Article Title/ Author/Year	**Article Type**	**Subjects (Number and Criteria)**	**Outcome Measures and Timeframes**	**Interventions or Methods**	**Results or Key Points**	**Conclusions**
Description of Dry Needling In Clinical Practice: An Educational Resource Paper 2013	Educational Resource Paper	N/A	N/A	N/A	Definition of DN: skilled intervention that uses thin filiform needles to penetrate skin and stimulate myofascial trigger points, muscle, and connective tissue to improve pain and movement impairments to improve activity and participation Definition of trigger points: hyperirritable spots within taut band of contractured skeletal muscle fibers that produce local and/or referred pain when stimulated;	N/A

					characterized by local ischemia and hypoxia, low pH, chemical differences, pain, and altered muscle activation patterns; generate motor endplate noise and excessive release of acetylcholine; peripheral sources of constant nociceptive input that can contribute to peripheral and central sensitization; active trigger points are spontaneously painful; latent trigger points are only painful when stimulated Theories of physiological effects: mechanotransduc	

					tion (body converting mechanical loading by needle into cellular response) achieved by needle rotation that generates fibroblast activation and collagen reorganization. Types of DN: deep DN with penetration of trigger point which causes local twitch response (spinal cord reflex that causes involuntary contraction of contractured taut band) which is associated with alleviation of motor endplate noise, chemical imbalance (nociceptive, inflammatory,	

					immune), and ischemia, as well as fiber relaxation, decreased pain, and improved ROM. Superficial DN just into muscle within proximity to trigger point which activates mechanoreceptors, resulting in decreased pain and improved ROM. No local twitch response produced. Indications for DN: presence of trigger points, ROM restrictions due to contractured muscle fibers/taut bands Safety: requires knowledge, skills, and attributes to perform; adhere to OSHA Blood	

					Borne Pathogens standard (gloves) Contraindications /precautions: needle phobia, significant anxiety, children 12 years of age or younger, significant cognitive impairment, unable to communicate directly or via interpreter, patient unwilling to receive treatment, patient unable to give consent, local skin lesions, local or systemic infections, local lymphedema, severe hyperalgesia, metal allergy, abnormal bleeding (on anticoagulants or with thrombocytopeni	

					a), compromised immune system, pregnancy, vascular disease, post-surgery of open joint capsule Adverse events: minor bleeding most common Application: DN is rarely performed alone and should be included in a broader physical therapy approach, including manual therapy, therapeutic exercise, neuromuscular re-education, and functional training Reimbursement: physical therapists should check with insurance payers	

					to determine billing policies	
Dry Needling: Getting to the Point Ries 2015	APTA Magazine web article	N/A	N/A	N/A	Definition of DN: instrument-assisted manual therapy, based on western neuroanatomy and modern science "single tool in the PT's toolbox" Acupuncture: DN and acupuncture differ in terms of historical, philosophical, indicative, and practice context Theories of physiological effects: largely unclear Personal scope of practice/PT education: basic anatomical, physiological, and biomechanical knowledge for DN taught as part of	N/A

					core PT education; DPT programs are teaching students about DN, movement to incorporate into residencies Professional scope of practice: included in APTA Board of Directors policy Guidelines: Physical Therapist Scope of Practice and listed as manual therapy technique in Guide to Physical Therapist Practice 3.0 based on 2011 review of evidence that found DN has mid-range research support Reimbursement: not CPT code, some payers do not reimburse , APTA defines DN as a manual	

					therapy technique but does not say it should be coded or billed as such, should check with payers to determine if DN is covered and which code to use, many provide DN on a cash basis to avoid this Historical perspective: David Simons and Janet Travell authored textbook *Myosfasical Pain and Dysfunction: The Trigger Point Manual* Application: DN should not be a standalone procedure Adverse events: most serious	

					being pneumothorax	
FSBPT Analysis of Competencies for Dry Needling by Physical Therapists Caramagno et al. 2015	Practice analysis web report	N/A	N/A	Purpose of document: determine measurable or observable knowledge, skills, and/or abilities (competencies) a PT must possess to perform DN competently Methods to determining competencies: background literature review, practitioner survey, task force meeting of 7 DN experts to define DN and standards for competence, review DN tasks and knowledge requirements, and identify DN skills and abilities	86% of knowledge requirements (evaluation, assessment, diagnoses, plan of care, documentation, safety, professional responsibilities) to be competent in DN is acquired during PT entry level education 14% of knowledge requirements (patient selection, needle placement and manipulation, identification of contraindications) must be acquired through post-graduate or specialized education The only skills that entry level	N/A

					PT's do not have that is required of DN is ability to handle needles and palpate tissues, which requires specialized training Historical perspectives: pioneered by Travell and Simons (MDs) Definition DN: based on philosophical and theoretical framework supported by modern science, use of needle without injectate	
Considering Providing Dry Needling Services? Understand your professional, legal, and personal scopes of practice	APTA Magazine web article	N/A	N/A	N/A	Professional scope of practice: defined by education, research, and APTA positions; recognized by APTA as within scope of practice	N/A

Markels 2021					and listed in Guide to Physical Therapist Practice 3.0 as manual therapy technique; APTA House of Delegates position "Interventions Performed Exclusively by Physical Therapists" says DN should not be delegated Legal scope of practice: depends on state licensure law/practice act/state licensure board positions Personal scope of practice: activities that a PT is educated, trained, and competent to perform, individual states often have	

					different educational requirements for DN Reimbursement: CPT codes 20560 (needle insertion without injection, 1-2 muscles) and 20561 (needle insertion without injection, 3 or more muscles)	
State Laws and Regulations Governing Dry Needling Performed by Physical Therapists in the U.S. 2021	N/A	N/A	N/A	N/A	DN by PTs permitted by law in 36 states plus Washington D.C. (including NC) DN by PTs prohibited by law in 6 states DN by PTs ambiguous in law in 8 states	N/A
Scope of Practice 2022	NC PT Board website	N/A	N/A	N/A	Legal and student scope of practice: Board previously determined that DN is “advanced” skills that requires advanced training	N/A

					(beyond entry-level); "Students who are in the process of didactic and clinical training do not meet the definition of 'advanced'" meaning that they cannot perform DN; there are no specific requirements for the education and training required for performing dry needling by a physical therapist licensee; certification is not currently required by the Board; "it is very useful to keep (certification if it is obtained) on file as part of documentation of competence related to the personal practice of DN), DN courses currently	

					approved per Continuing Competence rules 12 NCAC 48G .0105 - .0112.; "it is incumbent upon the licensee to obtain the appropriate training, education and be competent to perform DN"	
ADVERSE EVENTS ASSOCIATED WITH THERAPEUTIC DRY NEEDLING Boyce et al. 2020	Prospective questionnaire	420 physical therapists included	Survey collected information on minor (bleeding, bruising, pain, feeling faint, nausea, headache, drowsiness) and major (pneumothorax, punctured organ, broken or forgotten needle, excessive bleeding, nerve injury, infection, prolonged pain, fainting, convulsion, vomiting, skin reactions)	N/A	Information from a total of 20,464 DN sessions was used. 7,531 minor events reported; 36.7% of treatments resulted in minor events including bleeding (16.04%), bruising (7.71%), pain during treatment (5.93%), and others (<3%). 20 major events reported; <0.1% of treatments	Minor adverse events are relatively common as a result of DN; however, major adverse events are extremely rare. Because the risk of major adverse event is very small, DN can safely be used among patients.

			adverse events during DN over a 6-week period.		resulted in major events including symptom aggravation (6 participants), fainting (4 participants), forgotten needles (3 participants), flu like symptoms (2 participants), infection (2 participants), lower extremity weakness (1 participant), excessive bleeding (1 participant), upper extremity numbness (1 participant).	
A survey of American physical therapists' current practice of dry needling: Practice patterns and adverse events Gattie et al. 2020	Cross sectional observational survey	865 physical therapists included	Survey collected information on general information about DN, DN practice patterns and training, adverse events occurrence (major and minor), and demographics.	N/A	95.3% of participants report using a deep DN technique and 54% report using superficial DN. Many participants also reported almost always using the pistioning (in and	Minor adverse events are relatively common as a result of DN. While major adverse events can occur, they are far less common. Adverse events resulting from DN are

			Information regarding adverse events is most relevant to this capstone project.		out) technique (37.4%). 97.4% of participants report typically using DN in combination with other treatments. Of the 413 participants who performed DN, minor events such as pain during (39.56%) and after (23.38%) treatment were the most common. Other minor events included bleeding (17.11%), bruising (11.81%), fatigue, emotional, headache, drowsiness, shaky, itching, numbness, and claustrophobia (all less than 5%).	lower or comparable to other treatments (thrust joint manipulations or medications) for musculoskeletal conditions.

					Of the 413 participants who performed DN, major events such as prolonged symptom aggravation (15%) and fainting (15%) were the most commonly reported. Other major events included forgotten needle (6.3%), and vomiting, subdural hematoma, pneumothorax, nerve injury, infection, or broken needle (all less than 5%). Major adverse events were rare.	
PERTINENT DRY NEEDLING CONSIDERATIONS FOR MINIMIZING ADVERSE EFFECTS – PART ONE	Clinical commentary	N/A	N/A	N/A	Theories of physiological effects: peripheral and central pain modulation including the gate control theory	N/A

Halle and Halle 2016					and endogenous opioid system, disruption of hyperalgesia and central sensitization, disruption of trigger points with local ischemia/hypoxia related to access acetylcholine release and endplate noise, increases in blood flow and oxygen saturation levels, increased fibroblastic activity, endocrine/neurologic activity that decrease activation of limbic system Safety concerns: pneumothorax, penetration of pericardial sac/cardiac tamponade, hematoma, CNS injury when	

					needling in and around thorax (shoulder, neck, etc); can be mitigated with knowledge of anatomy and training in needle application	
PERTINENT DRY NEEDLING CONSIDERATIONS FOR MINIMIZING ADVERSE EFFECTS – PART TWO Halle and Halle 2016	Clinical commentary	N/A	N/A	N/A	Safety concerns: puncture of peritoneal cavity or internal organs when needling in and around the abdomen, pelvis and back; vasovagal responses leading to lightheadedness or syncope; importance of conveying possible adverse events when obtaining informed consent; use of universal precautions (glove wear to protect patient and therapist);	N/A

					can be mitigated with knowledge of anatomy, training in needle application, and training in response to adverse events	
Physiologic Effects of Dry Needling Cagnie et al. 2013	Review article	N/A	Review of basic and clinical published research	N/A	Peripheral pain modulation is achieved by chemical changes in local tissues including nociceptive and inflammatory substances. Central pain modulation is achieved by the gate control theory, endogenous opioid system, and other neural or endocrine pathways. Trigger point formation: development of taut band by excessive	The proposed effects of DN are not definitively supported by research, but are complex and involve peripheral and central pain modulating systems.

					acetylcholine release and end plate noise, sustained contracture of sarcomere results in ischemia and hypoxia, this results in release of nociceptive chemicals, which can cause peripheral and central sensitization Theories of physiologic effects: disruption of motor endplate noise and acetylcholine release by mechanical stimulation, increase blood flow and oxygenation by microinjury and release of vasodilators, gate control theory by mechanical stimulation,	

					endogenous opioid release or neurologic/endocrine response by microinjury	

Abbreviations: DN (dry needling), ROM (range of motion), PT (physical therapy or physical therapist), CPT (Current Procedural Terminology), APTA (American Physical Therapy Association), CNS (central nervous system)

Bibliography:

1. *Description Of Dry Needling In Clinical Practice: An Educational Resource Paper*. APTA Public Policy, Practice, and Professional Affairs Unit; 2013.
2. Dry Needling: Getting to the Point | APTA. https://www.apta.org/apta-magazine/2015/05/01/dry-needling-getting-to-the-point. Accessed February 4, 2022.
3. FSBPT Analysis of Competencies for Dry Needling by Physical Therapists | APTA. https://www.apta.org/patient-care/interventions/dry-needling/fsbpt-analysis-of-competencies-for-dry-needling-by-physical-therapists. Accessed February 4, 2022.
4. Considering Providing Dry Needling Services? | APTA. https://www.apta.org/apta-magazine/2021/03/01/apta-magazine-march-2021/considering-providing-dry-needling-services. Accessed February 4, 2022.
5. Dry Needling State Laws | APTA. https://www.apta.org/patient-care/interventions/dry-needling/laws-by-state. Accessed February 4, 2022.
6. Scope Of Practice. Ncptboard.org. https://ncptboard.org/app/LandingPages/ScopeOfPracticeHome.php. Published 2022. Accessed February 4, 2022.
7. Boyce D, Wempe H, Campbell C, et al. ADVERSE EVENTS ASSOCIATED WITH THERAPEUTIC DRY NEEDLING. *Int J Sports Phys Ther*. 2020;15(1):103-113.
8. Gattie E, Cleland JA, Snodgrass S. A survey of American physical therapists' current practice of dry needling: Practice patterns and adverse events. *Musculoskelet Sci Pract*. 2020;50:102255. doi:10.1016/j.msksp.2020.102255
9. Halle JS, Halle RJ. PERTINENT DRY NEEDLING CONSIDERATIONS FOR MINIMIZING ADVERSE EFFECTS - PART ONE. *Int J Sports Phys Ther*. 2016;11(4):651-662.
10. Halle JS, Halle RJ. PERTINENT DRY NEEDLING CONSIDERATIONS FOR MINIMIZING ADVERSE EFFECTS - PART TWO. *Int J Sports Phys Ther*. 2016;11(5):810-819.

11. Cagnie B, Dewitte V, Barbe T, Timmermans F, Delrue N, Meeus M. Physiologic effects of dry needling. *Curr Pain Headache Rep*. 2013;17(8):348. doi:10.1007/s11916-013-0348-5