



**Guidelines
For
Dry Needling Practice**

POLICY STATEMENT

The Irish Society of Chartered Physiotherapists (ISCP), hereafter referred to as the Society, is the sole professional body for Physiotherapists in Ireland.

It is the policy of the Irish Society of Chartered Physiotherapists that all members using dry needling follow these guidelines.

PURPOSE

This document is intended as a practice guideline¹ that makes recommendations for the safe practice of dry needling in physiotherapy.

These guidelines are intended to assist Chartered Physiotherapists to implement safe dry needling practice. The guidelines should be used as a reference guide for developing minimum standards for dry needling practice. Chartered Physiotherapists are encouraged to review the cited references. The practice of dry needling is the sole responsibility of the individual Chartered Physiotherapist.

SCOPE

This guideline refers only to trigger point dry needling / dry needling and does not address pharmacological trigger point injection therapy or other forms of invasive needling such as traditional acupuncture.

This guideline is intended for Chartered Physiotherapists as members of the Irish Society of Chartered Physiotherapists (ISCP) practising within the Republic of Ireland. It may also be used by physiotherapist managers and decision makers to guide the development of policies and procedures for physiotherapy practice in the healthcare setting.

The main focus of this guideline is on safety for both the patient and the Chartered Physiotherapist.

In this document the terms physiotherapy, physiotherapist, physical therapy, physical therapist and the abbreviation PT are used synonymously as defined by the World Confederation for Physical Therapy (WCPT) (www.wcpt.org).

LEGISLATION and other related policies and documents

Health and Social Care Professional's Act 2005.

The information contained in this document is intended to be used in conjunction with the Society's Rules of Professional Conduct incorporating the Code of Ethics and Guidelines for Professional Behaviour (2012) and the European Core Standards of Physiotherapy Practice (2008) and Scope of Practice (2012).

CITATION

This paper should be cited as follows:

Guidelines for Dry Needling Practice (2012), Irish Society of Chartered Physiotherapists (ISCP), Dublin, Ireland.

¹ A guideline is a formal statement about a defined task or function in clinical practice Stedman's (2000).
Stedman's Medical Dictionary. M. Barlow-Pugh. Baltimore, Lippincott Williams & Wilkins..

CONTENTS

EXECUTIVE SUMMARY	5
FORWARD.....	6
AUTHOR AND REVIEW PANEL	7
Authors.....	7
International Review Panel	7
Special Mention	8
GLOSSARY.....	9
ABBREVIATIONS	10
SECTION 1: INTRODUCTION.....	11
SECTION 2: GENERAL PRACTICE GUIDELINES.....	14
General Guidelines for Professional Practice	14
General Guidelines for Dry Needling	14
General Hygiene and Workplace Policies	15
Indications for Dry Needling	16
Integrated Approach to Dry Needling.....	16
Documentation.....	16
SECTION 3: TRAINING FOR DRY NEEDLING.....	17
Introduction.....	17
DN Training Recommendations for Chartered Physiotherapists:.....	17
SECTION 4: SAFETY.....	19
Introduction.....	19
Adverse Event Studies	20
Contraindications and Special Precautions.....	22
Absolute Contraindications	22
Relative Contraindications	22
Anatomical Considerations	26
Procedural Issues and Adverse Reactions in DN Therapy	28
Electrical Stimulation via Dry Needles	31
SECTION 5: HYGIENE	32
Hygiene Introduction:.....	32
Standard Precautions	32
Hand Hygiene Recommendations.....	33
Use of Gloves	35

Patient Skin Preparation	35
Needles.....	37
Needle and Medical Clinical Waste Disposal	38
Procedures Following a Needle Stick Injury or Other Exposure Incident.....	38
Management of Blood and Bodily Fluids Spills	39
SECTION 5: PRINCIPLES OF DRY NEEDLING PRACTICAL APPLICATION.....	40
Patient Selection.....	40
Patient Education and Consent Prior to Treatment	41
Procedural Education	41
Practical Application.....	42
Positioning.....	42
Palpation.....	42
Technique.....	43
Aftercare	45
REFERENCES	46
APPENDIX LIST.....	49
APPENDIX 1: Overview of the Risks of Acupuncture Treatment.....	50
APPENDIX 2: Overview of Selective Acupuncture Adverse Events.....	51
APPENDIX 3: Selective Acupuncture Points Anatomical Reference.....	58
APPENDIX 4: Pulmonary Pleura Landmarks	59

EXECUTIVE SUMMARY

Dry needling is a neurophysiological evidence-based treatment technique that requires effective manual assessment of the neuromuscular system. Physical therapists (physiotherapists) are well trained to utilize dry needling in conjunction with manual physical therapy interventions. Research supports that dry needling improves pain control, reduces muscle tension, normalizes biochemical and electrical dysfunction of motor endplates, and facilitates an accelerated return to active rehabilitation (AAOMPT 2009).

Dry needling is within the scope of physiotherapy practice. Chartered Physiotherapists may use various dry needling approaches as appropriate. The rules of professional conduct of the Irish Society of Chartered Physiotherapists and local work place policies and procedures should guide dry needling practice. Chartered Physiotherapists should complete suitable training of a minimum of 3 day (21hours) and limit dry needling practice to areas of competence and experience and commit to suitable continuing professional development.

Common adverse events of dry needling include bruising, bleeding, treatment soreness and post treatment soreness. Significant adverse events are usually rare and may include infection, nerve irritation and pneumothorax. Serious complications can be minimised by good technique application and hygiene and by applying practical anatomical knowledge.

Chartered Physiotherapists should remain aware of the indications, absolute contraindications, relative contraindications, anatomical considerations and procedural issues in dry needling practice. Patients suitable and not suitable for dry needling therapy should be selected accordingly. Patients should be educated appropriately and informed consent received before dry needling.

Chartered Physiotherapists should ensure excellent hygiene standards and use standard precautions, including hand hygiene, clean needling technique and suitable needle disposal. Gloves should be worn at least on the palpating hand.

Chartered Physiotherapists should apply dry needling in a safe manner by appropriately applying: anatomical knowledge, positioning, palpation, technique and aftercare. Where possible, pincer grip technique is preferred.

FORWARD

This document is intended as a guide to safe practice of dry needling for Chartered Physiotherapists in Ireland. Dry needling practice may include trigger point dry needling, superficial dry needling and various other western medical needling approaches.

This document was developed by a process of authorship, literature review and discussion by the author panel between 2009 and 2012. Referenced material is presented in the reference section.

The document was reviewed independently by an international panel of experts in 2011 and updated accordingly. This document has also been reviewed by the Irish Society of Chartered Physiotherapists.

Part of this safety document was presented as part of *Physiotherapy - Pain Conference* at the University Rey Juan Carlos, Alcorcón, Madrid, Spain in March 2011 (McEvoy 2011).

The authors, reviewers and editors have made every effort to provide accurate information in this document. However, they are not responsible for errors, omissions, or any outcomes related to the use of the contents of this document and take no responsibility for individual application of dry needling therapy. Individual physiotherapists are ultimately responsible for the application of dry needling therapy.

AUTHOR AND REVIEW PANEL

Authors

Johnson McEvoy MSc, DPT, MISCP, MCSP, PT
United Physiotherapy Clinic, Limerick, Ireland
External Lecturer, Sports Science, University of Limerick
Limerick, Ireland

Jan Dommerholt PT, DPT, MPS, DAAPM
Bethesda Physiocare,
Maryland, USA

Damian Rice MISCP
Clinical Specialist Physiotherapist
Musculoskeletal Triage
Waterford Regional Hospital
Dunmore Rd, Waterford, Ireland

Dr Liam Holmes MD
General Practitioner and Occupational Health Physician
Medical Practice
Castletroy, Limerick, Ireland

Christian Grobli PT
Swiss PhysioCare,
Winterthur, Switzerland

Cesar Fernandez-de-las-Penas PT, PhD
Professor, Department of Physical Therapy, Occupational Therapy, Physical Medicine and
Rehabilitation,
Universidad Rey Juan Carlos,
Alcorcón, Madrid, Spain

International Review Panel

Carel Bron PT, PhD
Practice for Physical Therapy for Disorders of the Neck, Shoulder and Upper Extremity
Groningen, The Netherlands

Esther-Mary D'Arcy MISCP, MCSP.
Professional Advisor,
Irish Society of Chartered Physiotherapists,
Royal College of Surgeons in Ireland,
St Stephen's Green,
Dublin 2.

Jo Fransen PT
Practice for Physical Therapy for Disorders of the Neck, Shoulder and Upper Extremity
Groningen, The Netherlands

Orlando Mayoral del Moral PT
Hospital Provincial de Toledo,
Toledo, Spain

Martin van Hoppe MISCP, MCSP
Douglas Physiotherapy Clinic,
Douglas, Cork, Ireland

Richard D. Weissmann, PT, OMT
Swiss PhysioCare,
Winterthur, Switzerland

Special Mention

Peter Huijbregts PT, MSc, MHSc, DPT, OCS, FAAOMPT, FCAMT
University of St. Augustine for Health Sciences
St. Augustine, Florida
USA

Our colleague, Peter Huijbregts PT, was to be involved in the review panel, but regrettably passed away suddenly in November 2010. We would like to take this opportunity to remember our academic and professional collaboration with him and his contribution to the physiotherapy profession.

GLOSSARY

Adverse event (AE): 'any ill effect, no matter how small, that is unintended and non-therapeutic' (White, Hayhoe et al. 1997).

Chartered Physiotherapist: a member of the Irish Society of Chartered Physiotherapists (MISCP).

Dry needling (DN): the physical use of a needle (usually a solid filament needle) in the absence of an injectable substance for the treatment of pain and dysfunction of various body tissues. There are varying conceptual models including, but not limited to, superficial dry needling (SDN), deep dry needling (DDN) and intramuscular stimulation (IMS) (Gunn 1997; Simons, Travell et al. 1999; Baldry 2005).

Flat palpation (dry needling): examination and dry needling technique by finger pressure directly onto the skin over the muscle as described by Travell and Simons (Simons, Travell et al. 1999). Flat palpation is also used as a dry needling technique where the fingers press down on the skin and muscle to control the target tissues. The target muscle(s) is compressed against the underlying structures such as bone e.g. infraspinatus, gluteals. This technique is usually used when pincer grip is not applicable.

Local twitch response (LTR): an involuntary spinal cord reflex contraction of the muscle fibres in a taut band elicited by palpation or needling of the trigger point (Simons, Travell et al. 1999).

Pincer grip technique (dry needling): examination and dry needling grip technique where the tissues are pinched and lifted in a pinch like fashion and has been described by Travell and Simons (Simons, Travell et al. 1999). This assists in palpation of the taut band and identification of the trigger point. In dry needling this technique is usually carried out to isolate the target muscle(s) for dry needling by drawing the muscle away from other structures such as the lung, blood vessels and nerves. Needling is carried out across the pinched tissues and needling out the mouth of the grip is avoided. This technique, where applicable, is often the safer choice in areas such as the upper trapezius, lower trapezius, levator scapula, gastrocnemius etc.

Superficial dry needling (SDN): use of a needle/solid filament needle in the absence of an injectable substance for the treatment of pain and dysfunction of various body tissues but especially myofascial trigger points.

Trigger point dry needling (TrPDN): dry needling technique with emphasis on myofascial trigger points.

ABBREVIATIONS

AAOMPT	American Academy of Orthopaedic Manual Physical Therapists
AE	Adverse event
A+E	Accident and Emergency
ASAP	Australian Society of Acupuncture Physiotherapists
AIM	Acupuncture in Medicine
CDC	Centre of Disease Control (USA)
CE	European Conformity (Conformité Européenne)
CPD	Continuing professional development
CPTA	College of Physical Therapists of Alberta
DDN	Deep dry needling
DN	Dry needling
ECSP	European Core Standards of Physiotherapy Practice
GP	General Practitioner (medical doctor)
HCW	Healthcare worker
HSE	Health Service Executive
IMS	Intramuscular stimulation
ISCP	Irish Society of Chartered Physiotherapists
ISCP-RPC	Irish Society of Chartered Physiotherapists Rules of Professional Conduct
LTR	Local twitch response
MISCP	Member of the Irish Society of Chartered Physiotherapists
SARI	Strategy for the Control of Antimicrobial Resistance in Ireland
SDN	Superficial dry needling
SHWWA	Safety, Health and Welfare at Work Act (Ireland)
TrP	Trigger point / myofascial trigger point
TrPDN	Trigger point dry needling
WCPT	World Confederation for Physical Therapy
WHO	World Health Organisation

SECTION 1: INTRODUCTION

A myofascial trigger point (TrP) is a hyperirritable spot in a taut band of skeletal muscle / myofascia that is painful on compression and that can give rise to characteristic referred pain pattern, tenderness, motor dysfunction and autonomic phenomena. TrPs have been described extensively by Travell and Simons (Simons, Travell et al. 1999) whom are considered the authority on the concept (Tough, White et al. 2007).

Dry Needling (DN) is a term referring to the employment of a solid filament needle for the treatment of pain and / or dysfunction of various body tissues. DN is considered an invasive physical therapy technique. There are a variety of conceptual models, most commonly DN is employed to treat myofascia including myofascial trigger points (TrPs) (Travell and Simons 1983; Travell and Simons 1992; Simons, Travell et al. 1999). The term Trigger Point Dry Needling (TrPDN) refers to the treatment of TrPs with dry needling techniques. For the purpose of this guideline the abbreviation DN will be used. Where required, clarification of the type of DN technique will be made.

There are several DN conceptual and practical models including, but not limited, to:

1. Superficial Dry Needling (SDN) - Baldry Model
2. Deep Dry Needling (TrPDN) - Travell Model
3. Radiculopathy Model – Intramuscular Stimulation (IMS) Gunn Model

Chartered Physiotherapists may employ one or a combination of these conceptual models and approaches. The choice is based upon suitable patient selection, the Chartered Physiotherapist's training, experience, current available research and clinical reasoning in regard to the patient's presenting problem, history, medical status, safety, patient informed consent and goals of treatment etc.

There is a large volume of publications on myofascial trigger point therapy and dry needling philosophies and techniques. Table 1 lists selected references underpinning the practice of myofascial trigger point therapy and dry needling and in essence forms the framework for these guidelines.

Historically TrPDN developed from Dr. Janet Travell's injection techniques. Steinbrocker (Steinbrocker 1944) and later Travell (Travell 1968), speculated that injection effect may be related to the physical action of the needle and the evocation of the local twitch response (LTR). Travell referred to this as "*dry needling*" (Travell 1968). The first Medline citation for *dry needling* is accredited to Dr. Karel Lewitt (Lewit 1979) and in essence was a description of Travell's technique. Subsequently, evidence has supported the importance of elicitation of LTR's in the treatment of TrP's, suggesting that the effect of TrP needling is linked to the *physical action* of the needle and not upon injectable agents (Hong 1994). Subsequent review of TrP needling research suggested that direct physical needling of TrPs is as effective as various injectables (Cummings and White 2001). One study reported more significant improvements from TrPDN compared to injections for myofascial pain syndrome (Ga, Koh et al. 2007). A Cochrane database systematic review supported the use of DN in the management of chronic low back pain (Furlan, Tulder et al. 2005).

Table 1: Selected myofascial trigger point and dry needling references		
Authors	Year	Title
Simons, Travell and Simons	1999	Travell and Simons' myofascial pain and dysfunction; the trigger point manual, Volume 1; 2 nd edition
Travell and Simons	1983	Travell and Simons' myofascial pain and dysfunction; the trigger point manual
Travell and Simons	1992	Travell and Simons' myofascial pain and dysfunction; the trigger point manual, Volume 2
Dommerholt and Fernandez-de-las-penas	2013	Trigger Point Dry Needling
McEvoy	2013	Trigger point dry needling: safety guidelines
Dommerholt and Huijbregts	2011	Myofascial trigger points : path physiology and evidence-informed diagnosis and management
McEvoy and Huijbregts	2011	Reliability of myofascial trigger point palpation: a systematic review
White and Cummings	2008	An introduction to western medical acupuncture
Dommerholt, Bron and Franssen	2006	Myofascial trigger points; an evidenced informed approach
Dommerholt, Mayoral and Gröbli	2006	Trigger point dry needling
Resteghini	2006	Myofascial trigger points: path physiology and treatment with dry needling
Baldry	2005	Acupuncture, Trigger Points and Musculoskeletal Pain
Rachlin and Rachlin	2002	Myofascial pain and fibromyalgia, trigger point management
Baldry	2001	Myofascial pain and fibromyalgia syndromes
Gunn	1997	The Gunn approach to the treatment of chronic pain
Lewit	1979	The needle effect in the relief of myofascial pain
Travell	1968	Office hours: day and night. The autobiography of Janet Travell MD

Interest in TrPDN has increased and is practiced by physiotherapists in many countries including Canada, Chile, Ireland, the Netherlands, South Africa, Spain, Switzerland and the United Kingdom (Dommerholt, Mayoral et al. 2006). An increasing number of US states have included DN under the scope of physical therapy practice. The American Academy Of Orthopaedic Manual Physical Therapists has ruled DN to be under the scope of physical therapy practice (AAOMPT 2009).

Support Statement AAOMPT (AAOMPT 2009):

Dry needling is a neurophysiological evidence-based treatment technique that requires effective manual assessment of the neuromuscular system. Physical therapists are well trained to utilize dry needling in conjunction with manual physical therapy interventions. Research supports that dry needling improves pain control, reduces muscle tension, normalizes biochemical and electrical dysfunction of motor endplates, and facilitates an accelerated return to active rehabilitation.

SECTION 2: GENERAL PRACTICE GUIDELINES

General Guidelines for Professional Practice

Chartered Physiotherapists are guided in practice by the Irish Society of Chartered Physiotherapists (ISCP) and European Core Standards of Physiotherapy Practice policy documents. Adherence to Scope of Practice, professional standards and policies is essential to the practice of physiotherapy.

1. Chartered Physiotherapists should follow the ISCP's Rules of Professional Conduct, incorporating the Code of Ethics and Guidelines for Professional Behaviour (ISCP- RPC 2012).
2. Chartered Physiotherapists should be guided by the European Core Standards of Physiotherapy Practice 2008 (ECSP 2008).
3. Chartered Physiotherapists shall confine themselves in practice to areas in which they have particular skills or professional competence as a result of experience or specialist training and shall at all times have regard to the Society's Scope of Practice Code. (ISCP-RPC 2012)
4. Chartered Physiotherapists should stay up to date with research and trends in clinical practice in line with best available evidence as outlined in the European Core Standards of Physiotherapy Practice 2008 (ECSP 2008).
5. Chartered Physiotherapists should keep up to date with developments in the practice of physiotherapy (ISCP, RPC 2012). In regard to DN, Continuous Professional Development recommendations are outlined in Section 3.
6. Chartered Physiotherapists should obtain appropriate valid consent from the patient/guardian in line with ISCP's Policy on Consent (ISCP 2012), ECSP 2008 and these guidelines. Consent should be documented.
7. Informed consent can be written or verbal as appropriate. Written consent may be required and Chartered Physiotherapists must use their judgement in deciding when written consent is needed (ECSP 2008). Special consideration for persons under 18 years of age is required as parental or guardian consent is additionally required.

General Guidelines for Dry Needling

1. Dry needling is within the scope of physiotherapy / physical therapy practice.
2. Chartered Physiotherapists should implement guidelines as applicable when practising DN and should observe local workplace policies whether in public or private healthcare.

3. The individual Chartered Physiotherapist is solely responsible for the individual patient's welfare, their own and third party safety and should practice DN ensuring high safety standards.
4. Chartered Physiotherapists should be able to demonstrate they have received suitable DN training. Chartered Physiotherapists shall confine themselves in DN practice to areas in which they have been trained and are confident and comfortable with and shall at all times have regard to the ISCP's rules of professional conduct (ISCP-RPC 2010).
5. Chartered Physiotherapists should complete a physiotherapy assessment prior to DN and ascertain if DN is suitable for the individual patient and the condition to be treated.
6. Chartered physiotherapists should practice DN in a sensible and reasonable manner and apply professional judgement.
7. Chartered Physiotherapists should consider the utilisation of DN in the light of evidenced informed practice, scientific research, clinical reasoning and patient goals, beliefs and desires (Cicerone 2005).

General Hygiene and Workplace Policies

1. Chartered Physiotherapists are required to comply with best practice hygiene practices per Health Service Executive (HSE) Standard Precautions (HSE 2009) and any other additional requirements of their employer or other local workplace policies.
2. Chartered Physiotherapists are required to comply with the waste disposal rules, requirements and guidelines (Dept of Health 2004) for needles or bodily fluids and any other requirements of their employer or other local workplace policies.
3. Chartered Physiotherapists are required to comply with best practice requirements for the management of needle stick accidents and adverse reactions and comply with any employer or other local workplace policies.
4. Chartered Physiotherapists should adhere to additional workplace consent policies.
5. Chartered Physiotherapists as employers and employees should meet occupational obligations and requirements of the Safety, Health and Welfare at Work Act 2005 (SHWWA 2005).
6. Chartered Physiotherapists when practicing should ensure personal health is optimal to maintain patient and personal safety. Required vaccinations and immunisations should be in place as required. Chartered Physiotherapist should seek guidance from medical doctor (GP) or occupational health physician.
7. Individual clinic policy and procedure documents can incorporate these guidelines and cited references.

Indications for Dry Needling

Dry needling is employed for the treatment of neuromusculoskeletal pain and dysfunction including but not necessarily limited to myofascial trigger point pain and dysfunction, soft tissues, muscle tension, scar tissue and pain.

Integrated Approach to Dry Needling

A physiotherapy assessment should be completed to ascertain the appropriateness of DN for an individual patient. The Chartered physiotherapist should select patients by using the principles outlined in this guide and as recommended by the College of Physical Therapists of Alberta (CPTA 2007). Considering the multisystemic nature of musculoskeletal pain, evidence supports the greater efficacy of a multimodal approach and therefore incorporating DN into multimodal therapeutic plan of care is encouraged (Boyling and Jull 2004; McEvoy and Dommerholt 2012).

Chartered Physiotherapists should remain aware of predisposing, precipitating and perpetuating factors for myofascial pain and identification and attention to these factors may be required in the context of the bio-psychosocial model of healthcare (Simons, Travell et al. 1999; Gerwin 2005; Dommerholt, Bron et al. 2006; McEvoy and Dommerholt 2012).

Documentation

Chartered Physiotherapists should keep documented records of treatment and informed consent per ISCP recommendations and requirements (ECSP 2008; ISCP-RPC 2010). DN treatment documentation should include the procedural approach (e.g. TrPDN or SDN) and area or muscle treated, if local twitch responses were elicited where appropriate. The patient's response to treatment, including any adverse reactions, should be noted where applicable. Any other information pertinent to the treatment should be documented as required.

SECTION 3: TRAINING FOR DRY NEEDLING

Introduction

Dry needling builds on entry level physiotherapy education. A suitable undergraduate degree in physiotherapy is required as a prerequisite for continuing education in DN. According to the AAOMPT, *physical therapists are well trained to utilize dry needling in conjunction with manual physical therapy interventions.*

Chartered Physiotherapists have met required educational standards of the ISCP. Chartered Physiotherapists have considerable graduate education in anatomy and neuro-anatomy, physiology and neurophysiology, pathology, biomechanics, standard precautions, pain management and psychology coupled with professional studies in of orthopaedics, rheumatology, neurology, soft tissue and sports and exercise physiotherapy, paediatrics, care of the elderly, women's health, ergonomics etc. Chartered Physiotherapists have also obtained 1000 hours of mentored clinical practice. This is the fundamental requirement prior to undertaking continuing professional development education in DN.

Currently dry needling is not an entry-level skill in Ireland. No University physiotherapy programme teaches DN at undergraduate level.

It is recognised that there is no international standard for DN postgraduate CPD training and that requirements may vary from jurisdiction to jurisdiction. For instance the Australian Guidelines For Safe Acupuncture and Dry Needling Practice (ASAP) consider a 2 day course adequate for basic introduction (ASAP 2007). In contrast, Colorado State, USA, requires a 46 hour programme of face to face training. A Swiss model for DN (TrPDN and SDN), which has been utilised in Ireland since 2006, has traditionally considered a pathway including an introductory trigger point therapy and palpation course as a prerequisite to DN needling. Dry needling training for the extremities, spine, trunk, neck, head and face is delivered in 2 modules of 3 days each (48 hours). The total relevant training for DN (TrPDN and SDN) is 64 hours.

It is recommended that in the future guidelines for DN course content and curricula should be developed and implemented. Future course accreditation by the ISCP could be considered.

It is reasonable to expect a minimum requirement for DN introduction to be 3 days (21 hours), recognising that this would limit the content. For trigger point dry needling, suitable training in myofascial trigger point palpation skills and therapy should be required as part of training (Simons, Travell et al. 1999; Dommerholt and Huijbregts 2011). Reliable identification of TrPs by palpation is dependent upon being expert and trained (McEvoy and Huijbregts 2011).

DN Training Recommendations for Chartered Physiotherapists:

Despite the focus on DN training hours or days, ultimately it is important to develop competency. In answer to this the College of Physical Therapists of Alberta (CPTA), Canada have developed a dry needling competency profile for physical therapists, and is a framework identifying the required skills and attributes for DN practice (CPTA 2007).

1. Chartered Physiotherapists shall confine themselves in physiotherapy DN practice to areas in which they have particular skills or professional competence as a result of

experience or specialist training and shall at all times have regard to the ISCP-RPC 2010 and ECSPP 2008.

2. Chartered Physiotherapists should be able to demonstrate that they have received training in DN and a minimum of a 3 day (21 hours) introductory course is required.
3. Chartered Physiotherapists should recognise that safety of patients is of primary importance and should practice DN ensuring high safety standards at all times.
4. Chartered Physiotherapists should work within their personal level of confidence and comfort.
5. Chartered Physiotherapists should recognise that accurate anatomical knowledge and practical application of anatomical knowledge is vital to TrPDN safety.
6. Chartered Physiotherapists should maintain safety by limiting themselves to DN muscles etc and body areas that they have had training in, are familiar with and confident in treating. Clinicians should be aware of specific precautions for the muscle or area being treated and if in doubt DN should not be employed.
7. Chartered Physiotherapists should stay up to date with current trends and research.
8. Chartered Physiotherapists should commit to continuing professional development (CPD) as outlined in the ISCP RPC 2010 and ECSPP 2008. Chartered Physiotherapists practising DN should devote some of the required CPD to myofascial trigger point and DN therapy. It is recommended that a minimum of six hours of formal and six hours of informal CPD is obtained within a three year cycle. Formal CPD should contain at least 50% practical aspect in DN.

SECTION 4: SAFETY

Introduction

Dry needling poses potential risks to the patient, clinician and third parties. Many of these potential risks are not associated with traditional non-invasive physiotherapy treatment e.g. pneumothorax, infection and internal bleeding. As safety is of the utmost importance in patient care, efforts should be made to ensure high safety standards.

An adverse event (AE) is defined as 'any ill effect, no matter how small, that is unintended and non-therapeutic' (White, Hayhoe et al. 1997).

There are no published DN AE studies. A search of Medline, PEDRO and CINHAL for the search terms “dry needling”, “trigger point acupuncture”, “adverse events” and “safety” revealed no such studies beyond an individual case study (Lee, Lee et al. 2011).

Despite the lack of AE studies, DN does not appear to pose significant volume of risk. However there is a need for AE research to quantify DN risk. Currently, a study of AE in TrPDN is underway in Ireland with a view to publication (Brady, McEvoy et al. 2012).

Though acupuncture and DN differ in terms of historical, philosophical, indicative and practical context, similarities exist in terms of dermal penetration with a solid filament needle to varying depths within the body for therapeutic indications. Notwithstanding the differences, acupuncture safety studies assist as a suitable framework for understanding the potential risks of DN. In this context safety concerns can be considered similar.

It is important for Chartered Physiotherapists to be cognisant of the risks associated with needling therapies for patient selection, safe application and for gaining informed consent.

Potential Risks

Acupuncture in Medicine (AIM) journal in 2001 published an entire journal issue on safety and this is available for free access (<http://aim.bmj.com/content/vol19/issue2/>). AIM is a scientific and clinical journal aimed at Western-trained physicians and other health professionals, and uses the prevailing understanding of neurophysiology and anatomy to interpret the effects of acupuncture. The journal largely restricts its published articles to western approach (<http://aim.bmj.com/misc/about.dtl>). The reader is recommended to review this journal publication to understand some of the issues, risks and adverse reactions in relation to needling therapies. Furthermore, a general review of acupuncture safety is offered in a recent textbook on western medical acupuncture (White, Cummings et al. 2008). Safety of TrPDN is discussed in new textbook on TrPDN (Dommerholt and Fernandez de las Penas 2013; McEvoy 2013).

Acupuncture is considered one of the safer forms of medical intervention (Vincent 2001; White, Cummings et al. 2008). Despite this, AEs do occur. In general the reported AEs in acupuncture can be categorised into the following groups (Peucker and Gronemeyer 2001):

1. Delayed or missed diagnosis
2. Deterioration of disorder under treatment
3. Vegetative reactions (e.g. syncope, vertigo, sweating etc)
4. Bacterial and viral infections (e.g. hepatitis B, HIV etc)
5. Trauma of tissue and organs.

It is important to classify, qualify, and quantify AE. Severity of acupuncture AEs has been classified as mild, significant and serious as presented in Table 2 (White, Cummings et al. 2008). Further classification of medical risk in qualitative/quantitative form is presented in Table 3 (Witt, Pach et al. 2009)

Table 2: Severity of Adverse Events

Adapted from (White, Cummings et al. 2008) Chapter 16, Page 122; (White, Hayhoe et al. 2001)

Severity	Definition
Mild (minor)	Reversible, short lived and does not seriously inconvenience the patient
Significant	Needs medical attention or interferes with the patient's normal activities
Serious	Requires hospital admission or prolongation of existing hospital stay, results in persistent or significant disability/incapacity or death

Table 3: Qualification and Qualification of Adverse Events

Adapted from (Witt, Pach et al. 2009)

Very common	Common	Uncommon	Rare	Very rare
>1-10	1-10/100	1-10/1,000	1-10/10,000	<1 / 10,000
≥ 10%	≥ 1 to10%	≥ 0.1% to 1%	≥ 0.01% to 0.1%	<0.01%

Adverse Event Studies

Many studies have investigated the AE rate for acupuncture. Three studies, one of UK Chartered Physiotherapists and medical doctors (White, Hayhoe et al. 2001), another on German physician acupuncturists (Witt, Pach et al. 2009) and a third on German physician acupuncturists (Melchart, Weidenhammer et al. 2004) are of particular value as they correlate well with Chartered Physiotherapists due to western medical style training. Chartered Physiotherapists should become familiar with these studies. A brief summary is offered.

White et al reported AE's following acupuncture in a prospective clinician based survey of 32,000 consultations amongst 78 UK Chartered Physiotherapists and medical doctors (White, Hayhoe et al. 2001). In summary, common minor AE's included: bleeding, needling pain. Uncommon minor AE's included aggravation of symptoms, faintness, drowsiness, stuck or bent needle and headache. Significant AE's (n=43) were rare or very rare and included various events including: Administrative problems (forgotten needle, forgotten patient); application site (cellulitis, needle allergy, needle site pain); cardiovascular problem (fainting); gastrointestinal problem (nausea, vomiting etc); neurological and psychiatric problem (anxiety and panic, euphoria, hyperesthesia, headache, slurred speech); exacerbation of symptoms (back pain, fibromyalgia, shoulder pain, vomiting, migraine). No serious AE's were reported in the 32,000 treatments. There was no association between the AE rate and the duration of acupuncture training or clinical experience.

Summarising the AEs, bleeding haematoma and needling pain were common, significant events were rare on very rare and no significant AE were reported. Furthermore generally adverse events can be classified as minimal, with some unavoidable events occurring. Acupuncture in skilled hands is one of the safer forms of medical intervention (White, Hayhoe et al. 2001).

Witt et al reported AEs following acupuncture in a large prospective patient based survey of 229,230 patient's (2.2million treatments) amongst German physician acupuncturists (Witt, Pach et al. 2009). This study reported AE's per patient (n=229,230) and not per treatment (n=2.2million) and this needs to be taken into account when comparing to White et al (White, Hayhoe et al. 2001), who reported AE per treatment (n=32,000). In summary 8.6% of patients reported experiencing at least one AE of which 2.2% of patients required medical treatment (significant or serious). This is suggesting 6.4% had an AE event that did not require treatment (minor). A comprehensive list of AE per patient were presented with notable common side effects including bleeding and haematoma; uncommon, strong pain during treatment, nerve irritation and injury and aggravation of symptoms. Rare and very rare side effects included local infection (31), systemic infection (5) and pneumothorax (2). Furthermore, a qualitative and quantitative explanation of acupuncture risks for patients was presented in table form – see appendix. As this is arguably the most comprehensive study of acupuncture AE Chartered Physiotherapists should familiarise themselves with this study's findings.

Melchart et al reported AE following acupuncture in a prospective clinician based survey of 97,733 patients amongst German physician acupuncturists. In summary nonserious AE's were seen in 7.10% of patients included needling pain, haematoma and bleeding in 3.28%, 3.19% and 1.3% respectively. Potentially serious AE were reported in 6 of 97,733 patients, including exacerbation of depression, acute hypertensive crisis, vasovagal reaction, asthma attack with hypertension and angina and pneumothorax in 2 cases.

Other studies have investigated AE in acupuncture including: 34,000 treatments by nonmedical UK acupuncturists (MacPherson, Thomas et al. 2001); 65,000 treatments by Japanese acupuncturists (Yamashita, Tsukayama et al. 1999); 3535 treatments by doctors and other healthcare workers in Germany (Ernst, Strzyz et al. 2003). These studies reported no serious AEs.

A review of rare but serious complications of acupuncture due to traumatic lesions has been reported (Peuker and Gronemeyer 2001). This included a review of the literature from 1965 on onwards. Traumatic lesions can be divided according to topographical and structural characteristics including: thoracic viscera, abdominal or retroperitoneal viscera, peripheral nerves, central nervous system, blood vessels. The review concluded that all traumatic injuries described in the review could be avoided if clinicians had better anatomical knowledge, applied existing anatomical knowledge or both. This stresses the importance of academic anatomy and practical anatomy in the needling application (Peuker and Gronemeyer 2001; Lee, Lee et al. 2011). Despite this, a further review of acupuncture literature from 2000, reported 95 cases of severe AE including 5 fatalities (Ernst, Lee et al. 2011).

Contraindications and Special Precautions

This section outlines contraindications, relative contraindications and special precautions. As noted in the patient selection section, patients should be screened for contraindications and special precautions prior to DN therapy. A physiotherapy assessment is required to determine patient selection. There should be an indication for DN therapy. A medical history of past and current medical history and medication usage is important. Attention should be paid to medical diagnoses and co-morbidities (e.g. patient with heart disease, peripheral vascular disease and diabetes). When treatment is contraindicated, it is important for the clinician not to be persuaded by an enthusiastic patient to employ DN (White, Cummings et al. 2008).

Absolute Contraindications

DN therapy should not be carried out under the following circumstances (ASAP 2007; White, Cummings et al. 2008):

1. In a patient with needle phobia
2. Unwilling patient - patient beliefs, fear etc
3. Unable to give consent - age-related, communication, cognitive
4. History of significant untoward reaction to needling (or injection) in the past
5. Medical emergency
6. Into a muscle or area in patients on anticoagulant therapy or with thrombocytopenia, where haemostasis by palpation cannot be carried out appropriately e.g. psoas, tibialis posterior
7. Into an area or limb with lymphoedema as patients with lymphoedema maybe more susceptible to infection. In addition it is not advisable to needle a limb after surgical lymphectomy.

Relative Contraindications

When absolute contraindications have been ruled out, it is important to consider relative contraindications / precautions. It is the practitioners responsibility to discuss the risks and benefits of DN therapy with the individual patient and obtain informed consent as appropriate (White, Cummings et al. 2008). Relative contraindications / precautions require clinical reasoning in the context of the individual patient and the aims of treatment and if goals can be met with non-invasive treatments.

Abnormal Bleeding Tendency

Patients on anticoagulant therapy, thrombocytopenia etc. Patients on blood thinning medication (e.g. Plavix and Warfarin) or with thrombocytopenia for any reason (e.g. haemophilia) may not be suitable for DN. Caution should be exercised when DN patients are on anticoagulants. Avoidance or light needling technique may be advisable. It is essential to apply pressure for haemostasis after withdrawing the needle. If haemostasis by palpation

cannot be carried out appropriately e.g. psoas, tibialis posterior, then needling should be avoided for that muscle(s) and is deemed an absolute contraindication.

Compromised Immune System

Patients with compromised immune system may be more susceptible to infection and therefore may be at a greater risk of developing a local or systemic infection from DN. Patients who are particularly vulnerable to infection include (ASAP 2007; White, Cummings et al. 2008):

1. Immunocompromised patients from disease (e.g. blood borne disease, cancer, HIV, AIDS, hepatitis, bacterial endocarditis, incompetent heart valve or valve replacements etc.)
2. Immunocompromised from immunosuppression therapy or on cancer therapy
3. Debilitated patients or those with chronic illness etc
4. Acute immune disorders (e.g. acute states of rheumatoid arthritis, current infection, local or systemic etc.)

Vascular Disease

Patients with vascular disease and may be more susceptible to bleeding, tissue trauma and infection.

Diabetes

Patients with diabetes mellitus may be compromised in tissue healing capabilities or have poor peripheral circulation.

Pregnancy

The use of DN therapy during pregnancy needs to be discussed thoroughly with the patient and should be used with caution as one in four to five pregnancies may naturally terminate in the first trimester (ASAP 2007). There is a potential for erroneous connection between such occurrences and needling therapies and this should be considered in patient education, clinical reasoning and decision making. There is no study addressing DN during pregnancy. There is conflicting opinion on the risk of acupuncture to induce labour or cause spontaneous abortion (WHO 1999; ASAP 2007; White, Cummings et al. 2008; Betts and Budd 2011; Cummings 2011; da Silva, Nakamura et al. 2011; Guerreiro da Silva, Nakamura et al. 2011). However, in a controlled trial of 593 women with pregnancy-related nausea, acupuncture in early pregnancy did not affect pregnancy outcomes or the health of the child (Smith, Crowther et al. 2002).

In considering DN during pregnancy, the recommendations of acupuncturists should be considered (WHO 1999; ASAP 2007; White, Cummings et al. 2008):

1. Acupuncture can be used throughout pregnancy with caution
2. Risks and benefits of treatment are considered in the usual way
3. It is wise to avoid strong stimulation
4. Electro-acupuncture should be avoided.

The ISCP Acupuncture policy (ISCP 2010) states “Acupuncture points that should be avoided include *LI 4*, *SP 6*, *BL 60* and *BL 67*; points over the abdomen and lumbosacral region, ear points for the endocrine & genitor-urinary system and scalp points for the genital & foot motor sensory areas as well as points that produce strong sensations.”According to the Australian Society of Acupuncture Physiotherapists (ASAP 2007) point areas to be avoided include *LI 4*, *SP6*, *BL 60*, *BL 67* and *LV 3*. Also over the abdomen, ear points for the genitor-urinary system and scalp points for the genital and motor sensory areas. Needling to *GB 21* and upper lumbar spine should be carried out with caution.

The anatomical reference for these acupuncture points are presented in the appendix.

Frail Patients

Caution should be exercised with infirm or frail patients due to the possible impaired ability to tolerate the dry needling procedure or ability to communicate their sensations properly.

Epilepsy

Patients with epilepsy, especially unstable epilepsy, should be dry needled with care and should not be left unattended at any stage during the treatment.

Allergy to Metals or Latex in Gloves

Patients allergic to metals may react to the metal of solid filament needles used in dry needling and relative risks should be discussed prior to treatment. It is accepted that the risk of allergic reaction to solid filament needles is low. The clinician needs to be aware that patients can have allergy to latex, found in examination gloves and alternative gloves should be employed for such patients.

Children

In addition to gaining informed consent parental or guardian consent must be sought when treating children under the age of 18. Ensure that younger patients do not have a needle phobia and are cooperative to the procedure. It is generally recommended to avoid TrPDN in patients less than 13 years of age due to procedural understanding and tolerance of the local twitch response stimulus (discussion Dommerholt, Fernández-de-las-Peñas, Grobili, McEvoy, Weissemann 2010)

Medications

Chartered Physiotherapists should remain aware of a patient's medication history as this may alert the clinician to medical condition(s) or situations that may be contraindicated or require special precautions for DN. Such situations may include patients on immune suppressive drugs, mood altering medication, blood thinning agents etc

Psychological Status

Patients with high distress, stress or psychological disorders may not be suitable for DN therapy. Such issues may reduce the likelihood of response to treatment or lead to greater stress response and risk of adverse psychological / physical response to DN therapy.

Unsuitable Patient for Any Reason

Anatomical Considerations

Dry needling therapy poses potential risk, however small to certain anatomical structures such as the lung, blood vessels, nerves and organs. This may include structural damage such as a pneumothorax in the case of the lung, blood vessels, peripheral and central nervous system and organs. All needling related traumatic injuries described by Peuker and Gronemeyer concluded that rare but serious traumatic complications could be avoided if practitioners had better anatomical knowledge, applied existing anatomical knowledge better, or both (Peuker and Gronemeyer 2001). This underpins the importance of academic and practical knowledge of anatomy in the safe practice of DN. Chartered Physiotherapists should exercise caution when practising DN in relation to avoiding certain anatomical structures and should limit practice to muscles and areas they have had training in and are confident in the application of DN to the proposed area. Should a clinician not be familiar with the anatomical area or muscles proposed for treatment, DN should not be used. Clinicians may choose, especially when newer to needling, to treat one side of the thorax only to prevent the rare and unlikely but serious risk of a bilateral pneumothorax. Specific areas of caution are covered in this section and include but not necessarily limited to the following:

Pleura and Lung

There is a risk of pneumothorax from dry needling muscles in the vicinity of the trunk. Dry needling therapy therefore raises the potential risk of serious medical emergency. A pneumothorax is defined as the presence of air or gas in the pleural cavity. The pleura is a serous membrane enveloping the lungs and lines the walls of the pleural cavity. The pleura consists of parietal and visceral layers. The parietal pleura is the outermost layer and lines the different parts of the wall of the pleural cavity. The visceral pleura is the inner layer enveloping the lungs. Iatrogenic pneumothorax is a pneumothorax caused by a medical procedure such as dry needling. The risk of a pneumothorax is very small (very rare) if proper needling techniques are employed.

Knowledge of pleural lung anatomy is essential for safe dry needling procedure when treating in the thoracic area. Pleural anatomy outline is included in the appendix.

Where appropriate, DN should be performed in such a manner as to needle away from the pleura / lung including the apex of the lung, intercostal space and infracostal area to avoid the risk of pleural penetration. Where able a pincer grip should be utilised, for example, as in the case of the upper trapezius, or needling over bone to protect the lung as in the case of the scapula and ribs when appropriate. It is important to point out that scapula fenestration is possible, though rare, and Chartered Physiotherapists should be aware that anatomical variance can occur. Again the risk of a pneumothorax is very small (very rare) if proper needling techniques are employed.

Blood Vessels

Anatomical knowledge of the vascular system is important as with DN there is a potential of injury to blood vessels. Palpating for a pulse, where accessible, to locate an artery prior to DN is recommended.

Nerve

Anatomical knowledge of the nervous system is important as with DN there is potential for injury to nerves. Special consideration needs to be given in relation to the spine and in the posterior sub occipital area as the brain stem is accessible through the foramen magnum.

Organs

Anatomical knowledge of internal organs is important as with DN there is potential for injury to internal organs such as the kidney or penetration into the peritoneum cavity.

Joints

Avoid needling into joints or joint capsules to avoid risk joint infection.

Prosthetic Implants

Avoid needling into or close to any implanted devices. For example joint or limb prosthetics including internal or external fixation devices.

Implants and Electrical Device Implants

Avoid needling in the vicinity of implanted devices including drug delivery systems, cannulae or electrical devices such as implanted spinal cord stimulators and associated wires.

Tumours

Do not needle in the vicinity of tumours.

Other

Avoid DN into pathological sites such as varicose veins, ganglion cysts, cysts, tumours, acute inflammation or skin lesions.

Procedural Issues and Adverse Reactions in DN Therapy

Painful Treatment

DN technique should suit the ability of the patient to tolerate the procedure. The Chartered Physiotherapist should needle only to the tolerance of the patient and progress the treatment in line with this. The patient's response should be monitored by verbal and non-verbal communication to ascertain the response.

Patients should not be encouraged to withstand painful treatment.

Sharp pain of a stinging, lancing, electrical or burning nature may signal penetration of a nerve or blood vessel and should be immediately stopped.

Post treatment soreness is common for one hour to two days but on occasion up to 4 days. Patients should be warned about the potential for post treatment soreness. Treatment should be scheduled to take into account patient's lifestyle, social and work commitments. Application of manual pressure (haemostasis) on the needled area is recommended which may prevent blood leakage within the tissue. Use of safe heat or cold application may be helpful and stretching and/or low level limbering movements may assist to reduce soreness.

Haematoma

It is recommended to pressurise the muscle for haemostasis after DN. This may assist in reducing post treatment soreness. Care should be taken to avoid penetrating blood vessels. If bleeding does occur, apply pressure to the area with a cotton swab after the needle has been withdrawn. Ice can be used locally to minimize the bruising. Patients should be warned of the potential for bruising.

Fainting and Autonomic Responses

Fainting may occur for a variety of reasons including: pain, psychological stress and tension, fatigue, positioning or in patients who are needle phobic, needle averse or autonomically labile. If a patient has a needle phobia, DN is contraindicated. It may be important to start initially with SDN to assess the patient's response and then gently titrate TrPDN treatment as appropriate. If fainting does occur remove needles and make sure the patient is lying down and consider raising their legs. Offer reassurance and water or a sweet drink. Symptoms should abate after resting. Due to the risk of fainting it is advised the patient's are treated in a recumbent or lying down position. If fainting or autonomic symptoms do occur the patient may not be in a position to drive after treatment. If there is any concern the patient should seek medical assessment

Patient Position and Movement

The patient should be positioned comfortably in the recumbent position sidelying, prone or supine. Sitting position should be avoided. The patient should be told to stay still during treatment. Despite this the clinician should prepare for potential movement and needle in such a way that allows needle control. For example when needling the lower trapezius and to reduce the risk of pneumothorax due to inadvertent patient movement, pincer grip technique offers greater control than needling the muscle onto the rib.

If static technique is used the patient should be told to remain still to prevent needle bending, unlikely needle breakage, or inadvertent tissue trauma or pneumothorax. The patient should be able to call for assistance at all times.

Stuck Needle

On occasion a needle may become stuck due to needle twisting as there is a tendency for the skin and soft tissue to bind around the needle. Should this occur, position the patient in a relaxed manner; avoid excessive twisting of the needle. If the needle is stuck due to over rotation, then rotate the needle in the opposite direction and remove. If it is stuck due to muscle tension, leave the needle in for a short period of time, relax the tissue around the needle with massage, ice massage or by inserting 1-2 needles around the stuck needle, then remove the needle. Another consideration is to have the patient gently isometrically contract the antagonist to relax the target muscle using reciprocal inhibition.

Bent Needle

The solid filament needle can become bent due to the needle striking hard tissue such as bone, thick fascia or due to contraction of the muscle. To prevent the bending of needles insert the needle with the patient in a relaxed and optimal position. Ensure the needling technique is optimal and avoid over curving the needle during dynamic needling treatment. If a needle demonstrates a bend it should be removed and discarded and replaced with a fresh needle.

Broken Needle

This may occur due to poor quality of the needle or repeated bending. The risk of needle breakage is very rare with the use of single use sterile needles as there is no metal fatigue from repeated use and autoclaving. However should this occur the patient should be advised to remain calm to avoid the needle from going deeper. Mark around the site of insertion with a pen or marker to make the needle site easy to identify. If the broken needle is exposed remove the broken section with tweezers, if it is not exposed press the tissue around the insertion site until the broken section is exposed and remove with tweezers. If the needle can't be removed in the clinic, medical attention must be sought so that the needle can be removed surgically.

The quality of needles is important and practitioners should only use needles that have a CE quality mark.

It is recommended to maintain approximately 1cm of the needle outside the skin. In the very unlikely event of a needle breakage at the hub, the broken needle could still be retrieved with tweezers.

Forgotten Needle

All needles used should be accounted for. A forgotten needle could cause tissue trauma or serious complications such as pneumothorax. Forgotten needles are more likely to occur with static needling technique, where the needle(s) are left in situ for a period of time or when needling various body parts. A "count them in, count them out policy" technique should be used, where the clinician counts the needles. This is both helpful to the clinician and reassuring to the patient.

Forgotten Patient

If using a static needle technique and leaving the patient in a treatment room or cubicle for a period of time it is important to avoid forgetting the patient. As the patient is not able to move, it is important that the patient has the ability to call the clinician verbally or with the use of call bell.

Infection

The skin in the region to be treated should be inspected and if any signs of infection are present treatment should be deferred and medical advice sought.

Excessive Drowsiness

A small percentage of patients may feel excessively relaxed or drowsy after DN treatment. They should be advised not to drive until they have recovered. In patients that experience this phenomenon future DN sessions should be timed around their lifestyle to allow for recovery and should be driven home by a third party.

Pneumothorax

When needling around the thoracic region patients should be warned of the rare possibility of a pneumothorax as has been outlined in the precautions section under *anatomical considerations*. Practitioners must have attended adequate training programmes to needle in the thoracic region.

The symptoms and signs of a pneumothorax may include:

1. shortness of breath on exertion
2. chest pain
3. dry cough
4. Decreased breath sounds on auscultation.

These symptoms may not occur until several hours after the treatment and patients need to be cautioned of this especially if they are going to be exposed to exercise and marked alterations in altitude such as flying or scuba diving. If a pneumothorax is suspected then the patient must be sent urgently to the nearest accident and emergency department (A+E).

Needling Over Abdominal Organs

All abdominal organs, including the kidney, liver, spleen, intestines and urinary bladder are potentially at risk, when needling directly over organs. The risk is greater with anatomical variance or enlarged organs. Do not needle deeply over organs.

Miscarriage and Pregnancy

This has been discussed under contraindication and special precautions section

Needle Stick Injury

Refer to the Hygiene section for management of needle stick injury

Patient Self Needling

Patients should never be given needles to take home or needle themselves or others due to obvious risks.

Electrical Stimulation via Dry Needles

Electrotherapy can be delivered via dry needles for pain relief, treatment of abnormal muscle tone or strengthening. This has been described by Gunn (Gunn 1997), Baldry (Baldry 2005) and White et al (White, Cummings et al. 2008) and is commonly employed in acupuncture and termed electroacupuncture. All contraindications and precautions for DN therapy should be observed (ASAP 2007).

Suitable equipment and procedure has been recommended (ASAP 2007; White, Cummings et al. 2008):

1. Consider the relevant electrotherapy device contraindications
2. Use only devices especially designed for electroacupuncture
3. Follow the recommendations of the manufacturer of the electrical stimulation device
4. Use suitable one use sterile metal tipped needles. Do not use needles with plastic handles (ASAP 2007)
5. Do not connect electrical clips to patient contaminated needle shafts

Contraindications to electrical stimulation via dry needling include:

1. A patient who is not comfortable or phobic to electrical stimulation or needling
2. It is recommended not to connect needles across the spinal cord including, the chest wall, arm to arm or leg to leg (White, Cummings et al. 2008).
3. Patients with implanted electrical devices, such as pacemakers, spinal cord stimulators (ASAP 2007; White, Cummings et al. 2008)
4. During pregnancy in the vicinity of the mid or low back, pelvis or abdomen.
5. In the vicinity of the carotid sinus the vagus nerve in the anterior triangle of the neck or in the vicinity of the recurrent laryngeal nerve (White, Cummings et al. 2008)
6. In areas of sensory denervation (White, Cummings et al. 2008)
7. Special caution should be used with persons with epilepsy

Special precaution

Extra care should be employed with patients who have bleeding disorders as associated muscle contraction from electrotherapy with indwelling needles may have a tendency to create significant bleeds.

SECTION 5: HYGIENE

Hygiene Introduction:

DN is an invasive procedure and therefore poses a hazard through risk of infection and injury to the patient, the clinician and third parties. This section recommends hygiene guidelines to minimise this risk. Reference is made and Chartered Physiotherapists should read the Health Service Executive's publication **Standard Precautions** 2009 (HSE 2009).

Standard Precautions

What are Standard Precautions?

Standard Precautions (HSE 2009) are evidence based clinical work practices published by the Centre of Disease Control (CDC) in 1996 and updated in 2007 that prevent transmission of infectious agents in healthcare settings (Siegal JD, Rhinehart E et al. 2007).

Standard Precautions require all healthcare workers to:

1. Assume that every person is potentially infected or colonized with an organism that could be transmitted in the healthcare setting.
2. Apply a set of work practices to blood, all body fluids except sweat, mucous membranes and non intact skin including:
 - hand hygiene
 - use of personal protective equipment
 - management of spillages of blood and body fluids
 - appropriate patient placement
 - management of sharps
 - safe injection practices
 - respiratory hygiene and cough etiquette
 - management of needle stick injuries
 - management of waste
 - management of laundry
 - decontamination of reusable medical equipment
 - decontamination of the environment.

What is the Rationale for Standard Precautions?

Within a healthcare setting both patients and healthcare staff are at risk of acquiring an infection. It has been estimated that 1 in 10 patients acquire a healthcare associated infection. Infection is an occupational risk for healthcare staff. Exposure to blood and body fluids from infected patients poses a risk of infection such as hepatitis B, C or HIV for healthcare staff.

Hand Hygiene Recommendations

“Hand hygiene is the single most important intervention to prevent transmission of infection and should be a quality standard in all health care institutions.” (SARI 2005).

It is recommended to refer to the full *Guidelines for Hand Hygiene in Irish Health Care Settings* by The Strategy for the Control of Antimicrobial Resistance in Ireland (SARI) and published by the HSE 2005. The following is extracted from the *SARI Guidelines for Hand Hygiene in Irish Health Care Settings* (SARI 2005; HSE 2009)

Summary of Recommendations for Hand Hygiene in the Healthcare Setting

Category I (I): Recommended for implementation and supported by experimental, clinical or epidemiologic studies with a strong theoretical background.

Category II (II): Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.

Category III (III): Recommended based on experience of experts in the field.

Hand Hygiene Preparation:

1. Nails must be kept short and cut smoothly (II)
2. Nail varnish (III) and/or false nails (I) must not be worn
3. All wrist and hand jewellery, including watches (except plain wedding bands) must be removed (II)
4. Shirts should have short or turn up sleeves (III).

Hand Decontamination Should be Carried Out:

1. When hands are visibly contaminated with dirt, soil or organic material (I) (Always wash hands when visibly contaminated)
2. At the beginning and end of the work shift (III)
3. Before and after each patient contact (II)
4. After moving from a contaminated to a clean area during care of an individual patient (II)
5. After removing gloves (I)
6. After handling soiled equipment, materials or environment (II)
7. Before preparing or handling food (I)
8. After personal bodily functions such as blowing nose or using the lavatory (I).

Hands may be decontaminated using both plain soap and water or if hands are physically clean, with an alcohol based hand rub/gel.

Decontamination with an Antiseptic Handwash Agent, or Alcohol Handrub Product

Use on visibly clean hands only, otherwise hands must be washed

Indication for use:

1. Before and after each patient contact in critical care units (II), those who are immunocompromised (III) or with large wounds or burns (I) and before entering units/wards with such patients (I)
2. After all contact with patients on transmission-based precautions and prior to leaving wards/rooms with such patients (I)
3. When hands are inadvertently contaminated with a heavy microbial load such as foul or infectious material (I). (Always wash hands when visibly contaminated)
4. Before performing invasive procedures as part of an aseptic technique (I).

An alcohol-based product should only be used on visibly clean hands and is recognised as a superior hand hygiene product for almost every situation. Alcohol handrub products with added emollient reduce the risk of dermatological side effects. Repeated use of alcohol-based products with added emollients may result in an excessive build up of emollient on the hands, and this may be reduced by periodic washing with soap and water.

Because alcohol-impregnated towelettes contain a restricted amount of alcohol, their effectiveness is similar to that of soap and water (CDC 2002).

Hand Decontamination Technique:

Decontaminating with Handwashing (CDC 2002; SARI 2005; HSE 2009)

When washing hands with soap and water:

1. Wet hands first with water
2. Apply an amount of soap product recommended by the manufacturer to hands
3. Rub hands together vigorously for at least 15 seconds, covering all surfaces of the hands and fingers
4. Rinse hands with water and dry thoroughly with a disposable towel
5. Use towel to turn off the faucet
6. Avoid using hot water, because repeated exposure to hot water may increase the risk of dermatitis.

Use single-use, disposable, good quality paper towels (SARI 2005). Multiple-use cloth towels of the hanging or roll type are not recommended (CDC 2002).

Decontaminating with Alcohol-based Hand Rub - Technique (CDC 2002; SARI 2005)

Decontaminate hands with suitable alcohol-based hand rub of 60-70% alcohol (isopropanol, ethanol, n-Propanol) concentration by weight. Concentrations of up to 95% can be used, but concentrations greater than 70% are generally avoided due to risk of skin dryness or dermatitis. Be aware that alcohol-based hand rub can be inactivated by organic material. If hands are soiled, handwashing is recommended. Refer to manufacturer's instructions.

Technique is recommended as follows:

1. Apply product to palm of one hand and rub hands together
2. Covering all surfaces of hands and fingers

3. For at least 15 seconds and until hands are dry.

Occupational Dermatitis

Due to the fact that HCW's are required to wash and decontaminated their hands frequently occupational dermatitis is common. Irritant dermatitis is a non-immunological inflammatory reaction of the skin to an external agent. Damaged areas of skin are more prone to colonisation with micro-organisms and therefore the management of all forms of dermatitis is essential for HCW's and subsequently patients. Recommendations for the prevention of occupational dermatitis in the healthcare setting have been published by SARI (SARI 2005).

Summary recommendations

1. Choose products with low irritation potential, with the addition of emollients
2. Promote use of alcohol based hand rubs containing emollients
3. Promote use of hand lotions and creams to increase skin hydration and replace depleted skin lipids
4. Receive feedback and input from HCW's regarding the tolerance etc of products.

Use of Gloves

Gloves should be worn on both hands during DN. The HSE *Standard precautions* document (HSE 2009) recommends the use of gloves:

1. for all activities that carry a risk of exposure to blood, body fluids, secretions or excretions, sharps or contaminated instruments
2. when touching mucous membranes and non-intact skin
3. When handling contaminated equipment.

Gloves should be single use and conform to European community standards. HCW's with allergy to latex should use latex-free gloves. Sterile gloves are recommended if contact with a sterile body area is required. Hand decontamination should be carried out as per recommendations (see section). Gloves should be donned immediately before DN and removed as soon as DN is finished. Gloves soiled with blood or body fluids should be disposed of as healthcare waste (see appropriate section).

It has been argued that gloves may affect the kinesiosthetic feedback during acupuncture or DN (ASAP 2007), however clinicians should be able to adapt to palpation technique using gloves.

Patient Skin Preparation

Routine disinfection of visibly clean skin before needling has not been considered necessary (Hoffman 2001; Baldry 2005; BAC 2006; ASAP 2007; White, Cummings et al. 2008). This is in line with World Health Organisation (WHO) best infection-control practices for intradermal, subcutaneous and intramuscular needle injections (Hutin, Hauri et al. 2003). It is argued that bacteria resident in the skin is not likely to cause infection provided host immunity is not seriously impaired (Hoffman 2001; Baldry 2005). Despite this, American acupuncture guidelines recommend to disinfect the skin with 70% isopropyl alcohol prior to needling.

1. Skin preparation is usually not required (Hoffman 2001), but if desired 70% isopropyl alcohol swab should be used prior to needling.
2. Be sure the patient's skin is visibly clean and if not the skin should be cleaned with warm soapy water and dried fully.
3. If DN close to an area that is more susceptible to infection such as a joint or bursa, or in an area that is habitually moist such as the armpit or groin, it is recommended to prepare the skin by swabbing, scrubbing with alcohol, isopropanol or povidone-iodine and allowing to dry for 2 minutes (see section below on skin sterilisation). This procedure may also be required with patients whom have an impaired immune system if deemed to be appropriate for DN therapy. It is recommended to follow the manufacturer's instruction for these products.
4. For a review on skin disinfection refer to Hoffman ((Hoffman 2001)

Skin Sterilisation (ASAP 2007)

1. Skin sterilisation is recommended for patients who have a deficiency in their immune system.
2. A sterilising solution such as 2% iodine in 70% alcohol should be used and left on the skin to dry for a minimum time of two minutes. (for those allergic to iodine, chlorhexidine in alcohol is suitable).
3. In this case a sterile glove is required if palpating the sterilised skin is required.

Immunocompromised patients include those with malignancies, autoimmune problems such as S.L.E, AIDS or R.A. and those on immune suppressive drugs e.g. organ transplant recipients. These groups of people can get an infection from a much smaller number of infectious agents than those with an intact immune system. Disinfection may not remove enough organisms to prevent infection, hence their skin needs to be sterilised.

The background to this policy is that in a normal healthy person a certain amount of infectious agents (bacteria, viruses) have to be introduced to the host's system before the body's defences are overwhelmed and an infection takes place. To reduce the number of bacteria or viruses below this infective agent is to *disinfect*. To completely remove all forms of life from the skin is to *sterilise*.

Needles

1. It is recommended without exception to use only high quality sterile single use disposable solid filament needles for dry needling therapy. Needles should be of good quality and should have a CE quality mark or British Kite mark. Ensure outer packaging is intact and the needles are within date and if not discard. Follow storage guidelines as recommended by the manufacturer and keep needles out of reach of children.
2. Needles should never be re-sterilised and/or reused.
3. Avoid touching the shaft of the needle as this could increase the risk of infection. Needles should be held by the handle only.
4. If the needle is contaminated by the clinician's hand, other object or surface it should be discarded and replaced with a fresh sterile needle.
5. In TrPDN the needle may be removed from the skin and reinserted at another point. In this case usual procedure should be followed and again the shaft of the needle should not be touched. Be aware that the needle may become blunt. If re-sheathing the needle back into its own guide tube, never re-sheath the needle into the guide tube sharp point first. The needle can be inserted back into the guide tube handle in first (White, Cummings et al. 2008). This is a procedure that needs to be practiced in order to achieve the dexterity required to perform safely and adequately. Needles and guide tubes should only be used together on an individual patient and never mixed as this could lead to cross contamination between patients. Chartered Physiotherapists should check their local work practice guidelines to ensure this type of needle re-sheathing is allowable
6. All needles and needle guide tubes should be discarded immediately after treatment in a "sharps container".
7. Never store a used needle for use on the patient at another treatment.
8. All needles must be accounted for after each session to avoid leaving a needle in situ in a patient or exposing the clinician or a third party to a needle stick injury by a lost needle.
9. If a reusable plunger type applicator has been used for intramuscular stimulation (Gunn technique), the applicator should be cleaned and then properly sterilised (e.g. using an autoclave) after use with each patient (CPTA 2007). However, Chartered Physiotherapists should ensure methods and equipment for sterilisation meet HSE requirements and should seek further expert advice in meeting HSE policies and procedures etc.
10. Patients should never be given needles to take home or needle themselves or others due to obvious risks.

Needle and Medical Clinical Waste Disposal

1. Disposal of needles and contaminated waste should be in line with the Irish Department of Health and Children's policy document on "Segregation Packaging and Storage Guidelines for Healthcare Risk Waste" 2004 (Dept of Health 2004).
2. Dispose of needles carefully in a "sharps container". Sharps containers should be of a standard and design to meet UN3291 approval. Chartered Physiotherapists should ensure the sharps container is within easy reach of the treatment area. It is important not to fill the container above the normal fill line indicator as this can lead to inadvertent needle stick injury. Ideally the sharps container should be wall mounted or on a trolley and should not be placed on the floor or in areas accessible to children. Full sharps containers should be closed using the locking mechanism and disposed of in accordance with local guidelines with a licensed waste disposal company.
3. Clinical waste from DN therapy may include swabs contaminated with blood and serous, soiled gloves etc. Clinical waste should be disposed of in an approved yellow bag. Yellow bags are designed for the disposal of soft items such as soiled swabs, gloves etc. No sharp objects or needles should be placed in yellow bags. Yellow bags should be available within easy reach of the treatment area and when full should be disposed of in accordance with local guidelines with a licensed waste disposal company.

Procedures Following a Needle Stick Injury or Other Exposure Incident

Do the Following:

1. Wash the area thoroughly with soap and warm water. In the case of needlestick injury / wounds encourage them to bleed. Do not suck the puncture site. Do not use a nail brush
2. Report the incident at once to your manager. Complete an accident form. Make a note of the details of the source patient (i.e. the patient on which the needle had been used). Take the name, date of birth, address, telephone number
3. Visit the Accident and Emergency Department where the situation will be assessed by the A+E doctor (***This must be done as soon as possible after the injury***). The A+E Doctor will need to consider the following:
 - Was this a significant injury in respect of possible exposure to blood/body fluid of another person
 - Is the recipient of this injury vaccinated against Hepatitis B

- If it was a significant injury, can the source patient be tested for blood borne infections (HIV, Hep C, Hep B)
4. The A+E doctor will provide immediate treatment as appropriate, and if further follow-up blood tests are necessary, this will be usually be done either by your employers occupational health resource, or your own GP.

Management of Blood and Bodily Fluids Spills

Blood and bodily fluid spills are rare in DN practice. The following guidelines are recommended if a blood or bodily fluid spill occurs. (Please note guidelines are adapted from ASAP 2007).

1. Wear suitable protective equipment e.g. gloves, apron, goggles as required.
2. Absorb the spill with paper towels. Disinfectants can be less active or even ineffective in the presence of high concentrations of proteins, such as in blood. The majority of the spilled blood or body fluid should be removed prior to disinfection. The absorbent paper towel waste should be placed in a suitable waterproof yellow bag.
3. Clean the spill site with detergent and water, rinse and dry with paper towel and dispose of the cleaning towels in yellow bags.
4. Disinfect the area with a chlorine-generating disinfectant if bare skin will contact the spill site (such as a treatment plinth) or if it is difficult to clean the surface in the clinical area. Sodium hypochlorite solutions (bleach) must be freshly prepared. When using disinfectants follow manufacturer's recommendations in relation to usage and safety. Disinfectants should be left in contact with the surface for 10 minutes. Domestic liquid bleach usually contains 4-5% available chlorine, diluted with tap water in a concentration of 1:100 yields 5000 parts per million (PPM) approximately. This concentration will inactivate Hepatitis B in 10 minutes and HIV virus in 2 minutes. Surfaces that cannot be cleaned adequately may need replacement e.g. carpeted surfaces.
5. Flood the spill site or wipe down the spill site with disposable towels soaked in disinfectant.
6. Absorb the disinfectant solution with disposable materials. Alternatively, the disinfectant may be permitted to dry.
7. Rinse the spill site with water to remove any noxious chemicals or odours. Dry the spill site to prevent slipping or further spills.
8. All materials used to absorb and clean the spill area should be placed in waterproof yellow bags and disposed of appropriately.

SECTION 5: PRINCIPLES OF DRY NEEDLING PRACTICAL APPLICATION

This section outlines the principles of DN of practice including:

1. Patient selection recommendations
2. Patient education and consent prior to treatment
3. Patient procedural education
4. Practical application – positioning, palpation, technique, after-care.

Patient Selection

Patients should be screened for appropriateness of DN. Chartered Physiotherapists should select patients suitable for DN based upon findings from the physiotherapy assessment. Appropriate selection of patients involves. Adapted from College of Physical Therapists of Alberta (CPTA 2007):

1. Consideration of the patient's physiotherapy diagnosis with the reasonable expectation of benefits from dry needling
2. Consideration of the patient's medical conditions including conditions requiring caution (e.g. pregnancy, use of medications such as blood thinners, the presence of a pacemaker, the presence of cancer or haemophilia)
3. Consideration of the patient's ability to understand what will be done and why
4. Consideration of the patient's capacity to effectively communicate his or her response to treatment
5. Consideration of the patient's ability to comply with treatment requirements (e.g. lying still)
6. Consideration of the patient's ability to provide informed consent within the guidelines of local regulations
7. Consideration of the capacity for the safe application and management of precautions (e.g. physiotherapy treatment in the patient home, at a sports club etc).

In addition it is important to consider the patient and practice context will issues/factors related to the application of dry needling (adapted from (CPTA 2007):

1. Understand the patient's characteristics: culture, comfort with needles, response to pain, response to handling
2. Understand the patient's functional and physical ability: cognition, anxiety etc
3. Understand the patient's language and communication: consent, reliability, understanding
4. Understand the patient's psychological status: Fear of needles, emotional responses

5. Understand the patient's age limitations: cautious use in the preteenage years (consider other non DN methods), consent requirements as routine.

Patient Education and Consent Prior to Treatment

Prior to DN therapy the Chartered Physiotherapist should educate the patient on the procedure. This may include where appropriate:

1. The indication and aim of the treatment should be explained appropriately to the patient
2. A brief explanation of how the treatment potentially works (e.g. SDN versus TrPDN)
3. It should be made clear to the patient that DN is an invasive procedure with insertion of the needle into the skin, subcutaneous tissue and muscle etc
4. The risks of DN treatment should be discussed with the patient (see section on safety) to allow the patient to make an informed decision about the choice of treatment and to give informed consent to the procedure. The patient should be informed of the possibility of transient symptoms during and/or after the treatment including post treatment soreness, fatigue, light headedness or temporary aggravation and haematoma. The patient should be informed that single use disposable needles will be utilised during treatment
5. Persons under 18 years of age should also have informed consent from parent or guardian
6. The patient should be given an opportunity to have their questions answered
7. Chartered Physiotherapists should gain informed consent from patients in line with ISCP-RPC 2010, ECSPP 2008 and this guide. Consent should be documented
8. Informed consent can be written or verbal as appropriate. Written consent may be required and Chartered Physiotherapists must use their judgement in deciding when written consent is needed (ECSPP 2008)
9. Patient education should delineate that DN when administered by Chartered Physiotherapist does not constitute the practice of acupuncture, unless the clinician is an acupuncturist or is qualified to deliver acupuncture.

Procedural Education

DN requires substantial cooperative interaction between patient and clinician. To enhance the safety and comfort of DN therapy the following is recommended:

1. The patient is asked and encouraged to give feedback to the clinician during DN to ensure treatment is matched to suit the patient
2. The patient is informed to remain still during treatment
3. The patient should be aware that they can at any time withdraw from the treatment and at this stage the clinician will stop the treatment

4. If employing TrPDN the patient should be informed of the local twitch response (LTR). This may feel like an electric shock or pulse. The patient is informed that reproduction of the LTR is the aim of TrPDN
5. If static technique is utilised, where the needle is left in situ statically for a period of time, the patient should be informed not to move as this poses a risk of further needle penetration and potential harm such as pneumothorax
6. If static technique is employed and the patient is left alone in a treatment room, the patient should be able to call or alert the Chartered Physiotherapist easily
7. Any advice following the treatment that may be pertinent for the individual patient should be given in context of the overall plan of care.

Practical Application

Positioning

1. The patient should be primarily treated reclined and positioned in a suitable manner to access the muscle(s) to be needled. Positions may include supine, prone, side lying or a combination of these positions. Pillows and bolsters can be utilised to ensure a relaxed position for the patient. It is important to ensure the patient is comfortable and relaxed
2. Treating patients in sitting should be avoided to prevent a fall from potential fainting, though low risk
3. The muscle(s) or body area being treated should be positioned optimally to allow skilled palpation of the taut band and trigger point and for dry needling procedure
4. It is helpful to be able to see the patients face for feedback, but accepting that this is not always possible, it is important to keep verbal communication with the patient to assess their response to the procedure
5. The Chartered Physiotherapist's position during needling should be comfortable and ensure good body mechanics. This is important to assist in prevention of work related disorders.

Palpation

1. The muscle(s) to be treated and anatomical landmarks should be identified by visual observation and skilled palpation. The Chartered Physiotherapist needs to be cognisant of avoiding other anatomical structures in the relevant area being needled e.g. sciatic nerve, lung etc.

2. The muscle should be palpated and the taut band and trigger point should be identified by the relevant criteria. The muscle can be contracted to identify fibre direction and to clarify muscle identification.
3. Flat palpation or pincer grip techniques should be employed as appropriate for the area being needled. It is again important to ensure anatomical position. Pincer grip is generally the recommended choice over flat palpation, in areas where applicable, to allow systematic avoidance of other tissues that may be more vulnerable with flat palpation approach e.g. when needling the upper trapezius.
4. Should the clinician remove her palpating hand from the muscle, to prepare the needle etc, the muscle and bony landmarks should be found again to avoid inadvertent incorrect needling due to patient movement or incorrect hand placement.
5. Ensure the patient and muscle is relaxed before starting the needle procedure.
6. Should the clinician not be able to palpate or confirm the muscle and anatomical landmarks, or is unsure of anatomical topography of the area to be needled, dry needling therapy should be avoided. This may occur in certain cases, for example obese patients.

Technique

It is accepted that various conceptual models and techniques maybe used individually or in combination during dry needling. A brief outline of the concepts has been mentioned in the introduction of this guide and Chartered Physiotherapists are recommended to review the referenced material.

1. The area to be needled is identified and the TrP is palpated and located as outlined in the palpation section above.
2. The palpating hand holds the muscle in pincer grip or flat palpation and the needling hand holds the needle by the handle only.
3. The clinician should remain aware of anatomical structures within the treatment area that are vulnerable to dry needling, such as the lung and ensure that technique avoids penetration.
4. The clinicians should stay alert to voluntary and involuntary patient movement that may compromise safe dry needling practice during treatment. In this regard the clinician's "needling hand" should keep contact with the patient to allow controlled relative movement with the patient should they patient move.
5. A high quality solid filament sterile needle of a thickness and length suitable for the muscle and size of the patient to be needled is chosen.

6. The needle is inserted through the skin either directly or using a guide tube. The guide tube is then removed. The clinician should not touch the needle shaft to prevent contamination (see hygiene section).
7. For SDN the needle is inserted to the depth for superficial needling as has been recommended by Baldry (Baldry 2002; Baldry 2005). For TrPDN, to a depth to engage the TrP.
8. In TrPDN technique the needle maybe moved in a slow steady lancing motion in and out of the muscle. This is termed dynamic needling and is applied by bringing the needle out to the edge of the external myofascia and directing the needle back into the muscle. The main aim of this treatment is to elicit LTRs.
9. Sharp pain of a stinging, lancing, electrical or burning nature may signal penetration of a nerve or blood vessel and should this be the case the needle should be removed immediately.
10. Dry needling technique may include leaving the needle in situ as in a static manner. The needle may be rotated with several revolutions to draw the fascia or soft tissues. If static needle procedure is used, the clinician should ensure when releasing grip that the needle should not move so as to make other structures (such as lung, blood vessels and nerves) vulnerable to needle penetration.
11. It is acceptable that an individual needle may be reinserted across the skin of the patient and then be disposed of when finished. The clinician should not touch the needle shaft to prevent contamination of the needle and potentially increase risk of infection. If this occurs the needle should be disposed of and a new needle used. Of course a needle should never be stored or reused.
12. If a static needle procedure (where the needle is left statically in situ) is utilised the Chartered Physiotherapist should remain within audible distance of the patient so that treatment can be monitored. Suitable procedures should be in place so as not to forget a patient.
13. The intensity of the treatment should suit the tolerance of the patient and be relative to the severity of the patient's presentation. The parameters that can be controlled in delivering DN therapy may include: SDN vs. DDN, quantity of lancing motions, intensity of lancing motion, stimulation and quantity of local twitch responses, length of time of active needling, number of needle insertions per muscle and number or muscles treated in one session.
14. Should a needle repeatedly contact bone it should be withdrawn and replaced as blunting may occur.
15. The clinician should keep active communication with the patient during the DN therapy and limit treatment to a level that the patient can tolerate. The patient should be

reassured throughout the procedure. This is most important for the initial treatment for a new, needle naive patient.

16. The patient's response to previous TrP treatments and dry needling should be taken into account to delineate the intensity of the active dry needling treatment.
17. When treatment is completed, all needles should be accounted for and discarded into a "sharps container" as well as guide tubes. Refer to the section on Hygiene.
18. Care should be taken when administering dry needling in an external setting (such as a local sports club or a home visit). The required equipment should be available on hand. The patient's skin should also be examined to ensure cleanliness prior to DN (see Hygiene Section).

Aftercare

The following is recommended for aftercare:

1. The area needled should be compressed immediately for 30-60 seconds following needle withdrawal to ensure haemostasis using a cotton swab. Cotton swabs should be disposed of in yellow medical waste bags only.
2. If blood is present on the skin, the skin should be cleaned with alcohol swab and the swab discarded in a yellow clinical waste bag.
3. The patient should receive where appropriate advice on safe self care such as hot or cold packs, stretching, exercises and / or activity modification as required in the overall context of the plan of care.
4. Adverse reaction should be dealt with as appropriate and as outlined in this guide.

REFERENCES

- AAOMPT. (2009). "AAOMPT Position Statements - Dry Needling." Retrieved 2/3/2011, from <http://www.aaompt.org/about/statements.cfm>.
- ASAP (2007). Guidelines for safe acupuncture and dry needling practice, Australian Society of Acupuncture Physiotherapists Inc.
- BAC (2006). The British Acupuncture Council Code of Safe Practice. London, BAC.
- Baldry, P. (2002). "Superficial versus deep dry needling." *Acupunct Med* 20(2-3): 78-81.
- Baldry, P. E. (2005). *Acupuncture, Trigger Points and Musculoskeletal Pain*. Edinburgh, Churchill Livingstone.
- Betts, D. and S. Budd (2011). "Forbidden points' in pregnancy: historical wisdom?" *Acupunct Med* 29(2): 137-9.
- Boyling, J. D. and G. A. Jull (2004). The future scope of manual therapy. *Grieve's modern manual therapy : the vertebral column*. J. D. Boyling, G. P. M. m. t. o. t. v. c. Grieve and G. A. Jull. Edinburgh, Churchill Livingstone: xv, 643 p.
- Brady, S., J. McEvoy, et al. (2012). Adverse Events following Trigger Point Dry Needling: A Prospective Survey of Chartered Physiotherapists.
- CDC (2002). Centers for Disease Control and Prevention. Guideline for Hand Hygiene in Healthcare Settings. *MMWR*. 51 (No. RR-16).
- CPTA (2007). Dry needling competency profile for physical therapists. Edmonton, Alberta, College of Physical Therapists of Alberta: 5.
- Cummings, M. (2011). "'Forbidden points' in pregnancy: no plausible mechanism for risk." *Acupunct Med* 29(2): 140-2.
- Cummings, T. M. and A. R. White (2001). "Needling therapies in the management of myofascial trigger point pain: a systematic review." *Arch Phys Med Rehabil* 82(7): 986-92.
- da Silva, A. V., M. U. Nakamura, et al. (2011). "'Forbidden points' in pregnancy: do they exist?" *Acupunct Med* 29(2): 135-6.
- Dept of Health (2004). Segregation Packaging and Storage Guidelines for Healthcare Risk Waste. Dublin, Irish Department of Health.
- Dommerholt, J., C. Bron, et al. (2006). "Myofascial trigger points; an evidence-informed review." *J Manual Manipulative Ther* 14(4): 203-221.
- Dommerholt, J. and C. Fernandez de las Penas (2013). *Trigger Point Dry Needling: An evidenced and clinical based approach*, Churchill Livingstone.
- Dommerholt, J. and P. Huijbregts (2011). *Myofascial trigger points : pathophysiology and evidence-informed diagnosis and management*. Sudbury, Mass., Jones and Bartlett Publishers.
- Dommerholt, J., O. Mayoral, et al. (2006). "Trigger point dry needling." *J Manual Manipulative Ther* 14(4): E70-E87.
- ECSP (2008). European Core Standards of Physiotherapy Practice, European Region of the World Confederation for Physical Therapy.
- Ernst, E., M. S. Lee, et al. (2011). "Acupuncture: Does it alleviate pain and are there serious risks? A review of reviews." *Pain* 152(4): 755-64.
- Ernst, G., H. Strzyz, et al. (2003). "Incidence of adverse effects during acupuncture therapy-a multicentre survey." *Complement Ther Med* 11(2): 93-7.
- Furlan, A., M. Tulder, et al. (2005). "Acupuncture and dry-needling for low back pain." *Cochrane Database Syst Rev*(1): CD001351.
- Ga, H., H. J. Koh, et al. (2007). "Intramuscular and nerve root stimulation vs lidocaine injection to trigger points in myofascial pain syndrome." *J Rehabil Med* 39(5): 374-8.
- Gerwin, R. D. (2005). "A review of myofascial pain and fibromyalgia--factors that promote their persistence." *Acupunct Med* 23(3): 121-34.
- Gray, H., P. L. Williams, et al. (1995). *Gray's anatomy : the anatomical basis of medicine and surgery*. New York, Churchill Livingstone.

- Guerreiro da Silva, A. V., M. U. Nakamura, et al. (2011). "The effects of so-called 'forbidden acupuncture points' on pregnancy outcome in wistar rats." Forsch Komplementmed 18(1): 10-4.
- Gunn, C. C. (1997). The Gunn approach to the treatment of chronic pain. New York, Churchill Livingstone.
- Hoffman, P. (2001). "Skin disinfection and acupuncture." Acupunct Med 19(2): 112-116.
- Hong, C. Z. (1994). "Lidocaine injection versus dry needling to myofascial trigger point. The importance of the local twitch response." Am J Phys Med Rehabil 73(4): 256-63.
- HSE (2009). Standard Precautions, Health Service Executive. Standard Precautions version 1.0 28th April 2009
- Hutin, Y., A. Hauri, et al. (2003). "Best infection control practices for intradermal, subcutaneous, and intramuscular needle injections." Bull World Health Organ 81(7): 491-500.
- ISCP-RPC (2010). Irish Society of Chartered Physiotherapists - Rules of Professional Conduct, ISCP.
- ISCP (2010). Acupuncture Policy, Irish Society of Chartered Physiotherapists.
- ISCP (2012). ISCP Policy on Consent. Dublin, Irish Society of Chartered Physiotherapists.
- Lee, J. H., H. Lee, et al. (2011). "An Acute Cervical Epidural Hematoma as a Complication of Dry Needling." Spine (Phila Pa 1976).
- Lewit, K. (1979). "The needle effect in the relief of myofascial pain." Pain 6: 83-90.
- MacPherson, H., K. Thomas, et al. (2001). "A prospective survey of adverse events and treatment reactions following 34,000 consultations with professional acupuncturists." Acupunct Med 19(2): 93-102.
- McEvoy, J. (2011). Trigger point dry needling: guidelines for safe practice. Physiotherapy Pain Conference. Universidad Rey Juan Carlos, Madrid, Spain.
- McEvoy, J. (2013). Trigger point dry needling: safety guidelines. Trigger Point Dry Needling: An evidenced and clinical based approach. J. Dommerholt and C. Fernandez de las Penas, Churchill Livingstone.
- McEvoy, J. and J. Dommerholt (2012). Myofascial trigger point of the shoulder. Physical Therapy of the Shoulder. R. Donatelli. St Louis, Elsevier Churchill Livingstone: 351-380.
- McEvoy, J. and P. Huijbregts (2011). Reliability of myofascial trigger point palpation: a systematic review. Myofascial trigger Points: Pathophysiology and evidenced-informed diagnosis and management. J. Dommerholt and P. Huijbregts. Sudbury, Jones and Bartlett.
- Melchart, D., W. Weidenhammer, et al. (2004). "Prospective investigation of adverse effects of acupuncture in 97 733 patients." Arch Intern Med 164(1): 104-5.
- Peuker, E. and D. Gronemeyer (2001). "Rare but serious complications of acupuncture: traumatic lesions." Acupunct Med 19(2): 103-8.
- SARI (2005). Guidelines for hand hygiene in Irish healthcare settings, The Strategy for the Control of Antimicrobial Resistance in Ireland (SARI) / Health Service Executive.
- SHWWA (2005). Safety, Health and Welfare at Work Act. SHWWA. Ireland, Irish Government.
- Siegal JD, Rhinehart E, et al. (2007). Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, Healthcare Infection Control Practices Advisory Committee.
- Simons, D. G., J. G. Travell, et al. (1999). Travell and Simons' myofascial pain and dysfunction; the trigger point manual. Baltimore, Williams & Wilkins.
- Smith, C., C. Crowther, et al. (2002). "Pregnancy outcome following women's participation in a randomised controlled trial of acupuncture to treat nausea and vomiting in early pregnancy." Complement Ther Med 10(2): 78-83.
- Stedman's (2000). Stedman's Medical Dictionary. M. Barlow-Pugh. Baltimore, Lippincott Williams & Wilkins.
- Steinbrocker, O. (1944). "Therapeutic injections in painful musculoskeletal disorders." Jama 125: 397-401.
- Tough, E. A., A. R. White, et al. (2007). "Variability of criteria used to diagnose myofascial trigger point pain syndrome--evidence from a review of the literature." Clin J Pain 23(3): 278-86.

- Travell, J. (1968). Office hours: day and night. The autobiography of Janet Travell, M.D. New York, World Publishing.
- Travell, J. G. and D. G. Simons (1983). Myofascial pain and dysfunction; the trigger point manual. Baltimore, Williams & Wilkins.
- Travell, J. G. and D. G. Simons (1992). Myofascial pain and dysfunction: the trigger point manual. Baltimore, Williams & Wilkins.
- Vincent, C. (2001). "The safety of acupuncture." BMJ 323(7311): 467-8.
- White, A., T. M. Cummings, et al. (2008). Evidence on the safety of acupuncture. An introduction to Western medical acupuncture. Edinburgh, Churchill Livingstone/Elsevier: 122.
- White, A., T. M. Cummings, et al. (2008). An introduction to Western medical acupuncture. Edinburgh, Churchill Livingstone/Elsevier.
- White, A., S. Hayhoe, et al. (1997). "Survey of adverse events following acupuncture." Acupunct Med 15(2): 67-70.
- White, A., S. Hayhoe, et al. (2001). "Survey of Adverse Events Following Acupuncture (SAFA): a prospective study of 32,000 consultations." Acupunct Med 19(2): 84-92.
- WHO (1999). Guidelines on basic training and safety in acupuncture, World Health Organisation: 35.
- Witt, C. M., D. Pach, et al. (2009). "Safety of acupuncture: results of a prospective observational study with 229,230 patients and introduction of a medical information and consent form." Forsch Komplementmed 16(2): 91-7.
- Yamashita, H., H. Tsukayama, et al. (1999). "Adverse events in acupuncture and moxibustion treatment: a six-year survey at a national clinic in Japan." J Altern Complement Med 5(3): 229-36.

APPENDIX LIST

1. Overview of Risks of Acupuncture Treatment (Witt, Pach et al. 2009)
2. Selective Overview of Acupuncture Adverse Events
3. Selective Acupuncture Points Anatomical Reference
4. Pulmonary Pleura Landmarks (Gray, Williams et al. 1995)

APPENDIX 1: Overview of the Risks of Acupuncture Treatment

Like all treatments, acupuncture can cause side effects. The following ranking is used:

Very common: more than 1 out of 10 treated people

Common: 1 to 10 out of 100 treated people

Uncommon: 1 to 10 out of 1,000 treated people

Rare: 1 to 10 out of 10,000 treated people

Very rare: less than 1 out of 10,000 treated people, including singular incidents

The character of possible side effects also depends on the acupuncture points which were chosen for treatment. Please ask your doctor which points he or she will use. The following symptoms were experienced by patients treated with acupuncture:

Common: 1 to 10 out of 100 treated people

Common side effects are bleeding and haematoma because of the lesion of small vessels. Sometimes, small bleedings are a desired part of Chinese acupuncture treatment.

Uncommon: 1 to 10 out of 1,000 treated people

Uncommon side effects observed in the context of acupuncture treatment include: inflammation at the application site, swelling, strong pain during needling, and local muscle pain. Nerve irritation or nerve injury is also possible. This can cause sensation difficulties or a temporary weakness in the associated musculature. Furthermore, headache, fatigue, and vegetative symptoms like vertigo and nausea were experienced. An initial aggravation of the symptoms which lead to the treatment is possible.

Rare: 1 to 10 out of 10,000 people treated

Rare side effects include: local infection, redness, itching, sweating, decrease of blood pressure, increase in blood pressure, unconsciousness, tachycardia, breathing difficulties, vomiting, worsening health state, generalised muscle pain, restricted movement, joint problems, feeling of coldness, menstrual problems, depressive mood, anxiety, sleep disturbance, restlessness/nervousness, disturbed vision and tinnitus.

Very rare: less than 1 out of 10,000 treated people, including singular incidents

Side effects observed in the context of acupuncture treatment include: palpitations, constipation, diarrhoea, gastrospasm, enterospasm, weight loss, circulatory disturbance, lesion of blood vessels, systemic infection, euphoria, nightmares, poor concentration, imbalance, disturbance of speech, disorientation, shivering, and eye irritation. Very rarely acupuncture needles can be forgotten or break. During treatment on the thorax a too deep insertion of an acupuncture needle can cause accumulation of air in the pleural cavity (pneumothorax). In the scientific literature injuries of the central nervous system and the pericardium have been reported.

Some of the side effects mentioned above can influence your fitness to drive!

If side effects occur during or after treatment, please inform your doctor.

Adapted from *Safety of acupuncture: results of a prospective observational study with 229,230 patients and introduction of a medical information and consent form* (Witt, Pach et al. 2009).

Permission to reproduce granted from: S. Karger AG, Medical and Scientific Publishers, Allschwilerstrasse 10, 4009 Basel, Switzerland

APPENDIX 2: Overview of Selective Acupuncture Adverse Events

ADVERSE EVENT	SYMPTOMS/SIGNS (Usually)	PREVENTION	MEASURES TO TAKE
Bleeding	<i>Mild</i>	Haemostasis Caution when DN on patients with abnormal bleeding tendency (anticoagulants, thrombocytopenia). Avoid varicose veins etc Avoid muscles where haemostasis cannot be applied adequately.	Pressure to the area with a cotton swab. Local use of ice to minimize the bleeding if required. Gloves mandatory at least on clinician's palpating hand.
Haematoma	<i>Mild</i>	Haemostasis. Caution when DN on patients with abnormal bleeding tendency. Avoid varicose veins etc.	Pressure to the area with a cotton swab. Local use of ice to minimize the bleeding if required.
Needling pain	<i>Mild</i>	Verbal and non-verbal communication. Explanation of the local twitch response.	Avoid sharp and burning pain - immediately withdraw the needle.
Post treatment soreness	<i>Mild - usually one hour to two days but on occasion up to 4 days</i>	Haemostasis of the needled region. Stretching combined with cold application.	Suitable patient. Educate patient. Treatment scheduled into patients lifestyle, social and work commitments.
Fainting	Significant	If patient is needle phobic, DN is contraindicated. Avoid if patient has high levels of psychological stress and tension or in patients with autonomic lability. Patients are treated in recumbent or lying position. Caution in patients with history of fainting from needling therapies, injections or blood taking etc.	Titrate DN treatment. If fainting occurs, remove needles. As patient should be lying down, consider raising legs or place in recovery position. Offer reassurance and water or sweet drink. Monitor until recovered. Patient should not drive until fully recovered. Medical assessment if there is any concern.

ADVERSE EVENT	SYMPTOMS/SIGNS (Usually)	PREVENTION	MEASURES TO TAKE
Drowsiness	Mild	A very small percentage of patients may feel excessively relaxed and/or sleepy after DN treatment.	Patient should be advised not to drive until they have recovered. In patients that experience this phenomenon future DN sessions should be timed around their lifestyle to allow for recovery and should be driven home by a third party.
Vegetative reactions (e.g. vertigo, sweating, nausea syncope)	<i>Mild -serious</i>	Patient history of similar response. Verbal and non-verbal communication. Monitor patient and reassure.	Remove all needles. Place patient in comfortable position or recovery position. Monitor, reassure. Seek medical treatment if required. Do not allow drive
Miscarriage in Pregnancy	Serious	Recognise conflict in scientific literature. Acupuncture recommendations include Avoid strong needling stimulation Avoid needling LI 4, SP 6, BL 60, BL 67, LV 3 over the abdomen, ear points for the genitor-urinary system and scalp points for the genital and motor sensory areas Needle with caution GB 21 and upper lumbar spine Electro-acupuncture should be avoided	Patient education and consent vital. Recognise conflict in opinion on the risks of acupuncture during pregnancy

ADVERSE EVENT	SYMPTOMS/SIGNS (Usually)	PREVENTION	MEASURES TO TAKE
<p>Infection</p> <p>Local infection</p> <p>Systemic infection</p> <p>Patient, clinician and third party</p>	<p>Significant</p> <p>For instance: mycobacteriosis, Hepatitis B HIV</p>	<p>Anatomical knowledge.</p> <p>Greater risk of DN on patients with a compromised immune system, vascular disease, diabetes mellitus etc.</p> <p>Advisable not to needle after surgical lymphectomy in limb affected.</p> <p>Avoid needling through acute inflammation or skin lesions, cysts, ganglion cysts, tumours, close to prosthetic implants.</p> <p>Avoid needling into joints.</p> <p>Assume that every person is potentially infected or colonized with an organism that could be transmitted in the healthcare setting to HCW or third party.</p>	<p>The skin in the region to be treated should be inspected and if any signs of infection are present treatment should be deferred and medical advice sought.</p> <p>Apply a set of work practices to blood, all body fluids including sweating areas, mucous membranes and non intact skin including:</p> <ol style="list-style-type: none"> 1. hand hygiene 2. use of personal protective equipment (gloves) 3. appropriate patient selection 4. safe needling practices (do not touch needle shaft) 5. use of alcohol or Betadine etc where implicated 6. management of sharps 7. management of spillages of blood and body fluids 8. respiratory hygiene and cough etiquette 9. management of needle stick injuries 10. management of waste 11. management of laundry 12. decontamination of reusable medical equipment eg bed etc

ADVERSE EVENT	SYMPTOMS/SIGNS (Usually)	PREVENTION	MEASURES TO TAKE
Pneumothorax	<p><i>Serious</i></p> <p>Signs and symptoms may include:</p> <p>Shortness of breath on exertion. Chest pain. Dry cough. Decreased breath sounds on auscultation. Increased respiration rate. Altered breathing patterns.</p> <p>These symptoms may not occur until several hours after the treatment and patients need to be cautioned of this especially if they are going to be exposed to exercise and marked alterations in altitude such as flying or scuba diving.</p>	<p>Thorough knowledge of pulmonary pleura landmarks. Consider dry needling of one side in the chest region at one treatment initially. Knowledge of scapula fenestration.</p>	<p>Anatomy and technique application. Urgent medical assessment if pneumothorax suspected.</p>
Penetration of abdominal organs, including the kidney, liver, spleen, intestines and urinary bladder	Potentially Significant	<p>Don't needle deeply over organs. The risk is greater with anatomical variance or enlarged organs. Good anatomical knowledge is needed.</p>	<p>Anatomy and technique application. Urgent medical assessment as required.</p>
Nerve irritation Nerve injury	Mild - Significant	<p>Anatomical knowledge. Needle slowly.</p>	<p>Withdraw needle immediately if electrical or burning pain or in the vicinity of a nerve.</p>

ADVERSE EVENT	SYMPTOMS/SIGNS (Usually)	PREVENTION	MEASURES TO TAKE
Forgotten needle	Significant	All needles should be accounted for. A forgotten needle could cause tissue trauma or serious complications such as pneumothorax. Forgotten needles are more likely to occur with static needling technique, where the needle is left in situ for a period of time or when needling various body parts.	Use a “ <i>count them in count them out policy</i> ”. Tally needle packets with withdrawn needles.
Stuck needle	Mild	Avoid excessive twisting of the needle to prevent skin and soft tissue binding around the needle.	If needle is stuck due to over rotation, then rotate the needle in opposite direction and remove If needle is stuck due to muscle tension, leave the needle in for a short period of time, relax the tissue around the needle with massage or by inserting 1-2 needles around the stuck needle, then remove the needle.
Bent needle	Mild	Prevent bending by inserting the needle with the patient in relaxed and optimal position. Use an optimal needling technique and avoid over curving the needle during dynamic needling treatment.	If a needle demonstrates a bend it should be removed and discarded and replaced with a fresh needle.

ADVERSE EVENT	SYMPTOMS/SIGNS (Usually)	PREVENTION	MEASURES TO TAKE
Broken needle	<i>Significant</i>	<p>Use single use sterile needles (never repeat use).</p> <p>Use good quality needles that are within date and have a CE quality mark.</p> <p>It is recommended to maintain approximately 1 cm of the needle outside the skin.</p> <p>If needle becomes bent, remove, discard and replace with a new needle.</p>	<p>Patient should be advised to remain calm to avoid needle from going deeper. If the broken needle is exposed remove the broken section with tweezers, if it is not exposed press the tissue around the insertion site until the broken section is exposed and remove with tweezers.</p> <p>If the needle can't be removed in the clinic, medical attention must be sought so that the needle can be removed surgically. Mark around the site of insertion with a pen or marker to make the needle site easy to identify.</p>
Needle allergy	Mild - Significant: Redness, itches	<p>Allergies to needle metals.</p> <p>Use of latex free examination gloves in Latex allergy.</p>	<p>Enquire about patient specific allergies.</p> <p>Use high quality needles.</p> <p>Use of latex free examination gloves if required.</p> <p>Monitor.</p> <p>Refer to medical as required.</p>
Forgotten patient	Significant	<p>If using a static needle technique and leaving the patient in the room or cubicle for a period of time it is important to avoid forgetting the patient.</p>	<p>Use an appropriate call bell system.</p>

ADVERSE EVENT	SYMPTOMS/SIGNS (Usually)	PREVENTION	MEASURES TO TAKE
Damage to implants and electrical device implants, including drug delivery systems and implanted spinal cord stimulators	Serious	Avoid DN in the vicinity of implanted devices.	Take patient specific history.

References: (Yamashita, Tsukayama et al. 1999; MacPherson, Thomas et al. 2001; White, Hayhoe et al. 2001; ASAP 2007; White, Cummings et al. 2008; Witt, Pach et al. 2009)

APPENDIX 3: Selective Acupuncture Points Anatomical Reference

Acupuncture Point	Anatomical reference
LI 4	On the dorsum of the hand, between the first and second metacarpal bones, approximately level with the middle of the second metacarpal bone in the middle of the web space.
SP 6	On the medial side of the lower leg, four fingers width above the tip of the medial malleolus, on the postero-medial border of the shin bone.
BL 60	Posterior to the lateral malleolus, in the depression between the tip of the lateral malleolus and Achilles tendon
BL 67	On the lateral side of the distal segment of the small toe just proximal to the corner of the toenail
LV 3	On the dorsum of the foot in a depression distal to the junctions of the 1st and 2nd metatarsal bones
GB 21	An imaginary line between the bony prominence of the neck (C7), and the top of the shoulder joint (the acromion process), this point lies midway along this curved line, at the highest point of the trapezius muscle

APPENDIX 4: Pulmonary Pleura Landmarks

For safety the parietal pleura surface landmarks should be noted to avoid the complication of pneumothorax from needle penetration. The parietal pleura is intimately fused with the inner aspect of the thoracic cavity.

Superiorly:

The pleura diverge from the midline to extend upwards and outwards to the apex of the pleural cavity. This point lies between 3-4 cm above the anterior end of the first rib but level with the posterior end of the rib. The surface marking of the superior point of the pleura lies about 2.5 cm above the middle third of the clavicle.

Laterally: The parietal pleura is intimately fused with the inner aspect of the thoracic cavity and can be followed laterally and inferiorly down the inner aspect of the chest wall to the level of the 10th rib in the midaxillary line which is its lowest point in that plane

Posteriorly:

Posterior and medially the pleura maybe followed along a line joining the transverse processes of the 2nd to 12th thoracic vertebrae. The pleura then extends horizontally and laterally crossing the oblique 12th and 11th ribs meet the 10th rib in the midaxillary line.

Anteriorly:

On the right side the costodiaphragmatic reflections of the pleura can be followed from the midaxillary line towards the midline, crossing the 8th rib in the midclavicular line to the xiphisternum. From here the pleura continues superiorly to the angle of Louis.

On the left side the costodiaphragmatic reflections of the pleura can be followed from the midaxillary line towards the midline, crossing the 8th rib in the midclavicular. However the pleura does not reach the midline on the left as it turns superiorly at the anterior end of the 6th rib approximately 3-5cm from the midline and ascends to the level of the 4th costal cartilage where it joins the right pleura in the midline and arises to the second costal cartilage. This variation on the left is to accommodate the heart.

(Gray, Williams et al. 1995)