates strict avoidance in these regions. However, treatment on other body parts may be permissible with appropriate clinical judgment.

Active Infection or Inflammation

The presence of active infections or acute inflammation in the target area is a significant contraindication. Ultrasound can increase local circulation and metabolic activity, potentially spreading infectious agents or intensifying inflammatory responses. For example, applying ultrasound over cellulitis or abscesses may

worsen the condition or promote systemic involvement. As a result, therapy is deferred until infection control is achieved.

Impaired Sensation or Circulation

Patients with diminished sensory perception, such as those with diabetic neuropathy or spinal cord injuries, are at increased risk during ultrasound therapy. They may not accurately perceive excessive heat or discomfort, risking burns or tissue damage. Similarly, compromised circulation—common in peripheral vascular disease—can impair heat dissipation, increasing the likelihood of adverse thermal effects. Such factors mandate careful patient selection and technique modification.

Over Implanted Medical Devices

Ultrasound therapy should not be applied directly over implanted electronic devices like pacemakers, defibrillators, or neurostimulators. The sound waves and induced electrical currents could interfere with device function, leading to malfunctions or patient harm. Additionally, metallic implants such as joint prostheses or plates may reflect or intensify ultrasound energy, causing localized overheating.

Growth Plates in Children

In pediatric populations, ultrasound therapy is contraindicated over open epiphyseal (growth) plates. The potential for thermal or mechanical disruption to developing bone tissue raises concerns about growth abnormalities or damage. Consequently, clinicians exercise caution, favoring alternative treatments or using lower intensities with vigilant monitoring when addressing musculoskeletal issues in children.

Relative Contraindications and Precautions

While absolute contraindications require strict avoidance, several relative contraindications call for careful assessment and modification of treatment parameters rather than outright exclusion.

Thrombophlebitis and Deep Vein Thrombosis (DVT)

Applying ultrasound over areas affected by thrombosis may risk dislodging clots, leading to embolic events. Although the evidence is mixed, prudence dictates avoiding ultrasound in these contexts or proceeding only after thorough risk-benefit analysis.

Over the Eyes, Heart, and Reproductive Organs

Sensitive organs such as the eyes and heart are vulnerable to ultrasound's thermal and mechanical effects. Likewise, reproductive organs should be shielded unless otherwise justified. The proximity of these structures to the treatment site can influence technique and safety considerations.

Recent Fractures and Hemorrhagic Areas

Therapeutic ultrasound over recent fractures is typically contraindicated until initial healing phases have passed. The increased circulation and cellular activity might disrupt clot formation or exacerbate bleeding. Similarly, areas with active hemorrhage necessitate caution to avoid further tissue damage.

Integrating Contraindications into Clinical Practice

Healthcare providers rely on comprehensive patient histories, physical examinations, and sometimes imaging studies before initiating ultrasound therapy. Recognizing contraindications to ultrasound therapy ensures personalized treatment plans that enhance efficacy and safety.

Incorporating these factors into electronic health records and treatment protocols streamlines decision-making and minimizes risks. Furthermore, patient education about potential side effects and contraindications fosters informed consent and adherence.

Comparative Safety: Ultrasound Therapy Versus Other Modalities

Compared to other physical therapy modalities such as electrical stimulation or heat packs, ultrasound therapy offers deeper tissue penetration and targeted effects. However, this advantage also introduces unique contraindications related to its capacity to generate thermal and mechanical energy at depth.

While electrical stimulation is contraindicated in patients with pacemakers similar to ultrasound, superficial heating methods may be safer in individuals with impaired circulation or sensation. Hence, contraindications to ultrasound therapy influence modality selection and treatment customization.

Emerging Research and Future Directions

Ongoing studies investigate the fine-tuning of ultrasound parameters to expand safe usage and potentially

reduce contraindications. Low-intensity pulsed ultrasound (LIPUS), for example, shows promise in promoting bone healing with minimal thermal effects, potentially widening therapeutic windows.

Additionally, advancements in imaging-guided ultrasound delivery may allow more precise targeting, avoiding contraindicated areas. However, until robust evidence supports these innovations, adherence to established contraindications remains paramount.

The landscape of contraindications to ultrasound therapy underscores the need for continuous professional education and clinical vigilance. By carefully evaluating patient-specific factors and treatment settings, practitioners can harness ultrasound's benefits while safeguarding against adverse outcomes.

Contraindications To Ultrasound Therapy

contraindications to ultrasound therapy: Rehabilitation of Musculoskeletal Injuries

Peggy A. Houglum, Kristine L. Boyle-Walker, Daniel E. Houglum, 2022-11-17 Rehabilitation of Musculoskeletal Injuries, Fifth Edition With HKPropel Online Video, presents foundational concepts that support a thorough understanding of therapeutic interventions and rehabilitative techniques. Accompanying video demonstrates challenging or novel rehabilitative techniques.

contraindications to ultrasound therapy: Physical Medicine and Rehabilitation

Joel A. DeLisa, Bruce M. Gans, Nicholas E. Walsh, 2005 The gold-standard physical medicine and rehabilitation text is now in its Fourth Edition—with thoroughly updated content and a more clinical focus. More than 150 expert contributors—most of them new to this edition—address the full range of issues in contemporary physical medicine and rehabilitation and present state-of-the-art patient management strategies, emphasizing evidence-based recommendations. This edition has two separate volumes on Physical Medicine and Rehabilitation Medicine. Each volume has sections on principles of evaluation and management, management methods, major problems, and specific disorders. Treatment algorithms and boxed lists of key clinical facts have been added to many chapters.

contraindications to ultrasound therapy: Clinical Sports Medicine

Walter R. Frontera, 2007-01-01 Accompanying CD-ROM contains ... convenient electronic access to the text's illustrations, downloadable for use in presentations, as well as diagnosis-specific office handouts that can be given to patients who want to know more about their conditions.--P. [4] of cover.

contraindications to ultrasound therapy: Current Therapy in Pain

Howard S. Smith, 2009-01-01 This unique resource focuses on the diagnosis and treatment of painful conditions-both acute and chronic-from a multi-disciplinary perspective. Joined by a team of nearly 200 international contributors representing a wide range of specialties, Dr. Smith presents the best management options within and across specialties. Succinct treatment and therapy guidelines enable you to quickly access clinically useful information, for both inpatient and outpatient pain management, while a 2-color format enhances readability and ease of use and highlights key concepts. And, as an Expert Consult title, it includes access to the complete contents online, fully searchable, plus links to Medline and PubMed abstracts-providing rapid, easy consultation from any computer! Includes access to the complete text online, fully searchable, plus links to Medline and PubMed abstracts-providing quick and convenient reference from anyplace with an Internet connection. Offers a cross-discipline approach to pain management for a comprehensive view of the best treatment options within and across specialties including internal medicine, gynecology, physical medicine and rehabilitation, orthopedics, and family medicine. Provides succinct treatment and

therapy guidelines, enabling you to locate useful information quickly. Organizes guidance on acute and chronic therapies in a templated format, to facilitate consistent, quick-access consultation appropriate for inpatient or outpatient pain management. Features a 2-color format that enhances readability and ease of use and highlights key concepts. Your purchase entitles you to access the web site until the next edition is published, or until the current edition is no longer offered for sale by Elsevier, whichever occurs first. If the next edition is published less than one year after your purchase, you will be entitled to online access for one year from your date of purchase. Elsevier reserves the right to offer a suitable replacement product (such as a downloadable or CD-ROM-based electronic version) should access to the web site be discontinued.

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contraindications to ultrasound therapy: Routledge Handbook of Sports Therapy, Injury Assessment and Rehabilitation Keith Ward, 2015-09-16 The work of a sports therapist is highly technical and requires a confident, responsible and professional approach. The Routledge Handbook of Sports Therapy, Injury Assessment and Rehabilitation is a comprehensive and authoritative reference for those studying or working in this field and is the first book to comprehensively cover all of the following areas: Sports Injury Aetiology Soft Tissue Injury Healing Clinical Assessment in Sports Therapy Clinical Interventions in Sports Therapy Spinal and Peripheral Anatomy, Injury Assessment and Management Pitch-side Trauma Care Professionalism and Ethics in Sports Therapy The Handbook presents principles which form the foundation of the profession and incorporates a set of spinal and peripheral regional chapters which detail functional anatomy, the injuries common to those regions, and evidence-based assessment and management approaches. Its design incorporates numerous photographs, figures, tables, practitioner tips and detailed sample Patient Record Forms. This book is comprehensively referenced and multi-authored, and is essential to anyone involved in sports therapy, from their first year as an undergraduate, to those currently in professional practice.

contraindications to ultrasound therapy: Orthopaedic Physical Therapy Secrets - E-Book Jeffrey D. Placzek, David A. Boyce, 2023-12-26 Unlock the secrets to passing the Orthopaedic Certified Specialist (OCS) exam with this comprehensive Q&A review! Offering a unique question-and-answer format, Orthopaedic Physical Therapy Secrets, 4th Edition helps you build the knowledge and skills needed to pass orthopaedic and sports certification specialty exams. The book introduces basic physical therapy concepts and then covers different healing modalities, clinical specialties, and orthopedic procedures typically prescribed for common injuries such as those to the shoulder, hand, wrist, spine, and knee. From a team of PT experts led by Jeffrey D. Placzek and David A. Boyce, this review also serves as a useful reference for practitioners who wish

to provide the latest in evidence-based care. - Coverage of topics found on the orthopedic specialty exam makes this a valuable resource for study and review. - Wide scope of orthopedic coverage includes specialties ranging from anterior knee pain to X-ray imaging, featuring topics such as therapeutic dry needling plus functional movement screening and assessment. - Annotated references provide a useful tool for further reading and research. - Review questions are consistent with the level of difficulty encountered on the orthopedic or sports specialty examinations. - Evidence-based content is based on the latest orthopedic research. - Clinical tips provide guidance for a variety of physical therapy tasks and situations. - Charts, tables, and algorithms summarize information in logical, quick-reference frameworks. - NEW! Updated content reflects contemporary practice standards and provides the current information you need to pass the Orthopaedic Certified Specialist (OCS) examination. - NEW! eBook version is included with print purchase. The eBook allows you to access all of the text, figures and references, with the ability to search, customize your content, make notes and highlights, and have content read aloud. - NEW! Updated references ensure that information is based on the latest scientific literature.

contraindications to ultrasound therapy: Treatment and Rehabilitation of Fractures Stanley Hoppenfeld, Vasantha L. Murthy, 2000 Written by leading orthopaedists and rehabilitation specialists, this volume presents sequential treatment and rehabilitation plans for fractures of the upper extremity, lower extremity, and spine. The book shows how to treat each fracture--from both an orthopaedic and a rehabilitation standpoint--at each stage of healing. Each chapter on an individual fracture is organized by weekly postfracture time zones. For each time zone, the text discusses bone healing, physical examination, dangers, x-rays, weight bearing, range of motion, strength, functional activities, and gait/ambulation. Specific treatment strategies and rehabilitation protocols are then presented. More than 500 illustrations complement the text.

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know before and after reading. Reading and practice assignments include recommended prerequisite knowledge and experience. Well-illustrated text includes line diagrams, photographs, and radiographs to clarify important concepts. New chapters on Hydrotherapy and Gait present current knowledge on these areas. Chapters have been updated to include more information on the upper limb. Chapters on Decision Making and Clinical Reasoning in Orthopaedics and Gait Analysis in the Clinical Situation have been thoroughly updated and revised.

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bladder, rehabilitation and prosthetic restoration in upper limb amputation, and acute medical conditions including cardiac disease, medical frailty, and renal failure. - Discusses quality and outcome measures for medical rehabilitation, practical aspects of impairment rating and disability determination, integrative medicine in rehabilitation, and assistive technology. - Offers highly illustrated, templated chapters that are easy to navigate without sacrificing coverage of key topics. - Includes access to dozens of even more practical videos and hundreds of integrated self-assessment questions for more effective learning and retention. - Enhanced eBook version included with purchase. Your enhanced eBook allows you to access all of the text, figures, and references from the book on a variety of devices.

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Olga Dreeben-Irimia, 2013 *Physical Therapy Clinical Handbook for PTAs*, Second Edition, is a concise and condensed clinical pocket guide designed specifically to help physical therapist assistants and physical therapist assistant students easily obtain helpful evidence-based information. This succinct, summarizing pocket-guide covers the evaluative as well as interventional aspect of physical therapy and offers immediate guidance concerning physical therapy data collection and interventions in various clinical settings including musculoskeletal, neurologic, cardiopulmonary, integumentary, geriatric, pediatric and acute care. With its portable and user-friendly format, this handbook is a valuable resource for physical therapist assistant students during the education training program and throughout clinical practice. The Second Edition features a new and unique look at physical therapy in acute care provided by PTAs. Acute care topics include musculoskeletal and neurological acute care, as well as the significant factors in acute care to consider while applying physical therapy to patients with endocrine, gastrointestinal, genitourinary, and oncological disorders/diseases. The Second Edition contains physical therapy terminology reflecting current physical therapy practice according to the APTA's Guide to Physical Therapist Practice and also includes guidelines from the CDC and JCAHO. Appendices contain helpful balance assessment forms, and cardiac and integumentary patient education forms.

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James P. Rathmell, Christopher L. Wu, Dennis C. Turk, Charles E. Argoff, Robert W Hurley, 2013-09-12 Obtain all the core knowledge in pain management you need from one of the most trusted resources in the field. The new edition of *Practical Management of Pain* gives you completely updated, multidisciplinary overview of every aspect of pain medicine, including evaluation, diagnosis of pain syndromes, rationales for management, treatment modalities, and much more. In print and online, it is all the expert guidance necessary to offer your patients the best possible relief. In summary, this is the best explanation of what lies behind MRI that I have read, taking what can be a dry subject and making it readily understandable and really interesting. I would recommend it to anyone starting their MRI training and anyone trying to teach MRI to others. Reviewed by RAD Magazine, June 2015 Understand and apply the latest developments in pain medicine with brand-new chapters covering disability assessment, central post-stroke pain, chronic widespread pain, and burn pain. Effectively ease your patients' pain with today's best management techniques, including joint injections, ultrasound-guided therapies, and new pharmacologic agents (such as topical analgesics). Access up-to-the-minute knowledge on all aspects of pain management, from general principles to specific management techniques, with contributions from renowned experts in the field. Read the full text and view all the images online at expertconsult.com. Understand and apply the latest developments in pain management with brand-new chapters covering disability assessment, central post-stroke pain, widespread chronic pain, and burn pain. Effectively ease your patients' pain with today's best management techniques, including joint injections, ultrasound-guided therapies, and new pharmacologic agents (such as topical analgesics).

contraindications to ultrasound therapy: DOWNER'S PHYSICAL THERAPY

PROCEDURES R. Eric Oestmann, 2011-11-01 This revised and expanded edition-now in an easily readable outline form-focuses on step-by-step application of major treatment techniques currently in use. It opens with the advantages, disadvantages, indications, precautions, contraindications, goals,

and effects for all treatments. These categories are included in the various chapters, and are absolutely essential for practitioners to provide effective and efficient treatments that are safe and reimbursable. Each of the modalities listed in the book has a Central Procedure Code (CPT) associated with it which is important to note for reimbursement purposes and appear at the beginning of each chapter. New to this edition is the reasoning and justification for the application instructions. Detailed instructions for therapeutic exercise, massage, mobilizations, passive and active range of motion, electrical stimulation, ultraviolet, and traction are given, with new and additional illustrations. While the fundamental format covering the superficial heating modalities including warm whirlpool, hydrocollator and instant hot packs, melted paraffin, infrared radiation, and fluidotherapy has remained the same, these topics have been revised and updated. The list of equipment manufacturers has been updated and remains an excellent source for information. This text continues to fulfill the existing need within the field for an up-to-date, precise, and comprehensive book that details the development that is necessary for physical therapy students, practitioners, athletic trainers, sports medicine professionals, and rehabilitation therapists.

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