Clinical Practice Guideline: **Dry Needling**

Date of Implementation: **April 17, 2014**

Product: **Specialty**

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Revised – October 17, 2024
To CQT for review 09/09/2024
CQT reviewed 09/09/2024
To QIC for review and approval 10/01/2024
QIC reviewed and approved 10/01/2024
To QOC for review and approval 10/17/2024
QOC reviewed and approved 10/17/2024

GUIDELINES

American Specialty Health – Specialty (ASH) considers dry needling unproven given insufficient evidence to support any conclusions related to health outcomes and benefits for all indications, including but not limited to:

- Myofascial Pain Syndrome (MPS)
- Musculoskeletal pain; including carpal tunnel syndrome, lateral epicondylitis, shoulder impingement, and others
- Osteoarthritis and rheumatoid arthritis
- Temporomandibular joint disorders

Additional clinical trials are required to determine the effectiveness of dry needling for the treatment of MPS and any other condition in order to determine its benefit-risk profile.

CPT® Code and Description

CPT® Code	CPT® Code Description
20560	Needle insertion(s) without injection(s); 1 or 2 muscle(s)
20561	Needle insertion(s) without injection(s); 3 or more muscles

For more information, see ASH *Techniques and Procedures Not Widely Supported as Evidence Based (CPG 133 – S)* clinical practice guideline.

Patients must be informed verbally and in writing of the nature of any procedure or treatment technique that is considered experimental/investigational or unproven, poses a significant health and safety risk, and/or is scientifically implausible. If the patient decides to receive such services, they must sign a *Member Billing Acknowledgment Form (*for Medicare use *Advance Beneficiary Notice of Non-Coverage form*) indicating they understand they are assuming financial responsibility for any service-related fees. Further, the patient must sign an attestation indicating that they understand what is known and unknown about, and the possible risks associated with such techniques prior to receiving these services. All procedures, including those considered here, must be documented in the medical record. Finally, prior to using experimental/investigational or unproven procedures, those that pose a significant health and safety risk, and/or those considered scientifically implausible, it is incumbent on the practitioner to confirm that their professional liability insurance covers the use of these techniques or procedures in the event of an adverse outcome.

DESCRIPTION/BACKGROUND

Dry needling is a relatively new method of pain management in the United States. It has been performed in other countries with different variations for quite some time. There are 3 main theoretical approaches to dry needling that are based on different hypotheses and anatomical models:

1. Myofascial trigger point
2. Radiculopathy
3. Spinal segmental sensitization

<u>Myofascial Trigger Point Model</u>

Myofascial trigger points (MTrPs) are defined as "hyperirritable spots in skeletal muscle associated with hypersensitive palpable nodules in a taut band" (Simons et al., 1998). These are characteristic of myofascial pain syndrome (MPS). Findings suggest that MPS is a complex form of neuromuscular dysfunction consisting of both motor and sensory abnormalities involving both the peripheral and central nervous systems (Shah and Gilliams, 2008). MTrPs are painful upon compression and can give a characteristic pain referral pattern. They can also give rise to referred tenderness, autonomic responses, motion restriction, and motor dysfunction. More specifically, trigger points are classified into active and latent trigger points. An "active" trigger point refers pain at rest, upon direct palpation, and with activity. On the other hand, "latent" trigger points are also painful upon compression but do not give off the characteristic referral pattern for the specific muscle while at rest. Identification of MTrPs by palpation (flat or pincer technique) includes the following features:

- Identification of a taut muscle band containing a discrete palpable nodule
- Focal tenderness
- Spontaneous exclamation of pain by the patient (e.g., "jump sign", whole body movement) in response to digital pressure or dry needling

- Consistent and reproducible pattern of referred pain
- A local twitch response [LTR (muscle fasciculation)] by snapping or palpation
- Electromyogram (EMG) demonstration of end plate noise (Simons et al., 1998; Shah and Gilliams, 2008; Dommerholt and Huijbregts, 2011; Sari et al., 2012)

Referred pain, LTR and EMG demonstration are not essential for clinical diagnosis but can be considered confirmatory observations (Dommerholt and Huijbregts, 2011). MTrPs are thought to form due to acute trauma or repetitive microtrauma, lack of exercise, nutritional deficiencies, postural faults, joint problems with dysfunctional movement patterns, proximal nerve compression and muscle spasm, muscle overload, and emotional stress (Shah et al., 2008; Simons et al., 1998; Dommerholt and Huijbregts, 2011). The mechanism underlying the development of MTrPs is not completely understood, but recent technological advances are assisting in further understanding. MTrPs are hypothesized to be a result of altered activity of the motor end plate or neuromuscular junction. Changes in acetylcholine receptor activity, numbers of receptors and in acetylcholinesterase (AChE) activity affect end plate activity. According to EMG studies, there is an increase in the frequency of miniature end plate potential activity at the point of maximum tenderness and in the neuromuscular junction end plate zone of the taut band. This has been labeled as spontaneous electrical activity (SEA) and it is generated at the MTrP loci and not seen elsewhere in surrounding tissue (Hubbard and Berkoff, 1993). This has been confirmed by other studies (Hong and Torigoe, 1994; Gerwin and Duranleau, 1997; Chen et al., 2001; Couppe et al., 2001; Simons et al., 2002; Simons and Dommerholt, 2007; Dommerholt et al., 2010; Ge et al., 2011).

Shah et al. (2008) determined that several biochemical changes commonly occur at active MTrPs using microdialysis sampling techniques. The findings include excessive release and elevation of acetylcholine, elevated calcitonin gene-related peptide (CGRP) levels, increased bradykinin, substance P, and cytokines [tumor necrosis factor alpha (TNF-α) and interleukin 1 (IL-1)], and decreased pH. The excessive acetylcholine is due to the fact that acetylcholinesterase cannot function as well in an acidic environment, which was also noted. These nociceptive chemicals which have been detected in abnormal high concentrations in MTrPs such as bradykinin, CGRP and substance P are active in the following ways: 1) bradykinin is a nociceptive agent that stimulates the release of tumor necrosing factor and interleukins, some of which can stimulate further release of bradykinin; 2) calcium gene-related peptide (CGRP) modulates synaptic transmission at the neuromuscular junction by inhibiting the expression of AChE; and 3) substance P alters the local microcirculation and vessel permeability (Shah et al., 2008). In general, these chemicals create an environment of hyper-nociception and inflammation.

Researchers, Dr. Janet Travell and Dr. David Simons, are key educators of the importance of myofascial pain and trigger points in musculoskeletal conditions. Simons introduced the Integrated Trigger Point Hypothesis, that postulates a local energy crisis resulting from the dysfunctional endplates at active loci, which brings together many of these concepts. MTrPs produce spontaneous electrical activity, which is end plate noise due to excessive acetylcholine. This results in muscle shortening, local ischemia, sensitizing substance increase, nociceptive pain and autonomic stimulation (Simons and Dommerholt, 2007). Muscle shortening or contracture compromises the local circulation, causing ischemia, which has been confirmed via measurement of oxygen saturation levels. This severe hypoxia in MTrPs leads to the release of sensitizing substances and activates muscle nociceptors. In support of the shortened muscle concept, Wang and Yu (2000) hypothesized that MTrPs are severely contracted sarcomeres whereby myosin filaments get stuck in the titin gel at the Z-band. Titin is the largest protein that connects the Z-band with myosin filaments within the sarcomere. Histologic studies have confirmed the presence of extremely contracted sarcomeres that result in hypoxia. From here, the cascade of events progresses as described above. In summary, it can be concluded that MTrPs act as peripheral nociceptors that can heighten and preserve sensory signals from the central nervous system. This can result in new areas of pain referral via peripheral nociceptive input because these MTrPs can influence dorsal horn receptors that normally only process information from remote body regions (Simons and Dommerholt, 2007).

Radiculopathy Model

Dr. Chan Gunn developed the "radiculopathy model." He also established a system for the diagnosis and treatment of myofascial pain syndromes known as Intramuscular Stimulation (IMS). IMS applies Cannon's Law, which causes the muscular system to display a contracted and hypersensitive state of pain and orthopedic dysfunction. Gunn believed that myofascial pain is always secondary to nerve compression or irritation in the form of peripheral neuropathy or radiculopathy. Therefore, myofascial pain is a result of neuropathic pain in the musculoskeletal system. Features of neuropathic pain include dysesthesia or deep aching, pain felt in region of sensory deficit, paroxysmal brief shooting or stabbing pain, allodynia, loss of joint range or pain caused by the mechanical effects of muscle shortening, autonomic symptoms, and muscle shortening in peripheral and paraspinal muscles.

Theoretically, shortened muscle from the neuropathy would compress and lead to "supersensitive nociceptors," which generate pain. This theory is based on Cannon and Rosenblueth's "Law of Denervation." This law states that the function and integrity of innervated structures is dependent upon the free flow of nerve impulses to provide a regulatory or trophic effect. When the flow is restricted, the innervated structures become atrophic, highly irritable, and sensitive. Because striated muscle is the most sensitive of innervated structures, Gunn states that it is the key to myofascial pain of neuropathic origin. This results in overreaction of muscle fibers to a wide variety of chemical and physical inputs (Dommerholt, 2005). According to Gunn, the mechanical effects of muscle shortening may result in many commonly seen musculoskeletal conditions, including tendonitis and arthralgia. When considering the paraspinal musculature, muscle shortening would preserve radiculopathy by disc compression, narrowing of the disc space and/or application of pressure directly on the nerve root. In Gunn's model, MTrPs do not play a major role but rather the posterior and anterior rami dominate. Given the segmental influence of the rami on the paraspinal and deep lumbar musculature, treatment must always treat the affected area of paraspinals as well as the peripheral muscles involved in the particular nerve root. Gunn assesses specific motor, sensory, and trophic changes to determine which levels are affected from a neuropathic standpoint. Unfortunately, Gunn's model was not developed beyond what he theorized in 1973. Case reports and review articles restating what was described above have been published but much of what his theory is based on has been refuted by recent research. His major input presently is the notion of segmental dysfunction and the need to consider this when developing treatment interventions.

Spinal Segmental Sensitization Model

This model was developed by Dr. Andrew Fischer and is a combination of the previous two theories; with an acknowledgment that central sensitization is often due to ongoing peripheral nociceptive input. Sensitization of both peripheral and central afferents is responsible for the transition from normal to abnormal pain perception in the central nervous system that outlasts the actual noxious peripheral stimuli. Continual input from peripheral muscle nociceptors may lead to changes in function and connections of sensory dorsal horn neurons via central sensitization (Dommerholt et al., 2010; Dommerholt, 2011). As an example, noxious stimuli from an active MTrP may sensitize dorsal horn neurons, leading to hypersensitivity and allodynia, as well as an increased area of referred pain. This results in hyperexcitation of nociceptor neurons and induces apoptosis of inhibitory interneurons (Simons and Dommerholt, 2007). This noxious barrage of input from the periphery results in chronic alterations in the central nervous system. In this state, substance P is released at the dorsal horn and astrocytes and microglia are activated and can produce cytokines (TNF-α, IL-1, IL-6) that sensitize neurons and generate this hyperalgesia (Simons and Dommerholt, 2007; Watkins et al., 2007). Srbely et al. (2010) tested the hypothesis that dry needle stimulation of an MTrP evokes segmental anti-nociceptive effects in a double-blind RCT of 40 subjects. Results demonstrated that 1 intervention of dry needling to a single MTrP evokes short term segmental anti-nociceptive effects. Authors concluded that the pain-relieving effects occurred due to modulation of segmental mechanisms and may be an important consideration in the management of MPS (Srbely et al., 2010).

Dry Needling

There are several interventions for MPS and soft tissue dysfunction. Dry needling has been proposed as an effective non-pharmacologic treatment that is thought to induce changes in the MTrPs (Hong, 1994; Langevin, 2008; Dommerholt, 2005). Other terms may be used to describe dry needling, such as intramuscular manual therapy, trigger point

CPG 178 Revision 11 – S
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Revised – October 17, 2024
To CQT for review 09/09/2024
CQT reviewed 09/09/2024
To QIC for review and approval 10/01/2024
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dry needling, or intramuscular needling. According to the Virginia Board of Physical Therapy Task Force on Dry Needling, “Intramuscular Manual Therapy (Dry Needling) is a technique used to treat myofascial pain that uses a dry needle, without medication, that is inserted into a trigger point with the goal of releasing/inactivating the trigger points and relieving pain.” According to the “Intramuscular Manual Therapy (Dry Needling) Resource Paper” published by the Federation of State Boards of Physical Therapy (FSBPT) on March 8, 2010, “there are numerous scientific studies to support the use of dry needling for a variety of conditions.” Dry needling is a technique that inserts a needle without medication into a myofascial trigger point with the goal to relieve pain, increase blood flow and improve function. Janet Travell, the former White House physician who treated former president John F. Kennedy’s low back pain with dry needling, identified trigger points as hyperirritable and sensitive palpable nodules in a taut band located within skeletal muscle. Travell first described the use of MTrP injections in the treatment of myofascial pain in 1942 (Travell et al., 1942). Her work led to the development of the dry needling technique; differing from her injection treatment, given no substances are used. In 1979, Lewit coined the term “needle effect” as the immediate analgesia that occurs by the delivery of the needle into the tender spot. His study demonstrated that the effectiveness of treatment was related to the intensity of pain produced at the trigger area and to the accuracy with which the site of maximal tenderness was located by the needle. In this paper, he also suggested upon review of techniques that the most important component of the injection was the puncture of the needle and not the anesthetic used. (Lewit, 1979). Since that time, other researchers have made the same finding (Simons et al., 1998; Hong, 1994; Kamanli et al., 2005; Cummings and White, 2001; Ay et al., 2010).

Simply stated, dry needling techniques utilize a fine gauge solid sterile needle for insertion into the MTrP followed by manipulation of the needle until several LTRs are induced if possible. The FDA classifies these needles as Class II medical devices ranging in length from 1.5 to 130 mm. Needles are not left in situ but are removed once the MTrP is inactivated. Dry needling is based on the traditional Western medical model for examination and evaluation to determine a diagnosis. Western anatomy, physiology, neurology, biomechanics and manual palpation and therapy skills are utilized. Red flag and yellow flag recognition is also included. The site of needle insertion into MTrPs is based on physical findings, although many practitioners may rely on trigger point mapping to assist them. The most common sites for this treatment include neck, shoulder, hip, and paraspinal musculature. The depth of needle penetration varies from superficial to deep and is dependent upon the location of the targeted tissue.

More specifically, dry needling appears to have three effects: mechanical, neurophysiologic, and chemical. Corrective exercises should be performed upon inactivation of MTrPs (Furlan et al., 2005).

Mechanical Effects

Direct mechanical stimulation appears to induce connective tissue remodeling and plasticity that interrupts the pathologic mechanism of MTrPs. Dry needling has been proposed to disrupt the integrity of the motor end plate of the MTrP. Placement of the needle into the shortened sarcomere may place a localized stretch on these contracted structures, which may disentangle the myosin filament from the titin gel at the Z-band. Through this mechanism, the resting length of the sarcomere can be achieved through reduction of actin and myosin overlap. Manipulation of the needle during insertion may further assist in this relaxation by winding the connective tissue up- leading to "needle grasp." Research has demonstrated that the orientation of collagen following needle insertions with and without manipulation was more parallel and organized after needle manipulation (Langevin et al., 2001 and 2004). As a result of the mechanical stimulation, group II fibers change length, which may induce the gate control system by blocking nociceptive input from the MTrP and achieving pain reduction (Baldry, 2002). The mechanical pressure of the needle has also been associated with the change in electrical activity observed post needling by elicitation of the LTR (Liboff, 1997). Rha et al. (2011) used guided ultrasound to determine presence of LTRs and noted that in the deep back musculature; often a LTR is noted on ultrasound but is not visibly seen. Researchers suggest that ultrasound guidance may improve the therapeutic efficacy of trigger point injection for treating MTrPs in the deep muscles (Rha et al., 2011).

Neurophysiologic Effects

Baldry, Gunn, and Fischer all support the neurophysiologic explanation of the effects of dry needling. Baldry (2002) concludes that dry needling creates long term activation of A-nerve fibers which may activate opioid mediated pain suppression. Another explanation may be the activation of serotonergic and noradrenergic descending inhibitory systems, which block noxious stimulus into the dorsal horn.

Chemical Effects

Shah and colleagues demonstrated that increased levels of certain chemicals, such as bradykinin, substance P, CGRP, and others are reduced immediately after dry needling and LTR (Shah et al., 2005, 2008; Vulfsons et al., 2012). Through real time ultrasound studies, the taut band and reduced blood flow have been identified. Upon needling, the hypoxic setting is alleviated with an immediate influx of blood, whereby these pain-inducing chemicals can by dissipated from the area and taken up by the body (Vulfsons et al., 2012; Cagnie et al., 2012; Maher et al., 2013; Turo et al., 2013; Sikdar et al., 2008, 2009, 2010).

Dry Needling Techniques

Travell pioneered the use of MTrP injections that eventually led to the development of dry needling. There are 3 techniques of dry needling: Superficial dry needling, deep dry needling, and intramuscular electric stimulation. Typically, when the term dry needling is

To CQT for review 09/09/2024
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used, it is in reference to deep dry needling. Superficial needling will be specifically identified or called out because it doesn't provide the mechanical effects to the muscle, nor does it have the profound biochemical effects as when an LTR is elicited during deep dry needling. It targets the peripheral sensory afferents primarily and not the dysfunctional motor units like deep dry needling does (Baldry, 1995). It is also performed less commonly, though Baldry (2002) is a proponent of superficial dry needling except when nerve root compression exists. Kalichman and Vulfsons (2010) suggest using superficial dry needling when the risk of injury is increased, such as when needling over the lung fields or in the presence of large blood vessels. Intramuscular electrical stimulation is simply an additional technique added to deep dry needling to provide further muscle contractions through the needle within the targeted muscle. Deep dry needling is used when mechanical stimulation or deformation of a sensitized MTrP can produce a patient's complaint of pain. It is also necessary when the pain originates from deeper structures such as the multifidi, piriformis, or supraspinatus. Also, given that dry needling is most effective when an LTR is elicited, it is important to go deep enough to promote this while confirming that the needle is placed correctly in the taut band. Interestingly, Fernández-de-Las-Peñas et al. (2022) compared the clinical effects of needling interventions eliciting local twitch responses (LTRs) versus needling without eliciting LTRs when applied to muscle trigger points (TrPs) associated with spinal pain of musculoskeletal origin. Six trials were included. The application of a needling intervention eliciting LTRs was associated with a significant reduction in pain intensity immediately after treatment when compared to the same needling intervention without elicitation of LTRs. No effect at short-term follow-up was observed. No significant differences based on elicitation or non-elicitation of LTRs were found in related disability or pressure pain thresholds. Authors concluded that low-level evidence suggests an immediate effect of obtaining LTRs during needling interventions on pain intensity, with no significant effects on related disability or pressure pain sensitivity in spinal pain disorders associated with muscle TrPs. Superficial dry needling has been found to be effective, however to a lesser extent than deep dry needling (Kalichman and Vulfsons, 2010). Superficial dry needling was initially used due to concerns of causing a pneumothorax when needling a patient deeply, therefore the technique was altered so that the needle is just inserted into the tissue just overlying the MTrP and left in for a short time. Some research demonstrates that using this technique abolishes the excessive tenderness at the MTrP and alleviates the pain (Baldry, 2002; Dommerholt, 2006; Edwards and Knowles, 2003). The needling procedures can be easily combined with electrical stimulation. The best results are achieved when the needles are placed within the dermatomes corresponding to the local pathology and deep needling techniques are utilized (Couto et al., 2013; Kim et al., 2012).

EVIDENCE REVIEW

Clinical Studies

Upper Quadrant Myofascial Pain Syndrome

Published literature in this area has increased substantially over the recent past in attempts to identify the effectiveness and efficacy of dry needling on patients with MPS. Huang et al. (2011) evaluated outcomes in patients who have received dry needling treatments and also identified prognostic factors that may influence these outcomes. Using a prospective cohort design with 92 patients following an 8 week dry needling-stretching protocol for chronic musculoskeletal pain, results demonstrated reduced pain and improved quality of life. Each patient received 8 weekly treatments whereby accurate needling was confirmed by reproduction of pain and/or an LTR. Outcomes were measured at 2, 4, and 8 weeks. Pain reduction occurred at each point in time, with the greatest effect size at 2 weeks. Prognostic factors associated with poorer outcomes included longer duration of symptoms, repetitive work, and sleep deprivation. Limitations included a lack of control group (Huang et al., 2011).

In another study, Ay et al. (2010) aimed to compare the efficacy of local anesthetic injection and dry needling methods on pain, cervical range of motion (ROM), and depression in MPS patients. This study was designed as a prospective randomized controlled study. Subjects included 80 patients diagnosed with MPS who were randomly assigned into two groups. One group received local anesthetic injection of lidocaine and the other group received dry needling to MTrPs. Both patient groups were given home stretching exercises for the trapezius muscle. Significant improvements were noted in pain. Outcomes were measured using the Visual Analog Scale (VAS), cervical ROM, Beck Depression Scores after 4 and 12 weeks for both groups. No significant differences were noted between groups. The authors concluded that dry needling was shown to be clinically and statistically beneficial in treating patients with MPS of the trapezius (Ay et al., 2010). Hsieh et al. (2007) investigated changes in PPT of remote MTrPs after dry needling the key active MTrP. 14 patients with bilateral shoulder pain and active MTrPs in infraspinatus muscles participated in this single blinded within-subject design study. An MTrP in the infraspinatus muscle on a randomly selected side was dry needled, and the MTrP on the contralateral side was not and served as a control. Shoulder pain intensity, shoulder internal rotation ROM, and PPT of the MTrPs in the infraspinatus, anterior deltoid, and extensor carpi radialis longus muscles were measured on both sides before and immediately after dry needling. Results demonstrated that both active and passive ROM of shoulder internal rotation and PPT of infraspinatus MTrPs were significantly increased. Pain intensity of the treated shoulder was significantly reduced as well. No significant changes were noted for the control side. The authors concluded this study provides evidence that inactivation of primary MTrPs inhibit the activity in remote MTrPs noted in the area where pain was referred, suggesting a spinal cord mechanism for this finding.

Tsai et al. (2010) investigated the remote effect of dry needling on the irritability of a myofascial trigger point in the upper trapezius muscle. A total of 35 patients with unilateral active MTrPs in the upper trapezius muscle were randomly divided into 2 groups. One group received sham needling and the other received dry needling into MTrPs in the extensor carpi radialis longus muscle. Pain, PPT, and neck ROM were measured pre- and post- treatment. Results demonstrated an improvement in all parameters in the study group compared to the control group. The implications of this study are that dry needling a distal MTrP can reduce the irritability of a proximal MTrP. Ga et al. (2007) explored whether dry needling of MTrPs with and without paraspinal needling for elderly patients with MPS differ in outcomes. 40 subjects were randomized into 2 groups. One received dry needling and the other groups received IMS, indicated needling of corresponding segmental cervical multifidi. Outcome measures included pain rating, PPT rating, and cervical ROM. Depression was also evaluated by the Geriatric Depression Scale-Short Form. At 12 weeks, dry needling at both distal and proximal sites was more effective in reducing pain, improving depression ratings and cervical ROM than just dry needling without including proximal paraspinals (Ga et al., 2007). Shah et al. (2005) used microdialysis sampling of the trapezius to measure the local biochemical milieu at specific points in the upper trapezius muscle. Based on evaluation, Group 1 was established as normal, Group 2 as latent, and Group 3 as active. Samples were obtained before needle movement, during needle advancement and LTR, and after the LTR, for a total of 15 minutes. Results demonstrated that specific chemicals (e.g., SP, CGRP, bradykinin, TNF-α, IL-1) were higher than the latent and normal samples. There was no overall difference between latent and normal points. At post LTR, concentrations of certain chemicals, such as SP and CGRP, were lower than prior to LTR. In a second study, similar sampling was done but in addition to the upper trapezius, sampling was done pre- and post- needling at a remote site with no MTrPs (gastrocnemius). Findings were confirmed for the upper trapezius as in the previous study, including additional analysis of IL-6 and IL-8. Findings demonstrated that the active group had the largest and most elevated levels, the latent group with an intermediate response and the control group the lowest. Despite gastrocnemius findings showing lower concentrations, abnormalities were noted. Explanations suggested were that widespread elevation of substances associated with pain and inflammation follows initial, more local, MTrPs.

Similar to other studies, Tekin et al. (2013) hypothesized that dry needling is more effective than sham dry needling for patients with MPS. In this prospective, double-blinded, randomized controlled study, 39 subjects were randomized into 2 groups (study and sham). The treatment group received 6 sessions of dry needling over 4 weeks. When VAS scores were compared between the groups, second and third comparisons were significantly lower in the dry needling group. SF-36 scores for both the physical and mental component scores were found to be significantly increased in the dry needling group. This study demonstrated that dry needling treatments are effective in relieving the pain and improving quality of life of patients with MPS. Pecos-Martín et al. (2015)

evaluated the effect of dry needling into a myofascial trigger point (MTrP) in the lower trapezius muscle of patients with mechanical idiopathic neck pain. Patients (*N*=72) with unilateral neck pain, neck pain for ≥3 months, and active trigger points in the lower trapezius muscle were randomly assigned to 1 of 2 treatment groups. Dry needling in an MTrP in the lower trapezius muscle, or dry needling in the lower trapezius muscle but not at a MTrP. Results indicated that treatment with dry needling of the lower trapezius muscle close to the MTrP showed decreases in pain and PPT as well as an improvement in the degree of disability (P<.001) compared with the baseline and control group measurements (P<.001). The dry-needling technique performed in the MTrP showed more significant therapeutic effects (P<.001). Authors concluded that the application of dry needling into an active MTrP of the lower trapezius muscle induces significant changes in the VAS, NPQ, and PPT levels compared with the application of dry needling in other locations of the same muscle in patients with mechanical neck pain. Cerezo-Téllez et al. (2016) studied the effectiveness of dry needling for chronic nonspecific neck pain in a randomized single-blinded, clinical trial. A total of 130 participants with nonspecific neck pain presenting with active myofascial trigger points in their cervical muscles were included and randomly assigned to receive: DDN plus stretching (n = 65) or stretching only (control group [n = 65]). Four sessions of treatment were applied over 2 weeks with a 6-month follow-up after treatment. Pain intensity, mechanical hyperalgesia, neck active range of motion, neck muscle strength, and perceived neck disability were measured at baseline, after 2 sessions of intervention, after the intervention period, and 15, 30, 90, and 180 days after the intervention. Significant and clinically relevant differences were found in favor of dry needling in all the outcomes (all P < 0.001) at both short and long-term follow-ups. Deep dry needling and passive stretching is more effective than passive stretching alone in people with nonspecific neck pain. According to authors, results support the use of DDN in the management of myofascial pain syndrome in people with chronic nonspecific neck pain.

Gerber et al. (2016) sought to determine whether the benefits of dry needling (DN) of a-MTrPs are sustained 6 weeks posttreatment. A total of 45 patients (13 male and 32 female) with cervical pain >3 months and a-MTrPs in the upper trapezius who completed 3 DN treatments and who were evaluated 6 weeks post treatment. Responders were patients whose MTrP status changed from active to latent or nonpalpable nodule (resolved). Secondary outcomes were pain pressure threshold (PPT), Profile of Mood States, Oswestry Disability Index (ODI), MOS 36-Item Short-Form Health Survey (SF-36), and cervical range of motion. In this study, there was sustained reduction of pain scores after completion of DN, which is more likely with a greater drop in VAS score. Patients with higher baseline VAS scores are less likely to respond to DN. Early intervention toward significant pain reduction is likely to be associated with sustained clinical response.

Stieven et al. (2020) sought to determine the added benefit of combining dry needling with a guideline-based physical therapy treatment program consisting of exercise and manual therapy on pain and disability in people with chronic neck pain. Participants were randomized to receive either guideline-based physical therapy or guideline-based physical therapy plus dry needling. The primary outcomes, measured at 1 month post randomization, were average pain intensity in the previous 24 hours and previous week, measured with a numeric pain-rating scale (0-10), and disability, measured with the Neck Disability Index (0-100). The secondary outcomes were pain and disability measured at 3- and 6-months post randomization and global perceived effect, quality of sleep, pain catastrophizing, and self-efficacy measured at 1-, 3-, and 6-months post randomization. One hundred sixteen participants were recruited. Authors concluded that when combined with guideline-based physical therapy for neck pain, dry needling resulted in small improvements in pain only at 1 month post randomization. There was no effect on disability.

Gattie et al. (2021) examined the short- and long-term effectiveness of dry needling on disability, pain, and patient-perceived improvements in patients with mechanical neck pain when added to a multimodal treatment program that includes manual therapy and exercise. Seventy-seven adults (mean ± SD age, 46.68 ± 14.18 years; 79% female) who were referred to physical therapy with acute, subacute, or chronic mechanical neck pain were randomly allocated to receive 7 multimodal treatment sessions over 4 weeks of (1) dry needling, manual therapy, and exercise (needling group); or (2) sham dry needling, manual therapy, and exercise (sham needling group). The primary outcome of disability (Neck Disability Index score) and secondary outcomes of pain (current and 24-hour average) and patient-perceived improvement were assessed at baseline and follow-ups of 4 weeks, 6 months, and 1 year by blinded assessors. Results showed that there were no group-by-time interactions for disability, current pain, or average pain over 24 hours. There were no between-group differences for global rating of change at any time point. Both groups improved over time for all variables; current pain; and average pain over 24 hours. Authors concluded that there were no differences in outcomes between trigger point dry needling and sham dry needling when added to a multimodal treatment program for neck pain. Dry needling should not be part of a first-line approach to managing neck pain.

Murillo et al. (2021) investigated if a single DN session of the Obliquus Capitis Inferior (OCI) muscle improves head and eye movement control-related outcomes, postural stability, and cervical mobility in people with neck pain. Forty people with neck pain were randomly assigned to receive a single session of DN or sham needling of the OCI. Cervical joint position error (JPE), cervical movement sense, standing balance and oculomotor control were examined at baseline, immediately post-intervention, and at one-week follow-up. Active cervical rotation range of motion and the flexion rotation test were used to examine the global and upper cervical rotation mobility, respectively.

Analysis revealed that the DN group showed a decrease of JPE immediately post-intervention compared to the sham group which was maintained at one-week follow-up. No effects on standing balance or cervical movement sense were observed in both groups. Upper cervical mobility showed an increase immediately after DN compared to the sham group which remained stable at one-week follow-up. Both groups showed an immediate increase in global cervical mobility. The results from the current study suggest that a single session of DN of the OCI reduces JPE deficits and increases upper cervical mobility in patients with neck pain.

Pandya et al. (2024) compared the short- and intermediate-term effects of dry needling to manual therapy on pain, disability, function, and patient-perceived improvement in patients with mechanical neck pain. Seventy-eight patients were randomly assigned to one of the 2 groups: (1) dry needling and therapeutic exercises (DN + Exercises) and (2) manual therapy and therapeutic exercises (MT + Exercises). Both groups received 7 treatment sessions over a maximum of 6 weeks. Outcome measures, collected at baseline, 2 weeks, discharge (7th treatment session), and 3 months after discharge, were as follows: Neck Disability Index (NDI), numeric pain-rating scale (NPRS), Patient-Specific Functional Scale (PSFS), global rating of change (GROC), Fear-Avoidance Belief Questionnaire (FABQ), and Deep Neck Flexor Endurance Test (DNFET). The ANCOVA revealed significant group-by-time interaction for all variables. Significant between-group differences, favoring MT + Exercises, were observed at all 3 time points on the NDI. Results for the MT + Exercises group exceeded recommended minimal clinically important difference for all variables, at all follow-up points. Authors concluded that MT + Exercises was more effective, both in the short term and intermediate term, than DN + Exercises in reducing pain, disability, and improving function in patients with mechanical neck pain.

Shoulder Pain

DiLorenzo et al. (2004) evaluated the efficacy of dry needling of MTrPs to relieve hemiparetic shoulder pain resulting from CVA. 101 CVA patients entered the study and randomly assigned to 1 of 2 groups. One group received standard rehabilitation and the other group received standard rehabilitation plus dry needling to the shoulder and scapular musculature. Those receiving the needling reported significantly less pain during sleep and physical therapy. Their sleep was also more restful, and frequency and intensity of pain was reduced as well. Osborne and Gatt (2010) described 4 case reports for elite female volleyball athletes during an intense phase of competition. Dry needling of scapulohumeral muscles was performed. Range of motion, strength and pain were assessed before and after treatment, with a functional assessment of pain immediately after playing and overhead activity, using the short form McGill Pain Questionnaire. All scores were improved post-treatment and athletes were able to continue overhead activities. Trigger point dry needling has been successful in treating athletes with myofascial pain and impingement symptoms but with only subjective improvement and not during a competitive phase. These cases support the use of dry needling in elite athletes during a competitive phase with short-term pain relief and improved function in shoulder injuries. Authors postulate that dry needling may help maintain rotator cuff balance and strength, reducing further pain and injury. Pérez-Palomares et al. (2017) investigated the effectiveness of dry needling in addition to evidence-based personalized physical therapy treatment in the treatment of shoulder pain. One hundred twenty patients with nonspecific shoulder pain were randomized into 2 parallel groups: (1) personalized, evidence-based physical therapy treatment; and (2) trigger point dry needling in addition to personalized, evidence-based physical therapy treatment. Patients were assessed at baseline, posttreatment, and 3-month follow-up. There were no significant differences in outcome between the 2 treatment groups. Both groups showed improvement over time. Authors suggested that dry needling did not offer benefits in addition to personalized, evidence-based physical therapy treatment for patients with nonspecific shoulder pain.

Arias-Buría et al. (2018) evaluated the cost-effectiveness of the inclusion of trigger point-dry needling (TrP-DN) into an exercise program for the management of subacromial pain syndrome. Fifty patients with unilateral subacromial pain syndrome were randomized with concealed allocation to exercise alone or exercise plus TrP-DN. Both groups were asked to perform an exercise program targeting the rotator cuff musculature twice daily for five weeks. Patients allocated to the exercise plus TrP-DN group also received dry needling during the second and fourth sessions. Authors concluded that the inclusion of TrP-DN into an exercise program was more cost-effective for individuals with subacromial pain syndrome than exercise alone. From a cost-benefit perspective, the inclusion of TrP-DN into multimodal management of patients with subacromial pain syndrome should be considered. Pai et al. (2021) evaluated in a randomized, sham-controlled study the pattern of analgesic efficacy and local sensory changes of a single session of DN for MPS in patients with chronic shoulder pain. Patients with chronic shoulder pain were randomized into active (n = 20) or sham (n = 21) groups. A single DN was performed by a researcher blinded to group assignment and pain outcomes. Pain intensity was assessed by the numeric rating score, and sensory thresholds were evaluated with a quantitative sensory testing protocol, including the area of tactile sensory abnormalities 7 days before needling, right before, and 7 days after the intervention. Results demonstrated that DN led to significant larger pain intensity reduction. Pain reduction scores were significantly different on the second day after needling and persisted so until the seventh day and were accompanied by improvement in other dimensions of pain and a decrease in the area of mechanical hyperalgesia in the active DN group alone. Authors concluded that active TP DN provides analgesic effects compared with sham and decreased the area of local mechanical hyperalgesia.

Shanmugam et al. (2021) compared the effectiveness of intramuscular electrical stimulation (IMES) combined with therapeutic exercises versus dry needling (DN) combined with therapeutic exercises in improving the clinical outcomes in patients with shoulder adhesive capsulitis (SAC). In this randomized controlled trial, IMES (n = 45) and DN (43) groups had received respectively IMES, and DN twice weekly for three consecutive weeks. Both groups received therapeutic exercises 1,520 minutes, five days in a week during the second and third week. Pain, disability, kinesiophobia, number of active and latent MTrPs, shoulder abduction and external rotation range of motion were assessed at baseline, week-1, week-2, week-3 and follow-up at 3 months. The results demonstrate that the post intervention assessment scores of VAS, DASH, shoulder abduction and external rotation ROM, number of active and latent MTrPs and kinesiophobia were significantly improved in both groups. However, IMES group had achieved a greater improvement over DN group on the shoulder pain severity and disability, shoulder range of motion, number of active and latent MTrPs and kinesiophobia. Despite the significant statistical differences between the groups, IMES group did not achieve the minimal clinically important differences of 1.5cm and 11-points respectively for the VAS and DASH scores. No serious adverse effects occurred during the three weeks of treatment. Authors concluded that IMES combined with therapeutic exercises is an effective treatment to reduce the shoulder pain severity and upper limb disability by deactivating the active and latent MTrPs and improving the shoulder abduction and external rotation range of motion in patients with SAC.

Dunning et al. (2020) compared the effects of spinal thrust manipulation and electrical dry needling (TMEDN group) to those of non-thrust peripheral joint/soft tissue mobilization, exercise, and interferential current (NTMEX group) on pain and disability in patients with subacromial pain syndrome (SAPS). Patients with SAPS were randomized into the TMEDN group (n = 73) or the NTMEX group (n = 72). Primary outcomes included the Shoulder Pain and Disability Index and the numeric pain-rating scale. Secondary outcomes included the global rating of change scale (GROC) and medication intake. The treatment period was 6 weeks, with follow-ups at 2 weeks, 4 weeks, and 3 months. At 3 months, the TMEDN group experienced greater reductions in shoulder pain and disability compared to the NTMEX group. Effect sizes were large in favor of the TMEDN group. At 3 months, a greater proportion of patients within the TMEDN group achieved a successful outcome (GROC score of 5 or greater) and stopped taking medication. Authors concluded that cervicothoracic and upper rib thrust manipulation combined with electrical dry needling resulted in greater reductions in pain, disability, and medication intake than non-thrust peripheral joint/soft tissue mobilization, exercise, and interferential current in patients with SAPS. The effects were maintained at 3 months.

Temporomandibular Dysfunction

Gonzalez-Perez et al., (2012) evaluated the usefulness of dry needling in the treatment of temporomandibular myofascial pain. A total of 36 subjects with MPS in the external pterygoid muscle were selected to participate. Outcome measures included pain with the visual analog scale and ROM of the mandible before and after needling. Results demonstrated improvement of pain and jaw movement, which continued up to 6 months after treatment. Pain reduction was more notable for those with higher intensity pain at baseline. Authors concluded that dry needling to the external pterygoid MTrP is effective for temporomandibular MPS. Dıraçoğlu et al. (2012) tested whether dry needling is more effective than sham needling in relieving temporomandibular myofascial pain. 52 subjects were randomized into 2 groups: true dry needling and sham. PPT, pain ratings, and jaw opening were measured pre- and post- treatment. Results indicated that dry needling appears to be an effective treatment method in relieving pain and tenderness of MTrPs.

Hip Pain

A 2004 randomized, double-blind, placebo-controlled trial by Huguenin et al. attempted to establish the effect on straight leg raise (SLR), hip internal rotation (IR), and muscle pain of dry needling to the posterior hip area. 59 male athletes participated in the study and randomly received either dry needling or placebo needling 1 time to their gluteal MTrPs. ROM (passive SLR and hip IR) and pain were evaluated immediately after, 24 hours and 72 hours after treatment. Pain and ROM improved for both groups, but the change was not different for either group. Given SLR and hip IR did not demonstrate improvements, authors suggested that these tests are not valuable in determining success of dry needling interventions. They suggested that patient reports of response are a better indicator of success (Huguenin et al., 2004). Brennan et al. (2017) investigated whether administration of dry needling (DN) is noninferior to cortisone injection in reducing lateral hip pain and improving function in patients with GTPS. Forty-three participants (50 hips observed), all with GTPS, were randomly assigned to a group receiving cortisone injection or DN. Treatments were administered over 6 weeks, and clinical outcomes were collected at baseline and at 1, 3, and 6 weeks. The primary outcome measure was the numeric pain-rating scale (0-10). The secondary outcome measure was the Patient-Specific Functional Scale (0-10). Authors concluded that cortisone injections for GTPS did not provide greater pain relief or reduction in functional limitations than DN. Data suggest that DN is a noninferior treatment alternative to cortisone injections in this patient population. Ceballos-Laita et al. (2019) sought to determine the short-term effects of DN on pain, hip ROM and physical function in patients with hip OA. Thirty patients with unilateral hip OA were randomized into two groups: DN group and sham group. Participants received three treatment sessions. The treatment was applied in active MTrPs of the iliopsoas, rectus femoris, tensor fasciae latae and gluteus minimus muscles. Pain intensity (visual analogic scale), passive hip ROM (universal goniometer and digital inclinometer) and physical function (30s chair-stand test and 20m walk test) were assessed at baseline and after the three treatment sessions. There was decreased pain intensity, increased hip ROM, and improved physical function following the DN treatment. These improvements were statistically significant ($p < 0.05$) compared to the sham group. Authors concluded that pain, hip ROM, and physical function improved after the application of DN in active MTrPs of the hip muscles in patients with hip OA.

CPG 178 Revision 11 – S
Dry Needling
Revised – October 17, 2024
To CQT for review 09/09/2024
CQT reviewed 09/09/2024
To QIC for review and approval 10/01/2024
QIC reviewed and approved 10/01/2024
To QOC for review and approval 10/17/2024
QOC reviewed and approved 10/17/2024

Ceballos-Laita et al. (2021) investigated the short-term effects of dry needling (DN) on physical function, pain, and hip muscle strength in patients with hip osteoarthritis (OA). Patients with unilateral hip OA (*N*=45) were randomly allocated to a DN group, sham DN group, or control group. Patients in the DN and sham groups received 3 treatment sessions. Three active myofascial trigger points (MTrPs) were treated in each session with DN or a sham needle procedure. The treatment was applied in active MTrPs of the iliopsoas, rectus femoris, tensor fasciae latae, and gluteus minimus muscles. Results demonstrated a significant group by time interactions for physical function, pain, and hip muscle force variables. Post hoc tests revealed a significant reduction in hip pain and significant improvements in physical function and hip muscle strength in the DN group compared with the sham and control groups. The DN group showed within- and between-groups large effect sizes. Authors concluded that DN therapy in active MTrPs of the hip muscles reduced pain and improved hip muscle strength and physical function in patients with hip OA. DN in active MTrPs of the hip muscles should be considered for the management of hip OA.

Knee Conditions

Mayoral et al. (2013) attempted to determine whether dry needling of MTrPs is superior to placebo in the prevention of pain after total knee replacement. 40 subjects were randomized to true dry needling or sham needling. Immediately following anesthesiology and before surgery started, subjects in the treatment group were dry needled in all previously diagnosed MTrPs, while the sham group received no treatment in their MTrPs. Subjects were blinded to group allocation as well as the examiner in pre-surgical and follow-up examinations performed 1, 3, and 6 months after arthroplasty. Results demonstrated that subjects in the treatment group had less pain after intervention 1 month after intervention, indicating the need for immediate post-surgery analgesics. Differences were not sustained at 3 and 6 month follow-up examinations. In conclusion, a single dry needling treatment of MTrP under anesthesia reduced pain in the first month after knee arthroplasty, when pain was the most severe (Mayoral et al., 2013). Espí-López et al. (2017) compared the effects of adding TrP DN to a manual therapy and exercise program on pain, function, and disability in individuals with PFP. Individuals with PFP (*n*= 60) recruited from a public hospital in Valencia, Spain were randomized to manual therapy and exercises (*n* = 30) or manual therapy and exercise plus TrP DN (*n* = 30). Both groups received the same manual therapy and strengthening exercise program for 3 sessions (once a week for 3 weeks), and 1 group also received TrP DN to active TrPs within the vastus medialis and vastus lateralis muscles. The pain subscale of the Knee injury and Osteoarthritis Outcome Score (KOOS; 0-100 scale) was used as the primary outcome. Secondary outcomes included other subscales of the KOOS, the Knee Society Score, the International Knee Documentation Committee Subjective Knee Evaluation Form (IKDC), and the numeric pain-rating scale. Patients were assessed at baseline and at 15-day (posttreatment) and 3-month follow-ups. At 3 months, 58 subjects (97%) completed the follow-up. No significant between-group differences (all, P>.391) were observed for any outcome. Both groups experienced similar moderate-to-large within-group improvements in all outcomes (standardized mean differences of 0.6 to 1.1); however, only the KOOS function in sport and recreation subscale surpassed the pre-specified minimum important change. Authors concluded that the current clinical trial suggests that the inclusion of 3 sessions of TrP DN in a manual therapy and exercise program did not result in improved outcomes for pain and disability in individuals with PFP at 3-month follow-up.

Sánchez Romero et al. (2020) assessed the effectiveness of adding dry needling (DN) to an exercise program on pain intensity and disability in patients with knee osteoarthritis. Sixty-two patients with knee osteoarthritis were randomly allocated into one of two groups: exercise plus DN (exercise + DN; N = 31) or exercise plus sham DN (exercise + sham DN; *N* = 31). Participants received six sessions of either DN or sham DN over the leg muscles related to knee pain from osteoarthritis plus a supervised exercise program. Authors concluded that the inclusion of DN to an exercise program does not reduce pain or disability in patients with knee osteoarthritis.

Low Back Pain

Koppenhaver et al. (2015) explored the literature for associations between demographic, patient history, and physical examination variables and short-term improvement in self-reported disability following dry needling therapy performed on individuals with low back pain (LBP). Seventy-two volunteers with mechanical LBP participated in the study. Potential prognostic factors were collected from baseline questionnaires, patient history, and physical examination tests. Treatment consisted of dry needling to the lumbar multifidus muscles bilaterally, administered during a single treatment session. Improvement was based on percent change on the Oswestry Disability Index at 1 week. Authors concluded that increased LBP with the multifidus lift test was the strongest predictor of improved disability after dry needling, suggesting that the finding of pain during muscle contraction should be studied in future dry needling studies. Wang et al. (2022) investigated the effects of electrical dry needling (DN) plus corticosteroid injection (CSI) on pain, physical function, and global change in patients with osteoarthritis of the knee (KOA). Sixty patients with KOA were randomly assigned to the electrical dry needling plus corticosteroid injection (electrical-DN+CSI) group or CSI group. The CSI group received glucocorticoid injection only once during the trial, and the electrical-DN+CSI group received glucocorticoid injection combined with 4 sessions of electrical-DN. The primary outcome was the numerical rating scale at 3 months. The secondary outcomes were the Western Ontario and McMaster Universities Osteoarthritis Index, the time to complete the Timed Up and Go test, and the score of the global rating of change scale at 3 months. Baseline characteristics and measurements were similar in the 2 groups. The group by time interaction effect was significant for all variables (P<.05). The electrical-DN+CSI group obtained a more significant reduction in pain intensity and more significant improvement in dysfunction than the CSI group at 3 months (P<.05). The median global rating of change score for the CSI group was +3 (somewhat better), and that for the electrical-DN+CSI group was +4 (moderately better). Authors concluded that electrical-DN therapy at myofascial trigger points combined with CSI is more effective at alleviating pain, improving dysfunction, and creating global change than CSI alone for patients with KOA. Electrical-DN may be an essential part of treatment for KOA rehabilitation.

Farley et al. (2024) studied the effect of combining spinal manipulation and dry needling in individuals with nonspecific low back pain. Spinal manipulative therapy (SMT), dry needling (DN), and exercise are common nonpharmacological treatments for LBP. This study was a 3-armed parallel-group design randomized clinical trial. They enrolled and randomized 96 participants with LBP into a multimodal strategy of treatment consisting of a combination of DN and SMT, DN only, and SMT only, followed by an at-home exercise program. All participants received 4 treatment sessions in the first 2 weeks followed by a 2-week home exercise program. Outcomes included clinical (Oswestry Disability Index, numeric pain intensity rating) and mechanistic (lumbar multifidus, erector spinae, and gluteus medius muscle activation) measures at baseline, 2, and 4 weeks. Participants in the DN and SMT groups showed larger effects and statistically significant improvement in pain and disability scores, and muscle percent thickness change at 2 weeks and 4 weeks of treatment when compared to the other groups. This study was registered prior to participant enrollment.

Heel Pain

Cotchett et al. (2010) reviewed the current evidence for the effectiveness of dry needling and/or injections of MTrPs associated with plantar heel pain. They included trials where participants diagnosed with plantar heel pain were treated with dry needling and/or injections (local anesthetics, steroids, Botulinum toxin A, and saline) alone or in combination with acupuncture. They determined limited evidence for the effectiveness of dry needling and/or injections of MTrPs associated with plantar heel pain. However, given the heterogeneity and poor quality of included studies, definitive conclusions cannot be made. Cotchett et al. (2014) evaluated the effectiveness of dry needling for plantar heel pain. Study participants were 84 patients with plantar heel pain of at least 1 month’s duration. Participants were randomly assigned to receive real or sham trigger point dry needling. The intervention consisted of 1 treatment per week for 6 weeks. Participants were followed for 12 weeks. At the primary end point of 6 weeks, significant effects favored real dry needling over sham dry needling for pain (adjusted mean difference: VAS first-step pain= -14.4 mm, 95% CI= -23.5 to -5.2; FHSQ foot pain=10.0 points, 95% CI=1.0 to 19.1), although the between-group difference was lower than the minimal important difference. The number needed to treat at 6 weeks was 4 (95% CI=2 to 12). The frequency of minor transitory adverse events was significantly greater in the real dry needling group (70 real dry needling appointments [32%] compared with only 1 sham dry needling appointment [<1%]). Authors concluded that dry needling provided statistically significant reductions in plantar heel pain, but the magnitude of this effect should be considered against the frequency of minor transitory adverse events. Dunning et al. (2018) compared the effects of adding electrical dry needling into a program of manual therapy, exercise and ultrasound on pain, function and related-disability in individuals with plantar fasciitis (PF). One hundred and eleven participants (n = 111) with plantar fasciitis were randomized to receive electrical dry needling, manual therapy, exercise, and ultrasound (n = 58) or manual therapy, exercise and ultrasound (n = 53). The primary outcome was first-step pain in the morning as measured by the Numeric Pain Rating Scale (NPRS). Secondary outcomes included resting foot pain (NPRS), pain during activity (NPRS), the Lower Extremity Functional Scale (LEFS), the Foot Functional Index (FFI), medication intake, and the Global Rating of Change (GROC). The treatment period was 4 weeks with follow-up assessments at 1 week, 4 weeks, and 3 months after the first treatment session. Both groups received 6 sessions of impairment-based manual therapy directed to the lower limb, self-stretching of the plantar fascia and the Achilles tendon, strengthening exercises for the intrinsic muscles of the foot, and therapeutic ultrasound. In addition, the dry needling group also received 6 sessions of electrical dry needling using a standardized 8-point protocol for 20 minutes. Authors concluded that the inclusion of electrical dry needling into a program of manual therapy, exercise and ultrasound was more effective for improving pain, function and related-disability than the application of manual therapy, exercise and ultrasound alone in individuals with PF at mid-term (3 months).

Fibromyalgia

Casanueva et al. (2013) evaluated the short-term efficacy of dry needling for patients diagnosed with fibromyalgia. One hundred twenty patients were randomly selected into 2 groups (control and dry needling). Dry needling treatments included weekly 1 hour sessions for 6 weeks. At the end of the treatment, the dry needling group showed significant differences in most tests, including pain, fatigue SF-36 pain rating, myalgic scores, PPTs and global subjective improvement. In conclusion, patients severely affected by fibromyalgia can obtain short-term improvements following weekly dry needling for 6 weeks. Castro Sánchez et al. (2019) compared the effectiveness of dry needling versus myofascial release on myofascial trigger points pain in cervical muscles, quality of life, impact of symptoms pain, quality of sleep, anxiety, depression, and fatigue in patients with fibromyalgia syndrome. Sixty-four subjects with fibromyalgia were randomly assigned to a dry needling group or a myofascial release group. Pain pressure thresholds of myofascial trigger points were evaluated in the cervical muscles. In addition, quality of life, impact of fibromyalgia symptoms, quality of sleep, intensity of pain, anxiety and depression symptoms, impact of fatigue at baseline and post treatment after four weeks of intervention were evaluated. Authors reported that dry needling therapy showed higher improvements in comparison with myofascial release therapy for pain pressure thresholds, the components of quality of life of physical role, body pain, vitality, and social function, as well as the total impact of FMS symptoms, quality of

To CQT for review 09/09/2024
CQT reviewed 09/09/2024
To QIC for review and approval 10/01/2024
QIC reviewed and approved 10/01/2024
To QOC for review and approval 10/17/2024
QOC reviewed and approved 10/17/2024

sleep, state and trait anxiety, hospital anxiety-depression, general pain intensity and fatigue. Implications for rehabilitation They concluded that dry needling therapy reduces myofascial trigger point pain in the short term in patients with fibromyalgia syndrome. This therapeutic approach improves anxiety, depression, fatigue symptoms, quality of life, and sleep after treatment. Dry needling and myofascial release therapies decrease intensity of pain, and the impact of fibromyalgia symptoms in this population. These intervention approaches should be considered in an independent manner as complementary therapies within a multidisciplinary setting.

Headache

Gildir et al. (2019) aimed to explore the effectiveness of trigger point dry needling in patients with chronic tension-type headache in reducing headache frequency, intensity and duration, and improvement of health-related quality of life. One hundred sixty participants were randomly assigned to one of two treatment groups for dry needling or sham dry needling, delivered in 3 sessions a week for 2 weeks. The dry needling was applied in active trigger points located in the musculature of the head and the neck. The sham dry needling procedure was applied into the adipose tissue located at any area where an active trigger point was absent. The primary outcome measurement was the headache intensity. In the dry needling group, intensity, frequency and duration of headache, and the scores of Short Form-36 subscales were significantly improved after treatment ($P<.05$). In the dry needling group, all the effect sizes for headache variables were large. Authors concluded that results of this clinical trial suggest that trigger point dry needling in patients with chronic tension-type headache is effective and safe in reducing headache intensity, frequency and duration, and increasing health-related quality of life.

Mousavi-Khatir et al. (2022) compared the long-term effect of adding real or sham dry needling with conventional physiotherapy in cervicogenic headache. Sixty-nine patients with cervicogenic headache were included in this study. Patients were randomly assigned into a control group (n = 23) receiving conventional physical therapy; a dry needling group (n = 23) receiving conventional physical therapy and dry needling on the cervical muscles; placebo needling group (n = 23) receiving conventional physical therapy and superficial dry needling at a point away from the trigger point. The primary outcome was the headache intensity and frequency. Neck disability, deep cervical flexor performance, and range of motion were secondary outcomes. Outcomes were assessed immediately after treatment and 1, 3, and 6 months later. Sixty-five patients were finally included in the analysis. Headache intensity and neck disability decreased significantly more in the dry needling compared to sham and control groups after treatment and during all follow-ups. The frequency of headaches also reduced more in the dry needling than in control and sham groups, but it did not reach statistical significance. Higher cervical range of motion and enhancement of deep cervical flexors performance was also observed in the dry needling compared to sham and control groups. Authors concluded that dry needling has a positive effect on pain and disability reduction, cervical range of motion, and deep cervical flexor muscles performance in patients with cervicogenic headache and active trigger points, although the clinical relevance of the results was small.

Review Articles

Upper Quadrant MPS

Cummings and White (2001) authored a review article on needling therapies in the management of MTrP pain. Randomized controlled trials (RCTs) in which some form of needling therapy was used to treat MPS were selected for inclusion. A total of 23 papers were chosen based on specific method, quality and outcome parameters. Trials that compared different injectable substances or dry needling to other injectable substances found that the effect was independent of the substance injected, with a dependence upon the actual needling procedure. The review, however, did not find rigorous evidence to confirm that needling therapies have an effect beyond placebo for MTrP pain. Authors do express a caveat being that only 1 trial identified whether an LTR was noted and as stated earlier, achieving an LTR improves results. Because all groups in which MTrPs were directly needling demonstrated marked improvement, further research is needed to investigate whether needling has an effect beyond placebo. Tough et al., (2009) reviewed the current evidence on needling without injection. They included studies where at least 1 group were treated by needling directly into the MTrP and where the control was either no treatment, or usual care, indirect local dry needling or some form of placebo intervention. Seven studies were included. One study concluded that direct dry needling was superior to no intervention. Combining these studies (n=134), needling was not found to be significantly superior to placebo; however, marked statistical heterogeneity was present. In conclusion, there is limited evidence deriving from one study that deep needling directly into myofascial trigger points has an overall treatment effect when compared with standard care. Limited sample size and poor quality supports the need for improved trials. In 2011, the American Physical Therapy Association (APTA) performed a synthesis and evaluation of the related literature. Based on specified search criteria, 154 articles were identified. Articles were reviewed to determine those appropriate for individual expert review. The remaining 46 individual studies were reviewed by a member expert in research analysis using a standardized review form. These 46 studies were reviewed using a rating scale from 0-5, with 5 indicating the highest level of quality and highest level of support for dry needling. The median quality of the research was 3; the median support of dry needling was 2. Of the 23 RCTs, the median quality of the research was 4; the median support of dry needling was 3.

Kietrys et al. (2013) performed a systematic review and meta-analysis to identify the effectiveness of dry needling in reducing pain for patients with MPS of the upper quarter. Four separate meta-analyses were performed: (1) dry needling compared to sham or control, immediate effects; (2) dry needling compared to sham or control, 4 weeks; (3) dry needling compared to other treatments, immediate effects; (4) dry needling compared to other treatments, 4 weeks. Based on the best current available evidence, the authors recommend dry needling, compared to sham or placebo, for decreasing pain (immediately after treatment and at 4 weeks) in patients with upper quarter MPS. However, due to the small number of high-quality RCTs published to date, additional well-designed studies are needed. Cagnie et al. (2015) described the effects of ischemic compression and dry needling on trigger points in the upper trapezius muscle in patients with neck pain and compare these two interventions with other therapeutic interventions aiming to inactivate trigger points. Fifteen randomized controlled trials were included in this systematic review. There is moderate evidence for ischemic compression and strong evidence for dry needling to have a positive effect on pain intensity. This pain decrease is greater compared with active range of motion exercises (ischemic compression) and no or placebo intervention (ischemic compression and dry needling) but similar to other therapeutic approaches. There is moderate evidence that both ischemic compression and dry needling increase side-bending range of motion, with similar effects compared with lidocaine injection. There is weak evidence regarding its effects on functionality and quality-of-life. Authors reported that based on this systematic review, ischemic compression and dry needling can both be recommended in the treatment of neck pain patients with trigger points in the upper trapezius muscle. Additional research with high-quality study designs is needed to develop more conclusive evidence. Liu et al., (2015) evaluated current evidence of the effectiveness of dry needling of MTrPs associated with neck and shoulder pain. The results suggested that compared with control/sham, dry needling of MTrPs was effective in the short term (immediately to 3 days) and medium term; however, wet needling, when a substance is injected (including lidocaine) was superior to dry needling in relieving MTrP pain in the medium term. Other therapies (including physiotherapy) were more effective than dry needling in treating MTrP pain in the medium term.

Navarro-Santana et al. (2020) evaluated the effect of dry needling alone as compared to sham needling, no intervention, or other physical interventions applied over trigger points (TrPs) related with neck pain symptoms. Randomized controlled trials including one group receiving dry needling for TrPs associated with neck pain were identified in electronic databases. Outcomes included pain intensity, pain-related disability, pressure pain thresholds, and cervical range of motion. Results demonstrated dry needling reduced pain immediately after and at short-term when compared with sham/placebo/waiting list/other form of dry needling and, also, at short-term compared with manual therapy. No differences in comparison with other physical therapy interventions were observed. An effect on pain-related disability at the short-term was found when comparing dry needing with sham/placebo/waiting list/other form of dry needling but not with manual therapy or other interventions. Dry needling was effective for improving pressure pain thresholds immediately after the intervention. No effect on cervical range of motion of dry needling against either comparative group was found. No between-treatment effect was observed in any outcome at mid-term. Low to moderate evidence suggests that dry needling can be effective for improving pain intensity and pain-related disability in individuals with neck pain symptoms associated with TrPs at the short-term. No significant effects on pressure pain sensitivity or cervical range of motion were observed.

Lower Quarter MPS

Morihisa et al. (2016) assessed and provided a summary on the current literature for the use of dry needling as an intervention for lower quarter trigger points in patients with various orthopedic conditions. This review of current literature suggests that dry needling is effective in reducing pain associated with lower quarter trigger points in the short-term. However, the findings suggest that dry needling does not have a positive effect on function, quality of life, depression, range of motion, or strength. Further high-quality research with long-term follow-up investigating the effect of dry needling in comparison to and in conjunction with other interventions is needed to determine the optimal use of dry needling in treating patients with lower quarter trigger points. Khan et al. (2021) explored the current evidence on effects of trigger point dry needling as a treatment strategy on pain and range of motion among subjects with lower extremity myofascial trigger areas. Of the 564 articles initially found 10 (33.3%) were selected for final assessment. All the 10 (100%) studies documented improvement in the pain over time with dry needling strategy. None of the studies targeted any other outcome, like anxiety and sleep disturbances, related with myofascial trigger points. Authors concluded that on the basis of the best evidence available, dry needling seemed to be effective in pain reduction related to lower extremity myofascial trigger points. Evidence also suggested that there was not much positive effect of myofascial trigger point dry needling on depression, anxiety, muscular strength and quality of life.

Dach and Ferreira (2023) completed an overview to highlight and discuss the evidence-based treatment of myofascial pain by dry needling in patients with low back pain. There are many different ways to manage and treat MPS, such as physical exercise, trigger points massage, and dry needling. A total of 509 records were identified at first. Seventy were published before 2000, so they were excluded. From the remaining 439 studies, 92 were RCTs or MA, of which 86 additional studies were excluded for the following reasons: not related to dry needling treatment ($n = 79$), not published in English ($n = 4$), duplicated ($n = 1$), project protocol ($n = 1$), and not related to myofascial pain ($n = 1$). These studies compared dry needling efficacy to other treatments, such as acupuncture, sham dry needling, laser therapy, physical therapy, local anesthetic injection, ischemic compression, and neuroscience education. Despite the varied outcomes and follow-up periods between the treatment types, the study showed that dry needling can decrease post-intervention pain intensity and pain disability. Authors concluded that dry needling is an effective procedure for the treatment of myofascial pain in patients with acute and chronic low back pain. Further high-quality studies are needed to clarify the long-term outcomes.

Low Back Pain

In 2005, Furlan et al. updated a systematic review on acupuncture and dry needling for low back pain using the framework of the Cochrane Collaboration. Studies included in this review were RCTs of acupuncture where needling was involved and RCTs of dry needling of adults with non-specific acute, subacute, or chronic low back pain. 35 studies were included for a total of 2,861 patients. The majority of these patients experienced chronic low back pain. Two of these studies had fatal flaws and were not included. Of the remaining 33 trials, 14 were of higher quality and 19 of lower methodologic quality. No blinding was done in any of the trials. In 28 trials, similar timing of outcome measurements occurred, but the quality of reporting was variable. This resulted in an inability to judge many aspects of the trials. Limiting discussion to dry needling, efficacy and effectiveness at trigger and motor points shows variable results. Evidence is limited that superficial needling inserted at MTrPs is better than placebo TENS. There is limited evidence that adding dry needling to standard physical therapy, occupational therapy or industrial assessments is better than standard care alone at the short (between 1 week and 3 months after end of sessions) and intermediate term follow up (between 3 months and 1 year after end of sessions). There is moderate evidence that there is no difference between a session of dry needling and injection of lidocaine and/or steroid. In identifying this data, evidence shows that deep needling is more effective at short term follow up than superficial needling for chronic low back pain. Also, distal point needling is no different from local lumbar area needling for measures of pain, function, and ROM. It also appears that needle retention for about 10 minutes is better than immediate removal. Some dry needling practitioners have adopted this technique. Authors conclude that although dry needling appears to be a useful adjunct to other therapies for chronic low back pain, no clear recommendations can be made due to poor quality of studies. There is insufficient evidence supporting its use for acute low back pain. They also note that although methodologic quality has improved over the past several years, it is still poor.

Liu et al. (2018) evaluated the current evidence of the effectiveness of dry needling of myofascial trigger points (MTrPs) associated with low back pain (LBP). A total of 11 RCTs involving 802 patients were included in the meta-analysis. Results suggested that compared with other treatments, dry needling of MTrPs was more effective in alleviating the intensity of LBP and functional disability; however, the significant effects of dry needling plus other treatments on pain intensity could be superior to dry needling alone for LBP at post-intervention. Authors concluded that moderate evidence showed that dry needling of MTrPs, especially if associated with other therapies, could be recommended to relieve the intensity of LBP at post-intervention; however, the clinical superiority of dry needling in improving functional disability and its follow-up effects still remain unclear. Hu et al. (2018) evaluated the efficacy and safety of dry needling for treating LBP. Sixteen RCTs were included and the risk of bias assessment of them was “high” or “unclear” for most domains. Meta-analysis results suggested that DN was more effective than acupuncture in alleviating pain intensity and functional disability at postintervention, while its efficacy on pain and disability at follow-up was only equal to acupuncture. However, compared with other treatments (laser, physical therapy, other combined treatments, etc.), it remained uncertain whether the efficacy of DN was superior or equal because the results of included studies were mixed. Authors concluded that compared with acupuncture and sham needling, DN is more effective for alleviating pain and disability at postintervention in LBP, while its effectiveness on pain and disability at follow-up was equal to acupuncture. Besides, it remains uncertain whether the efficacy of DN is superior to other treatments. Nevertheless, considering the overall "high" or "unclear" risk of bias of studies, all current evidence is not robust to draw a firm conclusion regarding the efficacy and safety of DN for LBP. Future RCTs with rigorous methodologies are required to confirm findings.

Radi et al. (2023) completed an evidence summary on the effectiveness of dry needling for low back pain. They concluded that a comprehensive treatment program that includes dry needling may provide some benefit in decreasing pain scores and perceived disability vs. standard physical therapy (PT) and home PT in the short term. However, this improvement is small, and the clinical significance is questionable. (Strength of Recommendation: B, randomized controlled trials [RCTs].) Additional research is needed to determine the best regimens to augment dry needling.

Lara-Palomo et al. (2023) evaluated the current evidence of the effectiveness of dry needling in patients with chronic low back pain (LBP). Randomized controlled trials (RCTs) that used dry needling as the main treatment, and which included participants diagnosed with chronic LBP. A total of 8 RCTs involving 414 patients were included in the meta-analysis. All trials examined the efficacy of DN in patients with chronic LBP. Results suggested that compared with other treatments, dry needling combined was more effective in alleviating the pain intensity of LBP post-intervention and at short- term. Authors concluded that current evidence showed that dry needling, especially if associated with other therapies, could be recommended to relieve the pain intensity of LBP at post-intervention and at short-term follow up. There is no evidence that dry needling alone or in combination improves disability at post-immediate or at short-term follow up.

Yu et al. (2023) evaluated benefits and harms of needling therapies (NT) for chronic primary low back pain (CPLBP) in adults to inform a World Health Organization (WHO) standard clinical guideline. They screened 1,831 citations and 109 full text RCTs, yielding 37 RCTs. The certainty of evidence was low or very low across all included outcomes. There was little or no difference between NT and comparisons across most outcomes; there may be some benefits for certain outcomes. Compared with sham, NT improved health-related quality of life (HRQoL) (physical) at 6 months. Compared with no intervention, NT reduced pain at 2 weeks and 3 months; and reduced functional limitations at 2 weeks and 3 month). In older adults, NT reduced functional limitations at

2 weeks and 3 months. Compared with usual care, NT reduced pain and functional limitations at 3 months. Authors concluded that based on low to very low certainty evidence, adults with CPLBP experienced some benefits in pain, functioning, or HRQoL with NT; however, evidence showed little to no differences for other outcomes.

Hip Pain

Forogh et al. (2024) assessed the evidence for the impact of dry needling (DN) on hip pain and function. A total of 7 eligible studies (including 273 patients) were included out of 2,152 screened records. Five studies were in participants with hip osteoarthritis (OA; n = 3), greater trochanteric pain syndrome (GTPS; n = 1) or piriformis syndrome (n = 1); the other two studies were conducted in healthy athletes (n = 2). Two articles assessed changes in participants' short-term visual analog scale (VAS) scores (<1 week), one of which showed that DN significantly reduced pain. One-week VAS scores were analyzed in three studies, all of which demonstrated reduced scores following DN. Hip range of motion (ROM) and muscle force were also improved following DN. No serious side effects were reported. Authors concluded that DN may be safe and effective at relieving hip pain and improving hip function. DN performs significantly better than several different types of control intervention (including sham DN, no treatment, corticosteroid injections and laser). Strong evidence (high degree of certainty around the results) is lacking, and future studies should ideally use longer follow-up periods and larger sample sizes.

Knee Pain

Rahou-El-Bachiri et al. (2020) evaluated the effect of trigger point dry needling alone or as an adjunct with other interventions on pain and related disability in people with knee pain. Ten studies (six patellofemoral pain, two knee osteoarthritis, two post-surgery knee pain) were included. The risk of bias was generally low, but the heterogenicity and the imprecision of the results downgraded the level of evidence. Authors concluded that low to moderate evidence suggests a positive effect of trigger point dry needling on pain and related disability in patellofemoral pain, but not knee osteoarthritis or post-surgery knee pain, at short-term. More high-quality trials investigating long-term effects are clearly needed.

Chronic Ankle Instability (CAI)

Luan et al. (2023) investigated the efficacy of acupuncture or similar needling therapy on pain, proprioception, balance, and self-reported function in individuals with CAI. Acupuncture or similar needling therapy has long been used to improve well-being, but its effectiveness in management of chronic ankle instability (CAI) is unclear. Twelve trials (n = 571) were found, of which the final meta-analysis was conducted with eight. Different studies employ varying treatments, including specific needle types, techniques, and therapeutic frameworks. Compared to control without acupuncture or similar needling therapy, acupuncture or similar needling intervention resulted in improved pain, proprioception (active joint position sense), balance, and self-reported function; American Orthopedic Foot and Ankle Society; Foot and Ankle Ability Measure: activities of daily living for individuals with CAI. Authors concluded that the available evidence suggests that acupuncture or similar needling therapy may improve pain, proprioception, balance, and self-reported function in individuals with CAI, but more trials are needed to verify these findings. Furthermore, various needles and techniques using in different studies have resulted in methodologic limitations that should be addressed in the future.

Shoulder

Hall et al. (2018) completed a systematic review and meta-analysis on patients with upper extremity pain and dysfunction. Eleven randomized trials involving 496 participants were appraised. Authors concluded that there is very low evidence to support the use of TDN in the shoulder region for treating patients with upper extremity pain or dysfunction. Two studies reported adverse effects to TDN interventions. Most common adverse effects included bruising, bleeding, and pain during or after treatment. Navarro-Santana et al. (2021) evaluated the effects of trigger point (TrP) dry needling alone or as an adjunct to other interventions on pain intensity and related disability in nontraumatic shoulder pain. The search identified 551 publications with 6 trials eligible for inclusion. Results demonstrated there was moderate-quality evidence that TrP dry needling reduces shoulder pain intensity with a small effect and low-quality evidence that TrP dry needling improves related disability with a large effect compared with a comparison group. The effects on pain were only found at short term. The Cochrane Risk of Bias was generally low, but the heterogenicity of the results downgraded the evidence level. Authors concluded that moderate- to low-quality evidence suggests positive effects of TrP dry needling for pain intensity (small effect) and pain-related disability (large effect) in nontraumatic shoulder pain of musculoskeletal origin, mostly at short term.

Para-García et al. (2022) examined the effects of dry needling alone or in combination with exercise therapy for reducing pain and disability in people with subacromial pain syndrome in a systematic review and Meta-Analysis. Five RCTs (*n* = 315) were included in the meta-analysis and qualitative analysis. Results determined that dry needling alone or combined with exercise therapy showed improvements in pain in the short-term and mid-term compared to a range of interventions. However, no differences were shown for disability at short-term and mid-term. Dry needling alone or in combination with exercise therapy may result in a slight reduction in pain in the short-term and mid-term. However, the evidence about the effect of this therapy on disability in the short- or mid-term is very uncertain compared to the range of interventions analyzed in this systematic review. Griswold et al. (2023) evaluated the evidence for the effectiveness of various applications of dry needling (DN) combined with other conservative treatments for subacromial pain syndrome (SAPS) in a systematic review with meta-analysis. Eight studies were selected. All eight studies involving 10 comparisons were included in the analyses (N = 538). Dry needling performed in combination with other conservative interventions produced favorable outcomes at all time points for pain and disability. Standard mean differences ranged from -0.57 (moderate) to -1.29 (large) for pain and -0.69 (moderate) to -1.07 (large) for disability, favoring groups receiving DN in addition to conservative treatment. Four of the eight studies were rated as having unclear or high risk of bias. Authors concluded that this meta-analysis suggests that various applications of DN performed with other conservative interventions are more effective than conservative treatment alone for reducing pain and disability in patients with SAPS. Direct-comparison studies are needed to determine whether one application of DN is superior to another.

Neck

The Orthopaedic Section of the American Physical Therapy Association (APTA) published a revision of the neck pain clinical practice guideline (Blanpied et al., 2017). Authors suggest that for individuals with chronic neck pain with mobility deficits, clinicians should provide a multimodal approach of the following:

- Thoracic manipulation and cervical manipulation or mobilization
- Mixed exercise for cervical/scapulothoracic regions: neuromuscular exercise (e.g., coordination, proprioception, and postural training), stretching, strengthening, endurance training, aerobic conditioning, and cognitive affective elements
- Dry needling, laser, or intermittent mechanical/manual traction

The Royal Dutch Society for Physical Therapy (KNGF) issued a clinical practice guideline for physical therapists that addresses the assessment and treatment of patients with nonspecific neck pain, including cervical radiculopathy, in Dutch primary care (Bier et al., 2018). Recommendations were based on a review of published systematic reviews. The physical therapist is advised not to use dry needling, low-level laser, electrotherapy, ultrasound, traction, and/or a cervical collar.

Hernández-Secorún et al. (2023) assessed the short-, mid-, and long-term effectiveness of dry needling in improving pain and functional capacity of patients with chronic neck pain in a systematic review and meta-analysis. Randomized controlled clinical trials in which at least 1 of the groups received dry needling were included. A total of 662 studies were found; 14 clinical trials were selected for qualitative analysis and 13 for quantitative analysis. The quality of most of the studies included was "high." All the studies reported improvements in cervical pain and/or disability, regardless of the protocol followed and the muscles targeted. No serious adverse effects were reported. Dry needling showed to be more effective when compared with other therapies in both women and men, without differences by sex. When the analysis was carried out by age, patients over 40 years old benefited more than those below 40 years old. Authors noted that their meta-analysis supports the use of dry needling to improve pain and functional capacity in patients with chronic neck pain at short- and mid-term intervals.

Headache

France et al. (2014) sought to determine the evidence supporting the use of dry needling in addition to conventional physiotherapy in the management of tension-type and cervicogenic headache. Only three relevant studies were identified and all three showed statistically significant improvements following dry needling, but no significant differences between groups. Only one study reported on headache frequency or intensity, reporting a 45 mm improvement in VAS score following the addition of dry needling to conventional physiotherapy. Two studies showed significant improvements with dry needling over 4-5 weeks of treatment. No adverse events were reported. Authors concluded that literature suggests that while there is insufficient evidence to strongly advocate for the use of dry needling, it may be a useful addition to conventional physiotherapy in headache management. Further research with a stronger methodological design is required.

Pourahmadi et al. (2021) assessed the effectiveness of dry needling on headache pain intensity and related disability in patients with tension-type headache (TTH), cervicogenic headache (CGH), or migraine. Of 2,715 identified studies, 11 randomized clinical trials were eligible for qualitative synthesis and 9 for meta-analysis. Only 4 trials were of high quality. Very low-quality evidence suggested that dry needling is not statistically better than other interventions for improving headache pain intensity in the short term in patients with TTH, CGH, or mixed headache (TTH and migraine). Dry needling provided significantly greater improvement in related disability in the short term in patients with TTH and CGH. The synthesis of results showed that dry needling could significantly improve headache frequency, health-related quality of life, trigger point tenderness, and cervical range of motion in TTH and CGH. Authors concluded that dry needling produces similar effects to other interventions for short-term headache pain relief, whereas dry needling seems to be better than other therapies for improvement in related disability in the short term.

Vázquez-Justes et al. (2022) reviewed the level of evidence for DN in patients with headache. Of a total of 136 studies, they selected 8 randomised clinical trials published between 1994 and 2019, including a total of 577 patients. Two studies evaluated patients with cervicogenic headache, 2 evaluated patients with tension-type headache, one study assessed patients with migraine, and the remaining 3 evaluated patients with mixed-type headache (tension-type headache/migraine). Quality ratings ranged from low (3/10) to high (7/10). The effectiveness of DN was similar to that of the other interventions. DN was associated with significant improvements in functional and sensory outcomes. Authors concluded that dry needling should be considered for the treatment of headache and may be applied either alone or in combination with pharmacological treatments.

Kamonseki et al. (2022) systematically reviewed the evidence about the effectiveness of manual therapy (MT) on pain intensity, frequency, and impact of headache in individuals with tension-type headache (TTH). Fifteen studies were included with a total sample of 1,131 individuals. High velocity and low amplitude techniques were not superior to no treatment on reducing pain intensity (low evidence) and frequency (moderate evidence). Soft tissue interventions were superior to no treatment on reducing pain intensity (low evidence) and frequency of pain (low evidence). Dry needling was superior to no treatment on reducing pain intensity (moderate evidence) and frequency (moderate evidence). Soft tissue interventions were not superior to no treatment and other treatments on the impact of headache. Authors concluded that soft tissue interventions and dry needling can be used to improve pain intensity and frequency in patients with tension type headache. High velocity and low amplitude thrust manipulations were not effective for improving pain intensity and frequency in patients with tension type headache.

Jung et al. (2024) assessed the efficacy of physical therapist interventions on the intensity, frequency, and duration of headaches, as well as on the quality of life of patients with cervicogenic headache. Randomized controlled trials assessing the effect of physical therapist interventions on adults with cervicogenic headache were included. Of the 28 identified reports, 23 were included in the quantitative synthesis. Manipulation plus dry needling was the highest-ranked intervention to reduce the short-term headache intensity and frequency when compared to a control intervention. Other high-ranked and clinically effective interventions (when compared to a control intervention) were muscle-energy technique plus exercise, as well as soft tissue techniques plus exercise to reduce short-term headache intensity, and dry needling plus exercise to reduce short-term headache frequency. These results were based on a low certainty of evidence. Authors concluded combined interventions such as spinal joint manipulation plus dry needling and muscle-energy technique or soft tissue techniques or dry needling plus exercises seem to be the best interventions to reduce short-term cervicogenic headache intensity and/or frequency.

All Body Regions

Boyles et al. (2015), sought to determine the effectiveness of TDN based on high-quality RCTs for all body regions. The majority of high-quality studies included in this review showed measurable benefit from TDN for MTrPs in multiple body areas, suggesting broad applicability of TDN treatment for multiple muscle groups. Rodríguez- Mansilla et al. (2016) summarized the literature about the effectiveness of dry needling (DN) on relieving pain and increasing range of motion (ROM) in individuals with myofascial pain syndrome (MPS). Authors concluded that DN was less effective on decreasing pain comparing to the placebo group. Other treatments were more effective than DN on reducing pain after 3-4 weeks. However, on increasing ROM, DN was more effective comparing to that of placebo group, but less than other treatments. Gattie et al. (2017) examine the short- and long-term effectiveness of dry needling delivered by a physical therapist for any musculoskeletal pain condition. After screening, 13 were included. Eight meta-analyses were performed. In the immediate to 12-week follow-up period, studies provided evidence that dry needling may decrease pain and increase pressure pain threshold when compared to control/sham or other treatment. At 6 to 12 months, dry needling was favored for decreasing pain, but the treatment effect was not statistically significant. Dry needling, when compared to control/sham treatment, provides a statistically significant effect on functional outcomes, but not when compared to other treatments. Authors concluded that very low-quality to moderate-quality evidence suggests that dry needling performed by physical therapists is more effective than no treatment, sham dry needling, and other treatments for reducing pain and improving pressure pain threshold in patients presenting with musculoskeletal pain in the immediate to 12-week follow-up period. Low-quality evidence suggests superior outcomes with dry needling for functional outcomes when compared to no treatment or sham needling. However, no difference in functional outcomes exists when compared to other physical therapy treatments. Evidence of long-term benefit of dry needling is currently lacking. Espejo-Antúnez et al. (2017) examined the effectiveness of dry needling in the treatment of myofascial trigger points and to explore the impact of specific aspects of the technique on its effectiveness. Fifteen studies were included in this systematic review. The main outcomes that were measured were pain, range of motion, disability, depression, and quality of life. The results suggest that dry needling is effective in the short term for pain relief, increase range of motion and improve quality of life when compared to no intervention/sham/placebo. There is insufficient evidence on its effect on disability, analgesic medication intake and sleep quality. Authors state that despite some evidence for a positive effect in the short term, further randomized clinical trials of high methodological quality, using standardized procedures for the application of dry needling are needed.

Sánchez-Infante et al. (2021) sought to determine the short-, medium-, and long-term effectiveness of dry needling (DN) applied by physical therapists to myofascial trigger points for the treatment of pain via systematic review and meta-analysis. The initial search identified 1,771 articles. After the selection, 102 articles were assessed for eligibility; 42 of these articles measuring pain were used for the meta-analysis. Four meta-analyses were performed according to the follow-up period from the last reported treatment. This meta-analysis found a large effect to decrease pain within 72 hours, a moderate effect in 1 to 3 weeks, a large effect in 4 to 12 weeks, and a large effect in 13 to 24 weeks. The risk of bias was generally low; however, the heterogeneity of the results downgraded the level of evidence. Authors concluded that low-quality evidence that the immediate to 72-hour (large) effect, 4- to 12-week (large) effect, 13- to 24-week (large) effect, and moderate-quality 1- to 3-week (moderate) effect suggested that DN performed by physical therapists was more effective than no treatment, sham DN, and other therapies for reducing pain.

Sousa Filho et al. (2021) compared the effects of corticosteroid injection (CSI) and dry needling (DN) for musculoskeletal conditions at short-, medium-, and long-term follow-up. Six studies were included (*n* = 384 participants). Four musculoskeletal conditions were investigated. There is very low-quality evidence that CSI is superior to DN for reducing heel pain (plantar fasciitis) and lateral elbow pain at short- and medium-term follow-up, but not for myofascial pain and greater trochanteric pain. There is very low-quality evidence that DN is more effective than CSI at long-term follow-up for reducing pain in people with plantar fasciitis and lateral epicondylitis. Very low-certainty evidence shows that there is no difference between DN and CSI for disability at short-term follow-up. One study showed that CSI is superior to DN at medium-term follow-up and another observed that DN is superior to CSI for reducing disability at long-term. Authors concluded that there are no differences between DN and CSI in pain or disability for myofascial pain and greater trochanteric pain syndrome. Very-low certainty evidence suggests that CSI is superior to DN at shorter follow-up periods, whereas DN seems to be more effective than CSI at longer follow-up durations for improving pain in plantar fasciitis and lateral epicondylitis. Large RCTs with higher methodological quality are needed in order to draw more incisive conclusions.

Valera-Calero et al. (2022) investigated the efficacy of dry needling and acupuncture in patients with FM regarding pain, function, and disability in both the short and the long term. A total of 25 studies addressed randomized controlled trial studies evaluating efficacy data of dry needling or/and acupuncture treatments to improve pain, fatigue, sleep disturbance and impaired quality of life and/or daily function. Most studies had an acceptable methodological quality. Four studies assessed the effect of dry needling, and twenty-one studies assessed the effect of acupuncture. In general, both interventions improved pain, anxiety, depression, fatigue, stiffness, quality of sleep and quality of life. However, both techniques were not compared in any study. Acupuncture and dry needling therapies seems to be effective in patients with FM, since both reduced pain pressure thresholds, anxiety, depression, fatigue, sleep disturbances and disability in the short term. It is still required to compare both techniques and their application in the long term.

Griswold et al. (2024) systematically evaluated the comparative effectiveness of dry needling (DN) or local acupuncture to various types of wet needling (WN) for musculoskeletal pain disorders (MPD). Twenty-six studies were selected. Wet Needling types included cortisone (CSI) (*N* = 5), platelet-rich plasma (PRP) (*N* = 6), Botox (BoT) (*N* = 3), and local anesthetic injection (LAI) (*N* = 12). Evidence was rated as low to moderate quality. Results indicate DN produces similar effects to CSI in the short-medium term and superior outcomes in the long term. In addition, DN produces similar outcomes compared to PRP in the short and long term and similar outcomes as BoT in the short and medium term; however, LAI produces better pain outcomes in the short term. Authors concluded that evidence suggests the effectiveness of DN to WN injections is variable depending on the injection type, outcome time frame, and diagnosis. In addition, adverse event data were similar but inconsistently reported.

Tendinopathy

Krey et al. (2015) summarized the best available evidence to determine if tendon needling is an effective treatment for tendinopathy. The studies that were included in this review suggest that tendon needling improves patient reported outcomes in patients with tendinopathy. In 2 studies evaluating tendon needling in lateral epicondylosis, one showed an improvement in a subjective visual analogue scale score of 34% (significant change > 25%) from baseline at 6 months. The other showed an improvement of 56.1% in a visual analogue scale score from baseline. In 1 study evaluating tendon needling in addition to eccentric therapy for Achilles tendinosis, the subjective Victorian Institute of Sport Assessment-Achilles (VISA-A) score improved by 19.9 (significant change > 10) (95% CI, 13.6-26.2) from baseline. In 1 study evaluating tendon needling in rotator cuff tendinosis, the subjective shoulder pain and disability index showed statistically significant improvement from baseline at 6 months ($P < 0.05$). Authors concluded that the evidence suggests that tendon needling improves patient-reported outcome measures in patients with tendinopathy. Stoychev et al. (2020) reviewed the use of dry needling as a treatment modality for tendinopathy. The effectiveness of dry needling for treatment of tendinopathy has been evaluated in 3 systematic reviews, 7 randomized controlled trials, and 6 cohort studies. The following sites were studied: wrist common extensor origin, patellar tendon, rotator cuff, and tendons around the greater trochanter. There was considerable heterogeneity of the needling techniques, and the studies were inconsistent about the therapy used after the procedure. Most systematic reviews and randomized controlled trials supported the effectiveness of tendon needling. There was a statistically significant improvement in the patient-reported symptoms in most studies. Some studies reported an objective improvement assessed by ultrasound. Two studies reported complications. Authors concluded that current research provides initial support for the efficacy of dry needling for tendinopathy treatment. In further high-quality studies, tendon dry needling should be used as an active intervention and compared with appropriate sham interventions. Studies that compare the different protocols of tendon dry needling are also needed.

Navarro-Santana et al. (2020) evaluated the effect of dry needling alone or combined with other treatment interventions on pain, related-disability, pressure pain sensitivity, and strength in people with lateral epicondylalgia of musculoskeletal origin in a meta-analysis. Seven studies including 320 patients with lateral epicondylalgia were included. Authors concluded that low to moderate evidence suggests a positive effect of dry needling for pain, pain-related disability, pressure pain sensitivity and strength at short-term in patients with lateral epicondylalgia of musculoskeletal origin. Jayaseelan et al. (2021) systematically reviewed the utilization and effects of DN for tendinopathy. After screening 462 articles, 10 studies met inclusion criteria. Study designs included case reports, case series, and randomized clinical trials. DN was used in isolation in 3/10 studies and as part of a multimodal approach in 7/10 studies. DN was associated with improved pain, function, muscle performance and perceived improvement in each study evaluating the relevant outcome. Authors concluded that DN may be a useful adjunctive treatment in the conservative management of tendinopathy, although its discrete effect is unclear. Very low-quality evidence and methodological limitations suggest further investigation is warranted.

Giorgi et al. (2022) summarized the best available evidence on the use of DN and exercise combined to treat tendinopathy. Seven studies met the inclusion and exclusion criteria. Current evidence supports the use of DN combined with therapeutic exercises, especially those including eccentric exercises, can improve pain and function for various tendinopathies. However, limited evidence exists regarding specific therapeutic interventions to be combined with DN. Authors concluded that there is moderate, level B evidence to suggest the use of DN techniques targeted at the tendon and combined with eccentric therapeutic exercise to improve pain and functional outcomes for tendinopathies. Nuhmani et al. (2023) evaluated the best available evidence on the effectiveness of DN in the management of tendinopathy. Seven randomized control trials were selected. To be included in the current systematic review, the study had to be an RCT conducted on human participants, which investigated the effect of the DN technique on the management of tendinopathies. A total of 357 participants were enrolled in the seven included studies, which were on greater trochanteric pain syndrome, lateral epicondylitis, supraspinatus tendinopathy and Achilles tendinopathy. DN was compared with various interventions, including platelet-rich plasma injection, autologous blood injection and non-steroidal anti-inflammatory medication. All the selected studies reported a significant positive effect of DN on pain intensity and other outcome measures, such as patient-specific functional score, disability index, range of motion and health-related quality of life. Authors concluded that these results indicate that DN appears to be as effective as other treatment methods at relieving pain and other symptoms of tendinopathy immediately after treatment and up to 6 months. DN can be considered among the many options available for the management of tendinopathy.

Lowdon et al. (2024) compared the effectiveness of different lateral elbow tendinopathy (LET) treatments directly and indirectly against control/placebo based on a validated outcome, the Patient-Rated Tennis Elbow Evaluation (PRTEE) pain score in a network meta-analysis. Thirteen studies with 12 comparators including control/placebo were eligible. The results indicated no significant improvement in PRTEE pain score in the short term across all treatments compared with control/placebo. In the midterm, physiotherapy/exercise showed benefit against placebo. Although steroid injections, dry needling, and autologous blood also exhibited potential treatment effects, it is crucial for the clinician to consider certain pitfalls when considering these treatments. The limited number of small studies and paucity of data call for caution in interpreting the results and need for further evidence. Authors concluded that patients should be informed that there is currently no strong evidence that any treatment produces more rapid improvement in pain symptoms when compared with control/placebo in the short and medium terms.

Heel Pain

He et al. (2017) conducted this meta-analysis to evaluate the effect of MTrP needling in patients with plantar heel pain. Extensive literature search yielded 1,941 articles, of which only seven RCTs met the inclusion criteria and were included in this meta-analysis. Authors determined that MTrP needling effectively reduced the heel pain due to plantar fasciitis. However, considering the potential limitations in this study, more large-scale, adequately powered, good-quality placebo-controlled trials are needed to provide more trustworthy evidence in this area. Llurda-Almuzara et al. (2021) evaluated the effects of dry needling over trigger points associated with plantar heel pain on pain intensity and related disability or function in a meta-analysis. The search identified 297 publications, with six trials eligible for inclusion. The meta-analysis found low-quality evidence that trigger point dry needling reduces pain intensity in the short term and moderate-quality evidence that it improves pain intensity and related disability in the long term, as compared with a comparison group. The risk of bias of the trials was generally low, but the heterogeneity of the results downgraded the level of evidence. Authors concluded that moderate- to low-quality evidence suggests a positive effect of trigger point dry needling for improving pain intensity and pain-related disability in the short term and long term, respectively, in patients with plantar heel pain of musculoskeletal origin. The present results should be considered with caution because of the small number of trials.

Orofacial Pain

Vier et al. (2019) systematically reviewed the effects of dry needling on orofacial pain of myofascial origin in patients with temporomandibular joint dysfunction. Seven trials were considered eligible. There was discrepancy among dry needling treatment protocols. Meta-analysis showed that dry needling is better than other interventions for pain intensity as well as than sham therapy on pressure pain threshold, but there is very low-quality evidence and a small effect size. There were no statistically significant differences in other outcomes. Authors concluded that clinicians could use dry needling for the treatment of temporomandibular joint dysfunction, nevertheless, due the low quality of evidence and high risk of bias of some included studies, larger and low risk of bias trials are needed to assess the effects of dry needling on orofacial pain associated with temporomandibular joint dysfunction. Al-Moraissi et al. (2020) completed a network meta-analysis (NMA) of randomized clinical trials (RCTs) aiming to compare the treatment outcome of dry needling, acupuncture or wet needling using different substances in managing myofascial pain of the masticatory muscles (TMD-M). Twenty-one RCTs involving 959 patients were included. The quality of evidence of the included studies was low or very low. Authors concluded that based on this NMA, one can conclude that the effectiveness of needling therapy did not depend on needling type (dry or wet) or needling substance. This NMA did not provide enough support for any of the needling therapies for TMD-M.

Menéndez-Torre et al. (2023) compared the effectiveness of manual therapy and dry needling in patients with myofascial TMD in a systematic review and network meta-analysis. Manual therapy and dry needling are commonly used interventions for the treatment of myofascial temporomandibular disorders. However, it is unclear whether one of them could be superior to the other. Out of 3,190 records identified, 17 met the inclusion criteria for qualitative analysis and eight were included in the network meta-analysis. Indirect comparisons between dry needling and manual therapy showed no significant differences in their effects on pain reduction. The ranking of treatments shows that manual therapy followed by deep dry needling present the highest values of estimation and can be considered the most likely to reduce pain. Authors concluded that the results of the network meta-analysis should be considered with caution due to the low quality of the evidence available and the high variability of the study protocols in terms of the method of application of dry needling and manual therapy interventions.

Spasticity

Bynum et al. (2021) examined existing studies on dry needling for spasticity and range of motion (ROM) and discusses its potential for use as an occupational therapy intervention. Authors noted that strong evidence was found to support the use of dry needling to decrease spasticity and increase ROM. They concluded that this systematic review suggests that dry needling is an effective physical agent modality to decrease spasticity and increase ROM, both of which are potentially beneficial to functional outcomes. Fernández-de-Las-Peñas et al. (2021) evaluated the effects of muscle dry needling alone or combined with other interventions on post-stroke spasticity (muscle tone), related pain, motor function, and pressure sensitivity. Seven studies (three within the lower extremity, four in the upper extremity) were included. The meta-analysis found significantly large effect sizes of dry needling for reducing spasticity, post-stroke pain, and pressure pain sensitivity as compared with a comparative group at short-term follow-up. The effect on spasticity was found mainly in the lower extremity at short-term follow-up. No effect on spasticity was seen at 4 weeks. No significant effect on motor function was observed. The risk of bias was generally low, but the imprecision of the results downgraded the level of evidence. Authors concluded that moderate evidence suggests a positive effect of dry needling on spasticity (muscle tone) in the lower extremity in post-stroke patients. The effects on related pain and motor function are inconclusive. Valencia-Chulián et al. (2020) summarized the available evidence about the effectiveness of deep dry needling (DN) on spasticity, pain-related outcomes, and range-of-movement (ROM) in adults after stroke. A total of sixteen studies, 7 of which were RCTs, were selected. All studies generally reported an improvement of spasticity level, pain intensity, and ROM after the use of DN, alone or combined with other interventions, in stroke survivors. Authors concluded that the management of adults after stroke with DN may impact positively on spasticity, pain, and ROM. However, there was significant heterogeneity across trials in terms of sample size, control groups, treated muscles, and outcome measures, and a meta-analysis was not feasible.

DRY NEEDLING SAFETY

Serious adverse events are rare with dry needling. Serious events include infection, internal bleeding, and pneumothorax. Other mild events include nausea, dizziness, faintness, somato-emotional responses, aggravation of symptoms, bruising, post-needle soreness, and bleeding. To reduce risk of infection, standard precautions should be followed by all practitioners. Use of gloves, sterile needles, appropriate needle placement, skin cleansing, and sharps management are important.

Absolute contraindications include:

- Patient with needle phobia or an unwilling patient due to fear or patient beliefs
- Inability to give consent — age-related, communication, cognitive
- History of reaction to needling (or injection) in the past
- Medical emergency
- Into a muscle or area in patients on anticoagulant therapy or with thrombocytopenia, where hemostasis by palpation cannot be carried out appropriately (e.g., psoas, tibialis posterior)
- Into an area or limb with lymphedema due to increased risk of infection or after surgical lymphectomy

Relative contraindications or precautions include:

- Abnormal bleeding tendency
- Compromised immune system
- Vascular disease
- Diabetes
- Pregnancy
- Frail patients
- Epilepsy
- Medications (e.g., anti-coagulants)
- Psychological status (e.g., schizophrenic or intoxicated patient)

Boyce et al. (2020) reported on the type of adverse events associated with the utilization of therapeutic dry needling (TDN). Four hundred and twenty physical therapists participated in this study. Information related to minor and major adverse events that occurred during 20,464 TDN treatment sessions was collected. Each physical therapist respondent was asked to fill out two weekly self-reported electronic surveys over a six-week period. One survey was related to “minor adverse events” (i.e., pain, bleeding, bruising), while the other was related to “major adverse events” (i.e., pneumothorax, excessive bleeding, prolonged aggravation). Following the six-week period, descriptive statistics were used to describe the adverse events (AE) associated with TDN and calculate the frequencies of those events. A total of 7,531 minor AEs were reported, indicating that 36.7% of the reported TDN treatments resulted in a minor AE. The top three minor AEs were bleeding (16%), bruising (7.7%), and pain during dry needling (5.9 %). The average ratio of minor AEs for all respondents across all weeks was 0.53 or approximately one event for every two patients. Twenty major AEs were reported out of the 20,494 treatments for a rate of <0.1% (1 per 1,024 TDN treatments). No associations were noted between the frequency of adverse events and the number of patients treated, practitioner age, level of education, years in practice, level of training or months experience with dry needling. Authors concluded that expected minor AE’s such as mild bleeding, bruising, and pain during TDN were common and major AEs were rare. Physical therapists and other medical practitioners need to be aware of the risks of TDN. Based on the findings of this study the overall risk of a major adverse event during TDN is small.

Malfait et al. (2024) assessed the safety of DN in stroke patients. Dry needling (DN) has been proposed as a potential additional option to consider in the multimodal treatment of post-stroke spasticity, although questions about its safety remain. Twenty-five articles were included in this review. Only six studies reported adverse events, all of which were considered minor. None of the included studies reported any serious adverse events. In four of the included studies anticoagulants were regarded as contra-indicative for DN. Anticoagulants were not mentioned in the other included studies. Authors concluded that there is a paucity of literature concerning the safety of DN in stroke patients and based on the results there is insufficient evidence regarding the safety of DN in stroke patients. Although DN could be a promising treatment in post-stroke spasticity, further research is indicated to investigate its mechanism of action and its effect on outcome. However, before conducting large clinical trials to assess outcome parameters, the safety of DN in stroke patients must be further investigated.

PRACTITIONER SCOPE AND TRAINING

Practitioners should practice only in the areas in which they are competent based on their education, training, and experience. Levels of education, experience, and proficiency may vary among individual practitioners. It is ethically and legally incumbent on a practitioner to determine where they have the knowledge and skills necessary to perform such services and whether the services are within their scope of practice.

It is best practice for the practitioner to appropriately render services to a patient only if they are trained, equally skilled, and adequately competent to deliver a service compared to others trained to perform the same procedure. If the service would be most competently delivered by another health care practitioner who has more skill and training, it would be best practice to refer the patient to the more expert practitioner.

Best practice can be defined as a clinical, scientific, or professional technique, method, or process that is typically evidence-based and consensus driven and is recognized by a majority of professionals in a particular field as more effective at delivering a particular outcome than any other practice (Joint Commission International Accreditation Standards for Hospitals, 2020).

Depending on the practitioner’s scope of practice, training, and experience, a member’s condition and/or symptoms during examination or the course of treatment may indicate the need for referral to another practitioner or even emergency care. In such cases it is prudent for the practitioner to refer the member for appropriate co-management (e.g., to their primary care physician) or if immediate emergency care is warranted, to contact 911 as appropriate. See the *Managing Medical Emergencies (CPG 159 – S)* clinical practice guideline for information.

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