GUIDELINES

Phlebology Training Curriculum
A Consensus Document of the International Union of Phlebology (UIP)-2010

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Phlebology has evolved as a distinct medical specialty in the past two decades. Many European countries have a strong tradition of excellence in the management of venous disease and phlebology is a well-established medical sub-specialty in some parts of the continental Europe. By contrast, there are no coherent phlebology training programs in most other countries and disjointed aspects of venous disease are taught under vascular surgery, vascular medicine, dermatology and haematology. More recently, countries such as Australia, New Zealand and the United States have been working towards establishing phlebology as an independent medical specialty. Union Internationale de Phlébologie (UIP) is committed to the global expansion of knowledge in phlebology and aims to provide a forum for advancement of science in this field, to foster the diffusion and exchange of ideas through scientific meetings and publications and to encourage research in various aspects of venous disease. The Union has been instrumental in giving phlebology more exposure within the broader medical community and has a key role to play in establishing phlebology as an independent specialty in member countries.

What may be considered as the jurisdiction of phlebology as an independent specialty may be debated. In this document we defined a phlebologist as a medical specialist who deals with all aspects of venous disease and hence the Curriculum contains core phlebology topics as well as

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— American College of Phlebology (ACP), Phlebology Fellowship Curriculum.
— Proposed Phlebology Training Curriculum. University of California, San Diego (UCSD) and the Vein Institute of La Jolla. 2008.
— Australasian College of Dermatologists (ACD) Training Handbooks.
— French and German phlebology educational programs
— Australasian Society for Ultrasound in Medicine (ASUM) Vascular Syllabus.
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broader aspects of venous disease. The comprehensive nature and the wide scope of this Curriculum reflects the multi-disciplinary nature of phlebology and allows for sub-specialisation in various aspects of this expanding field.

This document is intended to be used as a general guide. We encourage the member societies of UIP to modify this document to suit their own individual needs based on the local teaching and training traditions. The Curriculum should be integrated within the overall structure of individual training programs to form a coherent program of study. In Australia and New Zealand, this curriculum is incorporated in a four-year Phlebology Training Program which involves direct patient management, didactic teaching and integrated assessments and examinations.

This Curriculum will be reviewed on a regular basis to reflect the expanding knowledge in the field of phlebology. The committee welcomes feedback from member societies and individual phlebologists. This Curriculum was written with trainees in mind and feedback from phlebology or vascular trainees would be most welcome.

ABBREVIATIONS

APS: Antiphospholipid syndrome
AVM: Arteriovenous Malformations
CEAP: Clinical, Etiological, Anatomical, Pathophysiological classification
CM: Capillary Malformations
CT: Computerised Tomography
CVI: Chronic Venous Insufficiency
CW: Continuous Wave
DIC: Disseminated Intravascular Coagulopathy
DVT: Deep Vein Thrombosis
EVLA: Endovenous Laser Ablation
HRT: Hormone Replacement Therapy
IVC: Inferior Vena Cava
KTS: Klippel-Trenaunay Syndrome
LM: Lymphatic Malformations
LMWH: Low Molecular Weight Heparin
MRI: Magnetic Resonance Imaging
NSAIDS: Non-steroidal Anti-inflammatory Drugs
OCP: Oral Contraceptive Pill
PE: Pulmonary Embolism
PPD: Pigmented Purpuric Dermatoses
RFA: Radiofrequency Ablation
t-PA: Tissue Plasminogen Activator
UFH: Unfractionated Heparin
VM: Venous Malformations
VTE: Venous Thromboembolism

SECTION 1: CORE SCIENCES

CHAPTER 1:

ANATOMY

Detailed knowledge of the core topics and a basic understanding of the broader topics is recommended. Trainees should be familiar with:

1. The new venous nomenclature;[1-4]
2. Normal and abnormal flow patterns in the venous system;
3. Average size and normal diameters of important veins.

A. Core venous anatomy

1. Lower limb venous anatomy

a) Superficial system [3]

- Great saphenous system
  - — Saphenofemoral junction (SFJ)
  - — Great saphenous vein (GSV)
  - — Superficial inguinal veins
    1. The confluence (Crosse)
    2. Superficial circumflex iliac vein
    3. Superficial epigastric vein
    4. External pudendal veins
  - — Accessory great saphenous veins: anterior, posterior and superficial
  - — Thigh circumflex veins: anterior and posterior
  - — Accessory great saphenous veins of the calf: anterior and posterior
  - — Perforating veins
- Small saphenous system
  - — Saphenopopliteal junction (SPJ)
  - — Small saphenous vein (SSV)
  - — Cranial extension of the SSV (femoropopliteal vein)
  - — The vein of Giacomini and the posterior thigh circumflex vein
  - — Superficial accessory small saphenous vein
  - — Perforating veins
- The lateral superficial venous system
  - — Normal and abnormal flow
  - — Lateral thigh and lateral calf veins
  - — Lateral knee perforators
  - — Anterior thigh communications with the great saphenous system
  - — Lateral calf communications with the small saphenous system
  - — Lateral thigh and lateral calf perforators
- Inter-saphenous and communicating veins

b) Deep system

- Common femoral vein
- Femoral vein
- Profunda femoris
- Popliteal vein
- Posterior and anterior tibial veins
- Peroneal veins
- Gastrocnemius veins
- Inter-gemellar veins
- Soleal veins
- Sciatic and sural veins

2. *Veins of the foot*

a) Superficial system

- Superficial digital veins: dorsal and plantar
- Superficial metatarsal veins: dorsal and plantar
- Venous networks: dorsal and subcutaneous plantar
- Medial and lateral marginal veins

b) Deep system

- Deep digital veins (plantar and dorsal)
- Deep metatarsal veins (plantar and dorsal)
- Deep plantar venous arch
- Medial and lateral plantar veins

3. *Upper limb venous anatomy*

a) Superficial system

- Cephalic vein
- Basilic vein
- Median cubital vein
- Median vein of the forearm

b) Deep system

- Ulnar vein
- Radial vein
- Brachial vein
- Axillary vein

4. *Veins of the hand*

a) Superficial system

- Superficial digital veins
- Superficial metacarpal veins
- Venous networks

b) Deep system

- Deep digital veins
- Deep metacarpal veins
- Venous arches

5. *Cranial, neck and thoracic venous anatomy*

- Intra-cranial, extra-cranial and cranial perforating veins
- Jugular veins
- Vertebral veins
- Azygos vein
- Subclavian veins
- Superior vena cava

6. *Facial veins*

- Supra-trochlear and supra-orbital veins
- Ophthalmic and infra-orbital veins
- Angular and facial veins
- Transverse facial vein
- Superficial temporal and retromandibular veins

7. *Abdominal venous anatomy*

- Superficial abdominal venous system
- External and internal iliac veins
- Common iliac vein
- Inferior vena cava
- Portal vein
- Hepatic vein
- Coeliac and mesenteric veins
- Renal veins
- Splenic veins

8. *Pelvic venous anatomy*

- Superficial pelvic venous system
- Ovarian plexus
- Veins of the Broad ligament
- Uterine plexus
- Gonadal veins

9. *Veins of the genitalia and the perineum*

- Internal and external pudendal veins
- Superficial dorsal veins of clitoris/penis
- Anterior labial/scrotal veins
- Perineal veins
- Gluteal veins

B. Broader topics

1 *Classic systems of anatomy and common pathologies*

- Superficial and deep lymphatic systems
- Sciatic nerve, femoral nerve, sural nerve, saphenous nerve, common peroneal nerve
- Muscles of lower limbs
- Arterial system of lower limbs

2. Regional anatomy

- Saphenous hiatus
- Femoral triangle
- Adductor canal
- Foot and ankle

CHAPTER 2:
BASIC SCIENCES

A. Physics

- Ultrasound physics - see SECTION 2 CHAPTER 2B
- Laser physics
- Physics of compression
  — Measurements of interface pressure and stiffness [5]
- Physics of foams [6]
  — Buoyancy
  — Coarsening [7, 8]
  — Wet *vs*. dry foams
  — Wetting half-life
  — Foam stability [6, 9]
- Basic radiation physics as it relates to venography, computerized tomography (CT) and magnetic resonance imaging (MRI)

B. Biochemistry

The trainee should have a basic understanding of the following:

- Sclerosants
  — Detergents, surfactants and sclerosants
  — Classification of detergents
  — Phospholipids and biological membranes
  — Critical micelle concentration
  — Kraft point
  — Cloud point
  — Aggregation number
  — Interaction of detergents with lipid membranes [10]
- Folate pathway
- Factor X, thrombin and antithrombin
- Fibrinogen, Factor XIII, cross-linked and non-cross-linked fibrin
- D-dimer

C. Rheology and fluid dynamics

- Newtonian *vs*. non-Newtonian fluids
- Shear rates in the vascular systems
- Reynolds number
- Rheology of thrombosis
- Rheology of detergents

D. Venous physiology, function and haemodynamics

- Venous physiology and haemodynamics
  — Normal and abnormal patterns of venous flow
- Principles of venous haemodynamics [11]
- Calf muscle pump function
- Venous physiology measurements
  — Ambulatory venous pressure measurements
  — Plethysmography and volumetry
  — Light reflection rheography
  — Laser Doppler and transcutaneous oxygen
  — Digital infra-red thermography
  — Duplex ultrasound measurements

E. Genetics

The trainee should be familiar with the genetics of the following conditions:

- Chronic venous insufficiency (CVI)
- Venous thromboembolism (VTE) [12, 13]
- Vascular anomalies and related syndromes [14]
- Lymphoedema
- Vascular genodermatoses

F. Embryology

- Normal venous, arterial and lymphatic embryology
- Vasculogenesis, angiogenesis and lymphangiogenesis
- Embryology as it relates to venous anomalies including double IVC, dominant iliolumbar veins, gonadal/renal/ureteric vein anomalies and retro-aortic left renal vein.

G. Vascular histology and histopathology

Normal vascular histology and histopathology of the following conditions and their differential diagnoses

- Vessel wall
- Vessel wall in venous disease
- Common skin manifestations of venous disease
- Acute lipodermatosclerosis *vs*. cellulitis

- Chronic lipodermatosclerosis and other forms of panniculitis
- Pigmented purpuric dermatoses (capillaritis)
- Acroangiodermatitis (pseudo-Kaposi's sarcoma)
- Venous thrombosis
- Arterial thrombosis *vs*. venous thrombosis
- Thrombosis vs. sclerosis and endovascular fibrosis
- Vasculitis (small vessel, medium size vessel and large vessel)
- Nodular vasculitis
- Livedo vasculopathy
- Vascular tumours
- Vascular malformations
- Paediatric vascular anomalies [15]
- Lymphangitis and other lymphatic conditions

H. Vascular biology

- The endothelium
- Endothelial markers
- Circulating endothelial cells (CEC)
- Endothelial progenitor cells (EPC)
- Endothelial microparticles (EMP)
- Vascular basement membrane
- Vascular smooth muscle and the sub-endothelium
- Alterations of the vessel wall in CVI
- Interactions of the vascular system with the thrombo-haemostatic system
- Vasculogenesis, angiogenesis and lymphangiogenesis
- Angiogenic cytokines

I. Lymphatic biology

- Lymphangiogenesis
- Structure and function of the lymphatic system
- Anatomy of the lymphatic system
  — Superficial lymphatic system
  — Deep lymphatic system
  — Communication with the venous system
- Lymph transport
- Immune functions
- Genetic defects

J. Molecular basis of venous disorders

- Matrix metalloproteases
- Growth factors
  — Platelet derived growth factor (PDGF)
  — Basic fibroblast growth factor (b-FGF)
  — Vascular endothelial growth factor (VEGF)
- Basement membrane collagen, laminin and integrins
- Molecular basis of venous insufficiency
- Molecular basis of wound healing

K. Coagulation system

- Classic and cell models of coagulation
- Clotting factors
- Clotting tests
- Platelet structure and function
- Platelet derived microparticles (PMP)
- Factor XIII and fibrin stabilization [16, 17]
- Fibrinogen
- Structure of fibrin

L. Antithrombotic mechanisms

- Plasma coagulation inhibitors
- Protein C anticoagulant pathway
- Endothelial protein C receptor
- Protein S
- Thrombomodulin
- Antithrombin
- Heparin and vascular proteoglycans

M. Fibrinolytic mechanisms

- Plasminogen-plasmin system
- Tissue plasminogen activator (t-PA)
- Urokinase (u-PA)
- Plasminogen activator inhibitor 1 (PAI-1)
- t-PA/PAI-1 Complexes
- Thrombin activatable fibrinolysis inhibitor (TAFI)
- Antiplasmin
- Alpha-2 macroglobulin
- Fibrin degradation products and D-dimer

N. Inflammation

- Inflammatory cytokines
- The role of the inflammatory cascade in the development of vessel wall damage
- Inflammation and wound healing
- Tissue remodeling
- Vasculitis and phlebitis
- Lipodermatosclerosis and panniculitis

O. Clinical diagnosis and morphology

- Telangiectasia *vs*. venulectasia *vs*. telangiectatic matting
- Telangiectatic matting *vs*. mat telangiectasias
- Spider naevus *vs*. "spider veins"
- Localized varix
- Blanchable *vs*. non-blanchable
- Erythema *vs*. purpura
- Purpura
  — Palpable *vs*. non-palpable
  — Non-palpable purpura: petechiae *vs*. ecchymosis
- Petechiae *vs*. pigmented purpuric dermatoses (PPD)
- Reticulate patterns [18]
  — Livedo reticularis *vs*. livedo racemosa
  — Reticulate purpura *vs*. reticulate pigmentation
  — Stellate pattern *vs*. venous rings
  — Atrophie blanche

CHAPTER 3:

PHARMACOLOGY

A. General pharmacological principles

The trainee must have a thorough understanding of the pharmacological principles described below as it relates to drugs listed in this Curriculum:

- Pharmacokinetics and pharmacodynamics
- Half-life
- Drug absorption and the effect of foods
- Drug metabolism
- Drug excretion
- Drugs requiring dose reduction in renal and hepatic disease
- Drug hypersensitivity syndromes and drug toxicity
- Cross-reactivity
- Drugs crossing the placenta
- Drugs present in the breast milk
- Pregnancy categories
- Drug monitoring

B. Vascular pharmacology

- Autonomic innervations of blood vessels
- Neuro-humoral mediators of vascular tone
- Vascular pharmacogenomics
- Drugs affecting the vascular smooth muscle- vasoconstrictors and vasodilators

C. Specific drugs and agents

1. *Sclerosing agents*

- Detergents
- Osmotic agents
- Chemical irritants

2. *Embolic agents*

- Ethanol
- Embolic particles
- Onyx
- Coils

3. *Platelet inhibitors*

- Aspirin
- Clopidogrel
- GPIIbIIIa inhibitors
- Other anti-platelet agents

4. *Anticoagulants*

- Vitamin K
- Unfractionated (UFH) and low molecular weight (LMWH) heparins
- Pentasaccharides
- Vitamin K antagonists (VKA) including Warfarin
- Warfarin reversal [19]
- Hirudin and hirudin analogs
- New anticoagulants [20]
  — Factor Xa inhibitors
  — Direct thrombin inhibitors
  — New paediatric anticoagulants [21]

5. *Thrombolytic and fibrinolytic agents*

- t-PA
- Urokinase
- Streptokinase
- Tranexamic acid
- Stanozolol

6. *Veno-active drugs and supplements*

- To alleviate venous symptoms and oedema [22, 23]
  — Gamma-benzopyrones (flavonoids): diosmin, micronised purified flavonoid fraction,[24] rutosides
  — Saponins: escin, ruscus extract

— Other plant extracts: anthocyans, proanthocyanidines oligomers, ginkgo biloba
— Synthetic products: calcium dobesilate, naftazone
- In treatment of leg ulcers
— Micronised purified flavonoid fraction
— Prostacycline,
— Prostaglandin E-1 [25]
— Pentoxifylline [26]

7. Topical agents

- Topical steroids in the management of venous eczema and contact dermatitis
- Topical antibiotics and antifungals
- Topical vasodilators and vasoconstrictors
- Topical anaesthetic agents
- Contact sensitization and the management of leg ulcers

8. Other drugs

- Female hormones
— Oral contraceptive pill (OCP)
— Hormone replacement therapy (HRT)
- Non-steroidal anti-inflammatory drugs (NSAIDS)
- Drugs affecting folate metabolism including methotrexate
- Anaesthetic agents-topical, injectable, tumescent
- Mild sedation agents
- Vitamins and supplements affecting the vascular system

CHAPTER 4:

CLINICAL SCIENCES

A. Clinical phlebology

1. Venous incompetence and insufficiency

- Clinical evaluation of chronic venous insufficiency (CVI)
- Manifestations of CVI [27]
- Epidemiology [28-31]
- Risk factors
- Pathophysiology of varicose veins and telangiectasias
- Venous hypertension and its complications
- Venous oedema and phlebolymphoedema
- Swollen limb
- Measuring outcomes and classifications [32, 33]
— CEAP classification [34-36]
— Venous severity scores [37]
- Diagnostic evaluation and Duplex examination of venous incompetence [38-40] (see Section 2 CHAPTER 2B)
- Management of venous incompetence (see Section 2 CHAPTER 3B)

2. Venous thromboembolism (VTE)

- Natural history and consequences of VTE
- Epidemiology [41, 42]
- Risk factors [43]
- Diagnosis
- Specific topics
— Recurrent VTE [44-48]
— Cancer and VTE [49, 50]
— Obesity and VTE [51]
— Hormone related VTE [52]
— Pregnancy and VTE [53]
— Travel related VTE [54-56]
— VTE in the elderly [57]
— Paradoxical embolism and patent foramen ovale
— Iliac vein obstruction and May-Thurner Syndrome
— Venous outflow obstruction [58]
— Venous gangrene, phlegmasia alba dolens, phlegmasia coerulea dolens
- Venous thrombosis in unusual sites
— Portal vein thrombosis
— Mesenteric venous thrombosis
— Ovarian vein thrombosis
— Cerebral vein thrombosis [59]
— Axillo-subclavian venous thrombosis and Paget-Schroetter syndrome
- Superficial venous thrombosis
— Superficial venous thrombosis vs. thrombophlebitis
— Superficial migratory thrombophlebitis and associated malignancies
— Infective thrombophlebitis and vascular infections
— Granulomatous phlebitis
— Management of thrombophlebitis
- Investigations-
— Duplex ultrasound
— Role of venography (see Section 2 CHAPTER 2C)
— Role of CT and MR (see Section 2 CHAPTER 2E)
— Laboratory markers (see Section 2 CHAPTER 2F)
- Management (see Section 2 CHAPTER 3C)

3. Post-thrombotic syndrome (PTS)

- Manifestations
- Definitions and clinical scores
- Pathophysiology (macro- and microcirculation)
- Risk factors [12]
- Residual venous obstruction
- Deep and superficial venous reflux
- Management options

4. Lower limb ulceration

- Mechanisms underlying leg ulceration and the fundamental principles of wound healing
- Differential diagnosis to include: venous, arterial and mixed, neuropathic, pyoderma gangrenosum and other dermatological ulcers, vasculitic ulcers, ulcers due to infections, malignant lesions presenting as ulcers, traumatic ulcers and pressure sores and haematological and other ulcers
- Management (see Section 2 CHAPTER 3D)

5. Antiphospholipid syndrome (APS)

- Classification [60, 61]
- Dermatological manifestations [18, 62]
- Diagnostic markers [63]
- Thrombotic risk assessment [64]
- Catastrophic APS [65]
- Anticoagulation and management issues [66]

6. Venous compression syndromes

- Paget-Schroetter syndrome
- Superior vena cava syndrome
- May-Thurner syndrome
- Nutcracker syndrome
- Popliteal vein entrapment and compression syndrome

7. Venous aneurysms

- Popliteal vein aneurysm
- Jugular vein aneurysm
- Traumatic venous aneurysms

8. Venous trauma

- Diagnostic methods
- Venous injuries of lower extremities
  — Preservation of popliteal venous outflow
  — Role of distal arterio-venous fistulas
  — Consequences of femoral venous ligation
  — Vein grafts
  — Other repair techniques

9. Coagulopathies

- Localised intravascular coagulopathy (LIC)
- Disseminated intravascular coagulopathy (DIC)
- Kasabach-Meritt syndrome
- Warfarin necrosis and its differential diagnosis

10. Phlebectasias

- Corona phlebectatica paraplantaris
- Venous lakes and mucoid cysts
- Telangiectatic conditions
  — Generalised essential telangiectasias (GET)
  — Hereditary benign telangiectasias
  — Unilateral nevoid telangiectasias
  — Ataxia telangiectasias (AT)
  — Hereditary hemorrhagic telangiectasia (HHT; Osler-Weber-Rendu disease)
  — Mat telangiectasias of scleroderma
  — Telangiectasias macularis eruptive perstans (TMEP)
  — Spider nevus (angioma)
  — Angioma serpiginosum
  — Poikiloderma of Civatte
  — Post-radiation telangiectasias

11. Vascular tumours

- Congenital vascular tumors (see Section 1 CHAPTER 4B4)
- Pyogenic granuloma
- Kaposi's sarcoma
- Bacillary angiomatosis
- Haemangioendotheliomas
- Leiomyomas and leiomyosarcomas
- Angiosarcoma
- Angiolymphoid hyperplasia with eosinophilia (ALHE)
- Tumour/thrombus complexes such as those involving renal cell carcinoma
- Other vascular tumours

B. Paediatric phlebology

A detailed knowledge of the aetiology, epidemiology, clinical features, investigations, differential diagnosis, prognosis and management of the following conditions is required.

1. Venous incompetence and insufficiency in children

- Definitions [67]
- Epidemiology

- Prognosis
- Investigations and treatment
- Puberty and venous insufficiency

2. Thromboembolism in neonates and children

- Purpura fulminans
- Neonatal cerebral sinus venous thrombosis
- Neonatal renal vein thrombosis
- Neonatal portal vein thrombosis
- Paediatric venous thromboembolism
- APS in children
- Post-thrombotic syndrome in children
- Paediatric coagulopathies

3. Paediatric vascular malformations

See Section 1 CHAPTER 4C

4. Paediatric vascular tumours

- Haemangioma of infancy (HOI)
- Congenital haemangiomas
  — Rapidly involuting congenital haemangiomas (RICH)
  — Non-involuting congenital haemangiomas (NICH)
- Kaposiform haemangioendothelioma (KHE)
- Tufted angioma
- Haemangiopericytomas
- Diffuse congenital haemangiomatosis
- DIC and Kasabach-Meritt syndrome
- PHACES syndrome - *p*osterior fossa brain malformation, *h*aemangioma, *a*rterial anomalies, *c*ardiac and aortic anomalies, *e*ye anomalies, *s*ternal defects

5. Paediatric vascular and mixed syndromes

- Cutis marmorata
- Cutis marmorata congenita telangiectasias (CMCT)
- Sturge-Weber syndrome
- Cobb syndrome
- Proteus syndrome
- Beckwith-Wiedman syndrome
- von Hipplel-Lindau syndrome
- Fabry's disease
- Homocysteinuria
- Klinefelter syndrome

C. Vascular malformations

1. Capillary malformations (CM)

- Classification
- Combined malformations and syndromes that include a CM
  — CM-arteriovenous malformation (CM-AVM)
  — Sturge-Weber syndrome
  — Macrocephaly - CM syndrome (M-CM)
  — Cobb syndrome
  — Cerebral capillary malformations
  — Cutis marmorata congenital telangiectasias (CMCT)
  — Other syndromes
- Laser therapy for CM

2. Venous malformations (VM)

- Classification, syndromes and sub-types [68]
  — Truncular vs. non-truncular
- Truncular VM
  — IVC anomalies
  — Persistent embryonic veins
  — Klippel-Trenaunay syndrome (KTS)
  — Primary venous aneurysms
- IVC anomalies
  — Diagnosis and management
  — Aplasia and hypoplasia
  — Duplication
  — Deep vein thrombosis (DVT) in patients with IVC anomalies
- Persistent embryonic veins
  — Sciatic vein
  — Lateral embryonic marginal vein
- Non-truncular VM
  — Localised and generalized sporadic VM
  — Glomovenous malformations
  — Blue Rubber Bleb syndrome
  — Generalized phlebectasias
  — Sinus peri-cranii
  — Cerebral VM ("cavernous malformation")
- Complications
  — Localised intra-vascular coagulopathy
  — Recurrent thrombophlebitis
  — Venous thrombosis and pulmonary embolism (PE) in patients with VM
  — Soft tissue and bony hypertrophy in patients with VM
  — Chronic venous hypertensive changes
  — Psychological and developmental aspects
- Investigations
  — Ultrasonic features and Doppler findings
  — Venography and MRI
  — Laboratory investigations of associated coagulopathies
- Management options
  — Conservative management
  — Interventions- see SECTION 3 CHAPTER 4.A

3. *Lymphatic malformations (LM)* [69]

- Classification
  - — Truncular LM presenting as primary lymphoedema [70, 71]
  - — Non-truncular LM
    Microcystic *vs*. macrocystic
    Angiokeratomas and capillary-lymphatic malformations
- Cutaneous manifestations and complications
  - — Lymphoedema
  - — Papillomatosis
  - — Infection, cellulitis
  - — Bleeding and intra-lesional thrombosis
  - — Psychological and developmental aspects
- Syndromes that include a LM
- Investigations
  - — Ultrasonic features
  - — MRI
  - — Radionuclide lymphoscintigraphy for lymphoedema of truncular LM
  - — Lymphangiography, microlymphangiography and indirect lymphography
  - — Patent blue and Indocynanin test
- Management options [72]
  - — Conservative management
  - — Interventions (see Section 3 CHAPTER 4A)

4. *Arteriovenous malformations (AVM)*

- Diagnosis, clinical and radiological classifications [73, 74]
- Cutaneous manifestations including acroangiodermatitis
- Syndromes that may include AVMs
  - — Parks-Weber syndrome (PWS)
  - — Sturge-Weber syndrome
  - — HHT
  - — SOLAMEN syndrome-SOLAMEN: *s*egmental *o*vergrowth, *l*ipomatosis, *a*rteriovenous malformation, *e*pidermal *n*evus.
  - — CM-AVM
- Complications
  - — Soft tissue and bony hypertrophy in patients with AVM
  - — Chronic venous hypertensive changes
  - — Cardiac function in patients with AVMs
  - — Psychological and developmental aspects
- Investigations
  - — Ultrasonic features and Doppler findings
  - — Differentiation from fast flow tumours
  - — Role of angiography
  - — Role of MRI
  - — Role of nuclear-medicine investigations to determine shunt volumes
- Management options [75]
  - — Conservative management
  - — Interventions (see Section 3 CHAPTER 4A)

5. *Complex malformations and syndromes*

- KTS
- Parks-Weber Syndrome (PWS)
- Proteus syndrome
- Maffucci's syndrome
- Phacomatosis pigmentovascularis
- Hyperkeratotic cutaneous capillary venous malformation (HCCVM)
- Macrocephaly - CM syndrome (M-CM)
- Hemi-hyperplasia - multiple lipomatosis syndrome (HHML)
- SOLAMEN syndrome
- CLAPO syndrome - CLAPO: *c*apillary malformation, *l*ymphatic malformation, *a*symmetry, partial/generalized *o*vergrowth
- CLOVE syndrome - CLOVE: *c*ongenital *l*ipomatous *o*vergrowth, *v*ascular malformations, *e*pidermal nevi

D. Venous pathology in other systems

1. *Phlebology in dermatology*

- Dermatological manifestations of CVI [27]
- Panniculitis and lipodermatosclerosis
- Pigmented purpuric dermatoses
- Acroangiodermatitis (Pseudo-Kaposi's Sarcoma)
- Purpura
- Reticulate eruptions [18]
  - — Livedo reticularis
  - — Livedo racemosa
  - — Reticulate purpura
  - — Reticulate pigmentation
- Vasculitis
- Nodular vasculitis and erythema induratum
- Livedo vasculopathy
- Vascular and thrombotic complications of pseudoxanthoma elasticum (PXE)
- Vascular complications of Ehlers-Danlos Syndrome- especially type IV
- Vascular tumours- see SECTION 4.A.11 and 4.B.4
- Warfarin necrosis and its differential diagnoses [76, 77]
- Neuro-vascular instability
  - — Raynaud's phenomenon

— Erythromelalgia
— Acrocyanosis
— Pernio
— Complex regional pain syndromes

2. Phlebology in haematology

- Hypercoagulable states
- Heritable and acquired thrombophilias
- DIC
- Microangiopathies
  — Thrombotic thrombocytopenic purpura
  — Idiopathic thrombocytopenic purpura
  — Haemolytic-uremic syndrome
- Inherited and acquired platelet disorders
- Paroxysmal nocturnal haemoglobinuria

3. Phlebology in neurology

- Chronic cerebrospinal venous insufficiency (CCSVI) and multiple sclerosis [78, 79]
- Intra-cranial venous thrombosis and in particular cavernous sinus thrombosis
- Right-to-left shunts, paradoxical embolism and stroke
- Migraines and transient neurological complications of venous interventions
- Sinus peri-cranii
- Neuropathy
- Neuro-vascular instability (see 1 above)

4. Phlebology in obstetrics and gynecology

- Vulval varices
- Vulvodynia
- Pelvic congestion syndrome
- Pregnancy and thrombophilia
- Thrombotic complications of pregnancy and post-partal period
  — Anticoagulation during pregnancy
  — Inherited thrombophilias and pregnancy
- Mondor's disease of the breast
- Thrombosis and OCP [80]
- Thrombosis and HRT [81]
- Menstrual variations in venous incompetence
- Angiogenic potential of hormonal preparations

5. Phlebology in gastroenterology

- Portal venous system
  — Normal anatomy and flow characteristics
  — Hepatic venous flow
  — Portal venous hypertension: signs and symptoms, collateral flow, imaging and sonographic diagnosis, changes in portal vein flow with cardiac failure, surgical porto-systemic shunts
- Portal vein thrombosis
- Budd Chiari syndrome [82]
- Mesenteric inflammatory veno-occlusive disease
- Oesophageal varices
- Gastric antral vascular ectasia (Watermelon stomach)
- Haemorrhoidal varices

6. Phlebology in urology

- Varicoceles
- Mondor's disease of penis

7. Psycho-social aspects

The trainee should be familiar with the psychosocial aspects of conditions covered in the Curriculum and in particular the following conditions:

- Lymphoedema
- CVI
- PTS
- Leg ulcers
- Disfiguring vascular malformations
- Vulvodynia
- Reflex sympathetic dystrophy
- Patients with recurrent VTE
- Patients diagnosed with heritable thrombophilias
- Patients with chronic pain
- Body dysmorphic syndrome

E. Lymphology

1. Lymphoedema

a) Clinical aspects

- Diagnosis and differential diagnosis
  — Phlebolymphoedema
  — Mid-line lymphoedema
  — Lipoedema
  — Other causes of oedema
- Staging of lymphoedema [83-85]
- Epidemiology and pathophysiology
- Clinical manifestations
- Complications
- Prognosis
- Elephantiasis
- Disability and quality of life issues

b) Classification

- Primary lymphoedema
  — Congenital, praecox and lymphoedema tarda
  — Milroy's disease
  — Meige's syndrome
  — Lymphoedema distichiasis syndrome
  — Yellow-nail syndrome
  — Truncular lymphatic malformations
- Secondary lymphoedema
  — Infective lymphoedema: lymphatic filariasis, lymphogranuloma inguinale, lymphangitis, perilymphadenitis, lymphangiothrombosis
  — Inflammatory lymphoedema: panniculitis and lipodermatosclerosis, rosacea and acne vulgaris, podoconiosis
  — Cellulitis
  — Pretibial myxoedema
  — Other causes: traumatic, malignancy related

c) Management

- Management options (see Section 2 CHAPTER 3E)

2. Lymphatic malformations

- See Section 1 CHAPTER 4C3

3. Lipoedema

- Diagnosis and management

4. Lymphophilic tumours

- Kaposi's sarcoma
- Malignant eccrine poroma

SECTION 2: PATIENT MANAGEMENT

CHAPTER 1: CONSULTATION

Phlebologists can only provide high quality care through the establishment of an effective relationship with their patients and those involved in the patient's care utilising effective communication skills. An accurate diagnosis and management relies on obtaining and recording a comprehensive medical history through effective communication and performing a thorough examination. The trainee must demonstrate the adoption and application of performance criteria listed below.

- Develop effective communication skills
- Obtain and record a history relevant to the presenting problem
- Develop skills in obtaining informed consent
- Develop effective clinical decision making and diagnostic skills

A. History

The trainee should obtain a detailed history in a systematic and organized fashion which may involve the use of questionnaires. The history should include the following:

1. Presenting complaint- including the patient's main concern
2. Presenting symptoms, exacerbating and relieving factors
3. Past venous, thrombotic, thrombophilic and bleeding history
4. Current medical problems and past medical and surgical history
5. Psychological history and in particular suitability for office-based procedures
6. Obstetrics and gynaecological history:
   - number of pregnancies and number of miscarriages
   - use of oral contraceptive and other hormonal supplements
7. Family history of venous, thrombotic, thrombophilic and bleeding problems and other relevant family history
8. Social history including alcohol and tobacco consumption, exercise and travel
9. Regular medications and supplements
10. Allergies

B. Examination

1. Examination for CVI
   - Examination in the standing position
   - Inspection for manifestations of CVI
   - Description of morphology
   - Interpretation and formulation of a CEAP code
   - Inspection of other regions depending on the presenting complaint
   - General medical examinations if indicated

2. Examination appropriate for other conditions described in this curriculum

C. Documentation and record keeping

1. The trainee should maintain a legible and appropriate record of consultations and procedures.
2. Photographs are to be taken with prior patient consent of the regions of interest.
3. Written communication with referring doctors following consultations and procedures.

CHAPTER 2:
DIAGNOSTIC EVALUATION

Training in the performance and interpretation of diagnostic studies as related to venous disease is a critical part of phlebology training.

1. The trainee should investigate:
   - **D**iagnosis - to make a diagnosis and exclude differential diagnosis
   - **E**xtent - to assess the extent of the presenting condition
   - **A**ssociations - to investigate the associated conditions, underlying causes and predisposing factors
   - **T**herapy - to work-up for therapeutic options
2. The trainee should consider the following when ordering investigations:
   - Indication, contra-indications and complications
   - Appropriateness for the presenting condition
   - Be able to interpret the results of investigations and seek expert advice if required
   - Have a recording system for following up and notification of patients of the test results
   - Ethical issues
     — Genetic testing
     — Radiation exposure especially in children
   - Cost to the patient

A. Basic modalities

The trainees should be competent in utilising the basic modalities used in the management of venous disease. Other modalities such as duplex ultrasound, should only be taught and used once a core understanding of the basic modalities such as continuous wave (CW)-Doppler is achieved.

1. CW-Doppler

CW-Doppler plays an important role in screening of patients with CVI[86], selecting candidates for duplex ultrasound,[87] and detection and localization of subtle reflux.[88] CW-Doppler is also essential in teaching the Doppler principles and ankle-brachial index measurements. CW-Doppler is a very sensitive, although non-specific, modality for detection of reflux.[89]

The trainee should:

- Understand the indications and applications of CW-Doppler examination.
- Be familiar with the concept of the best Doppler angle and explain the Doppler physics.
- Locate the saphenofemoral junction and distinguish between the femoral vein and the GSV.
- Interrogate the popliteal fossa for saphenopopliteal junction and be familiar with the anatomical variations in this region.
- Demonstrate reflux in reticular veins, venulectasias and perforators.
- Locate subtle reflux underlying post-sclerotherapy pigmentation and matting.
- Mark subtle reflux for duplex localization.

2. Other modalities

The trainee must be aware of the utility of the following modalities in the management of venous disease:

- Side trans-illumination (Episcopy)
- Light polarization
- Trans-cranial Doppler studies.

B. Duplex ultrasound

1. Core knowledge

Experience and training in duplex ultrasound is an essential part of general phlebology training. Detailed knowledge of ultrasound physics, applied ultrasound technology, Doppler ultrasound principles, duplex principles and colour flow imaging is required. An understanding of ergonomic and occupational health and safety issues is recommended. Training in duplex ultrasound should only be commenced when the trainee has achieved a core understanding and competency in CW-Doppler.

2. B-mode

The trainee needs to obtain a detailed knowledge of the following:

- Image optimization techniques
- Transducer types, selection and orientation
- Gain, time gain compensation, depth and frequency
- Tissue harmonics
- Compounding
- Dynamic range
- Mechanical and thermal indices
- B-mode artefacts.

3. Colour Doppler and spectral analysis

The trainee needs to understand the utility and the clinical significance of Doppler measurements and be competent in:

- Measurements: velocity ratios, acceleration rates, volume flow
- Normal arterial and venous flow
- Flow features associated with spectral display
- Effects of sample volume
- Local effects of stenosis
- Advantages and limitations of color and pulse-wave Doppler
- Optimisation of colour Doppler parameters
- Artefacts in colour Doppler imaging

4. Specific ultrasound studies

The trainee should be able to identify thrombosis and incompetence on duplex ultrasound scans. The protocols and anatomical nomenclature should conform with internationally accepted standards. The trainee should be competent in performing the following:

- Venous incompetence studies (deep and superficial) [38-40]
- Deep vein thrombosis studies
- Upper limb studies
- Neck vein studies
- Vascular anomalies (tumours and malformations)
- Pelvic and vulvar veins
- Compression syndromes
- Iliofemoral, IVC and renal veins
- Venous aneurysms
- Identification of
  - — Normal structures such as arteries, tendons, ligaments and muscles
  - — Nerves: sciatic nerve, femoral nerve, sural nerve, saphenous nerve, common peroneal nerve
  - — Lymph nodes: benign and malignant
  - — Baker's cyst and joint effusions
  - — Lipomas and other soft tissues tumours
  - — Haematomas

C. Venography

Although venography has been mostly replaced by duplex ultrasound in the diagnosis of venous thrombosis and occlusive disease, it still plays a role in the diagnosis of pelvic vein incompetence and venous malformations and hence the trainee should be able to interpret venographic films.

D. Venous function and venous physiology assessment

The trainee should be familiar with plethysmography and in particular air and photo plethysmography and techniques to measure ambulatory venous pressures and other modalities including infra-red thermography and laser Doppler.

E. Other imaging modalities

The trainee should be familiar with the role of

- Lymphoscintigraphy in the diagnosis and management of lymphoedema
- CT, MRI and both modalities in combination with angiography [90] or venography in the diagnosis and management of:
  - — Thrombosis of pelvic and abdominal veins
  - — Iliac vein compression syndrome
  - — Insertion of IVC filters
  - — Defining the extent of vascular malformations
  - — Pre-intervention road mapping

F. Laboratory investigations

The trainee should demonstrate the ability to accurately and appropriately order and interpret laboratory tests including:

1. Routine measurements

- Routine blood, urine, microbiology, imaging and other investigations
- Clotting tests, clotting factor assays and platelet function assays [91]

2. Laboratory markers

- VTE [92]
  — Assessment of coagulation and fibrinolysis in VTE patients [93]
- Thrombophilia (see 3 below)
- Monitoring of anticoagulant therapy
- Fibrinolytic abnormalities
- APS[63]
- DIC and other coagulopathies [94]
- D-dimer in monitoring of venous malformations [14]
- Vasculitis
- Connective tissue disorders
- Microangiopathies
- Malignancy

3. Thrombophilia testing

- Guidelines for testing for heritable thrombophilias [95]
- Laboratory markers of thrombophilia [96]
- Thrombophilia testing in patients with first VTE [97]
- Role of thrombophilia testing in the clinical management of patients with VTE [98]
- Thrombophilia testing in recurrent VTE [45]
- Psychological aspects of thrombophilia testing [99]

G. Histopathology

The trainee should be able to interpret and be familiar with:

- Histopathological reports as they relate to conditions covered in the Curriculum
- Common stains used in the identification of common venous conditions.
- The histopathology of the common conditions covered in the Curriculum and in particular:
  — Acute and chronic lipodermatosclerosis
  — Panniculitis
  — Venous and arterial thrombosis
  — Endo-venous sclerosis and endovascular fibrosis
  — Pigmented purpuric dermatoses ("capillaritis")
  — Acroangiodermatitis ("pseudo-Kaposi's sarcoma")
  — Vasculitis (small vessel, medium size vessel and large vessel)
  — Nodular vasculitis and erythema induatum
  — Livedo vasculopathy
  — Warfarin necrosis and calciphylaxis
  — Vascular tumours

CHAPTER 3:
MANAGEMENT

The trainee should be able to formulate a management plan in a systematic and organized fashion that would incorporate the following:

A. General measures

1. Communicate the diagnosis

- Communicate the diagnosis, in an accurate and consistent fashion, and in a language comprehensible to the lay person.

2. Patient education and counseling

- Use resources such as diagrams, pictures, video clips and other modalities to communicate in the most efficient fashion. Written information should be provided to further support and re-enforce the verbal communication.
- Recommend educational materials, websites and patient support groups.

3. Identify offending drugs and exacerbating factors

- Identify any drugs or factors that exacerbate the patient's presenting condition.

4. Identify and treat the underlying pathology

- Identify and generate a management plan for conditions with an underlying pathology.

5. Lifestyle modifications

- Identify lifestyle modifications essential in prevention and management of the presenting condition.

6. Joint management and referrals to other practitioners

The trainees should:

- know their own limitations and know when to refer a patient to other medical specialists or allied health practitioners.
- communicate and coordinate effectively any changes in the management of the patient. with the primary care physician.
- coordinate the management plan with other healthcare professionals including the primary care physician, other medical special-

ists, community nurses and physiotherapists.

7. Family member screening and genetic counseling

- Indications and limitations of genetic testing.
- Medical, medico-legal and psychosocial implications of screening of family members of patients with heritable thrombophilias and other genetic disorders.

8. Commence appropriate treatment

- Patient selection, indications, absolute and relative contra-indications.
- Develop a hierarchy of treatment options based on the presenting condition, starting with the least invasive but the most appropriate option
- Communicate the suggested treatment option and discuss alternative options.
- Understand the prevention, recognition and management of complications of treatment
- Identify at risk groups

9. Follow-up

- The trainee should understand the importance of taking full responsibility for patients under their immediate care which includes appropriate follow-up.
- The trainee should be able to formulate a sensible short term and long term patient follow-up plan.

B. Management of CVI

1. Guidelines and consensus documents

The trainee should be familiar with international and national guidelines and consensus documents [100]

2. Prevention

- Pharmacological methods- see venoactive drugs SECTION 1 CHAPTER 3.C.6
- Compression garments

3. General measures

- General measures (see A above)
- Life-style modifications and in particular the role of
  — Standing occupations and CVI obesity
  — Factors influencing the calf muscle function [101]
  — Hormonal supplementations

4. Management of associated problems and comorbidities

- Oedema
- Venous eczema
- Pigmentary changes
- Lipodermatosclerosis
- Atrophie blanche
- Leg ulcerations- see D below
- Rare manifestations including PPD and nodular vasculitis
- Joint dystrophy

5. Conservative management

- Compression therapy [102] (see Section 3 CHAPTER 1)

6. Non-surgical intervention

- See SECTION 3 CHAPTER 2

7. Surgical intervention

- See SECTION 3 CHAPTER 3

C. Management of VTE

1. Guidelines and consensus documents

The trainee should be familiar with international and national guidelines and consensus documents [103, 104]

2. Prevention and thromboprophylaxis

- Pharmacological methods [105]
- Compression garments
- Compression devices including intermittent pneumatic compression
- Strategies to improve prophylaxis delivery [106]

3. General measures

- General measures (see A above)
- Identification and exclusion of provoking factors
- Exclusion of underlying pathology and in particular malignancies
- Identification and exclusion of ongoing risk factors

4. Conservative management

- Compression therapy [102]

5. Anticoagulation for acute DVT and PE

- LMWH and UFH [107]
  — Anti Xa monitoring [108]
  — Heparin induced thrombocytopenia (HIT): diagnosis, laboratory investigations and management [109, 110]
- Anticoagulation in children [111-114]
- Anticoagulation in the elderly [115]
- Vitamin K antagonists and Warfarin
- New anticoagulants [20, 116, 117]
- Monitoring of anticoagulant therapy [111, 118, 119]
- Duration of anticoagulant therapy [120, 121]
- Ultrasound monitoring
- Management of VTE in cancer patients [49]

6. Treatment of SVT and STP

- Role of NSAIDS
- Role of LMWH
- Role of new anticoagulants [122]

7. Recurrent VTE

- Risk factors [44, 46, 123]
- Long term anticoagulation
- Role of vena caval filters
- Role of anti-platelet agents and aspirin

8. Surgical and interventional techniques

- Thrombolysis (see SECTION 3 CHAPTER 4C)
- Vena caval filters (see SECTION 3 CHAPTER 4D)
- Surgical venous thrombectomy
- Surgical procedures to treat venous outflow obstruction including
  — Autogenous or prosthetic bypass
  — Venous dilation and stenting [124-126]

D. Management of leg ulcers

1. Guidelines and consensus documents

Trainees should be familiar with international and national guidelines and consensus documents.

2. Prevention

- Management of underlying conditions such as CVI, diabetes mellitus, peripheral vascular disease and neuropathy
- Compression garments for venous ulcers
- Life-style modifications and in particular the role of weight reduction

3. General measures

- General measures (see A above)
- Adjunctive treatment such as physiotherapy for calf muscle pump function and ankle mobility.

4. Management of associated problems and co-morbidities

- Cutaneous problems
  — Venous eczema
  — Contact sensitization to topical agents and dressings and in particular sensitizing agents such as neomycin and adhesives.
  — Tissue fibrosis calcification and ossification
- Infections
  — Prevention of clinical infections
  — Prevention of antibiotic resistance
  — Differentiation between a clinical infection and growth of common pathogens in wound swabs
  — Indications for appropriate antibiotic and antifungal therapy
- Psychosocial issues

5. Wound management

- Role of biopsy in excluding malignant change and differential diagnoses.
- Treatment of wound hypergranulation.
- Indications, contraindications, and complications associated with the use of different types of dressings and topical medications.

6. Compression therapy

- The fundamental role of adequate compression therapy in treatment of venous ulcers [127-131]

7. Oral treatment

- Role of veno-active drugs [23, 24, 25, 132]

8. Interventions

- Role of non-invasive interventions such as sclerotherapy [133]
- Role of commonly used surgical interventions in the management of chronic wounds

including skin flaps, substitutes, matrix grafts, growth factors and surgical debridement

E. Management of lymphoedema

1. Guidelines and consensus documents

The trainee should be familiar with international and national guidelines and consensus documents [84]

2. Prevention

- Compression garments
- Life-style modifications and in particular the role of weight reduction

3. General measures

- General measures (see A above)
- Adjunctive treatment such as physiotherapy
- Basic skin care

4. Management of associated problems and co-morbidities

- Infections
  — Prevention of recurrent infections
  — Management of concurrent bacterial or fungal infections
- Cutaneous problems
  — Hyperkeratosis
  — Lymphostatic verrucosis
  — Role of oral retinoids
- Pain management
- Congestive heart disease
- Hypertension
- Cerebrovascular disease and in particular stroke
- Psychosocial issues

5. Conservative treatments

- Decongestive lymphatic therapy (DLT)
  — Manual lymphatic drainage (MLD)
  — Compression bandaging
  — Intermittent pneumatic compression
- Electrostimulation devices

6. Surgical/operative therapy

- Reconstructive surgery
  — Lympho-venous anastomoses
- Debulking/ablative (excisional) surgery
- Liposuction

SECTION 3: TREATMENT MODALITIES

CHAPTER 1: COMPRESSION THERAPY

The trainee should understand the role of compression therapy in the management of venous and lymphatic disorders.

A. Core knowledge

- To understand the principles of compression therapy, compression bandaging and the science of compression [102]
- Indications and contra-indications of compression therapy [102]
- Complications of compression therapy
- Classification of compression bandages [134]
- Pneumatic compression pumps
- Compression devices [135]

B. Practical knowledge

- The trainees should be competent in applying compression bandaging

CHAPTER 2: CORE PROCEDURES

The trainee is expected to be competent in performing the following Core Procedures.

A. Sclerotherapy

- The trainee should be able to competently perform the following procedures:
  — Direct vision sclerotherapy
  — Ultrasound guided sclerotherapy (UGS)
  — Catheter directed sclerotherapy (CDS) [136]
- Sclerosing agents
  — Classification
  — Mechanism of action
  — Pharmacokinetics and pharmacodynamics
  — Interaction of detergent sclerosants with the coagulation system,[137] antithrombotic mechanisms,[138] fibrinolysis [139, 140] and blood cells [141]

- Techniques of sclerotherapy
  — Indications and contraindications
  — Liquid and foam [142-147]
  — Alternative procedures
- Complications of sclerotherapy [148-150]
  — Thrombotic complications
  — Post-sclerotherapy deep vein occlusion [151]
  — Gas embolism following foam sclerotherapy [152-154]
  — Right-to-left shunts and cerebrovascular events
  — Intra-arterial injections
  — Cutaneous necrosis
  — Telangiectatic matting and pigmentation
  — Other complications
- The trainees should have a thorough understanding of:
  — Occupational health and safety (OH&S) issues and in particular the prevention and management of needle stick injury (see Section 4C).

B. Endovascular ablation

- The trainee should be able to competently perform the following procedures:
  — Endovenous laser ablation (EVLA)
  — Radiofrequency ablation (RFA)
- The trainee should have a thorough understanding of:
  — Catheters, guidewires, glidewires, sheaths, torque devices and other equipment used in endovascular procedures
  — Range of laser wavelengths and systems used for endovenous ablation
  — Indications, contraindications, and risks of endovascular techniques used to treat varicose veins
  — Complications of endovenous ablative procedures
  — Alternative procedures
  — New methods of endovascular ablation (steam, cryotherapy, etc.)
  — Laser safety guidelines (see Section 4A)

C. Ambulatory phlebectomy (AP)

- The trainee should be competent in performing this procedure.
- The trainee should have a thorough understanding of:
  — Patient selection
  — Indications, contraindications and complications of AP
  — Selection of appropriate veins
  — Techniques of AP
  — Types of hooks
  — Incisions
  — Alternative procedures

D. Vascular laser and light therapy

- The trainee should be competent in performing these procedures in the treatment of telangiectasias and capillary malformations:
  — Vascular laser therapy
  — Intense pulse light (IPL)
- The trainee should have a thorough understanding of:
  — Range of laser wavelengths and systems used for vascular laser therapy.
  — Indications, contraindications and complications of vascular laser therapy and IPL
  — Alternative procedures
  — Laser safety guidelines (see Section 4A)

CHAPTER 3:
SURGICAL PROCEDURES

The trainee should have a broad knowledge and understanding of the indications, contraindications, and complications associated with surgical procedures listed below. The trainee is NOT expected to perform these procedures unless the trainee has completed an appropriate post-graduate surgical training program.

A. Varicose vein surgery

- Saphenofemoral and sapheno-popliteal ligation or crossectomy
- Stripping and other methods to remove the saphenous trunk, partial or complete
- Surgical methods to remove saphenous tributaries and clusters of varicose veins
- Surgical techniques to ligate or disconnect incompetent varicose veins
- Removal of non-saphenous varicosities elsewhere on the leg
- Role of external stenting of the saphenofemoral junction
- Alternative procedures
- Recurrent varices after surgery (REVAS) [155-157]

— Causes, investigation and management
— The trainee should be aware that there are non-surgical techniques to treat patients presenting with REVAS
— The trainee should be able to evaluate and determine a unique management plan for individual patients based on clinical and duplex findings
- A basic understanding of CHIVA and other restorative surgical procedures
- Complications including but not limited to pain, phlebitis, haematoma, infection, allergic reactions and VTE [158]

B. Surgery for other venous conditions

- Surgery for deep venous reflux
  — Reconstructive surgery including valvuloplasty, vein and valve transplantation and vein segment transposition [159-161]
  — Role of external stenting
- Surgical treatments for pelvic venous insufficiency
- Surgical venous thrombectomy
- Knowledge of procedures designed to treat venous outflow obstruction including autogenous or prosthetic bypass and venous dilation and stenting [124-126]
- Thoracic outlet decompression for Paget-Schroetter Syndrome
- Repair of popliteal vein aneurysm

CHAPTER 4:
INTERVENTIONAL PROCEDURES

The trainee should have a broad knowledge of patient selection, indications, contraindications, and complications associated with procedures listed below. The trainee is NOT expected to perform these procedures unless the trainee has completed an appropriate post-graduate interventional training program or fellowship.

A. Vascular malformations

- Capillary malformations (see Section 3 CHAPTER 2D)
- Venous malformations
  — Sclerotherapy with detergent sclerosants or ethanol
  — Role of endovascular ablative techniques such as EVLA and RFA
  — Image guidance with ultrasound and/or fluoroscopy
  — Compression therapy
  — Management of associated bony and soft tissue abnormalities.
- Lymphatic malformations
  — Sclerotherapy with detergent sclerosants, doxycycline, OK-432 and other agents.
  — Management of lymphoedema (see Section 2 CHAPTER 3E)
- AVMs
  — Embolisation with ethanol, Onyx, particles or coils.
  — Image guidance and catheterisation
  — Antegrade vs. retrograde approach
  — Management of associated bony and soft tissue abnormalities.

B. Pelvic congestion syndrome

- Conservative therapy
- Coil embolisation of ovarian veins
- Sclerotherapy for ovarian and pelvic veins
- Surgical treatments for ovarian veins

C. Thrombolysis and thrombectomy

- Mechanical vs. chemical
- Device types
- Catheter directed thrombolysis (CDT) [162, 163]
- Surgical and endovenous thrombectomy [164]

D. Vena caval filters

- Permanent *vs*. retrievable filters
- Filter types

E. Endovenous catheter dilatation and stenting

- Applications in the management of CCSVI

SECTION 4:
ADJUNCTIVE EDUCATION

A. Laser safety and regulations

Local laser safety regulations and education should be completed by all trainees. A refresher

course may be required on a regular basis depending on the local regulations.

B. Basic and advanced cardiac life support and emergency medicine

Knowledge of causes and management of vasovagal reactions, cardio-respiratory collapse, anaphylaxis, anaphylactoid reactions, scotomas, and hemiparalysis as it relates to sclerotherapy and other venous procedures.

C. Occupational health and safety (OH&S)

The trainee should be familiar with:
- OH&S related protocols at their working institution
- Safe practices to minimize the risk of needle stick injuries and safe management of sharps
- Institutional guidelines for exposure to blood or body fluids and post-exposure prophylaxis measures
- Ergonomic problems of sonography
- Laser safety regulations (see A above)

D. Research design and analysis

The trainee should be familiar with scientific method of research and the classification of clinical trials. The trainee should have a basic knowledge of medical statistics and should be able to critically analyze scientific publications. The trainee should understand the principles of scientific writing and what the editors and reviewers look for in publications.

E. Venous outcomes assessment

The trainee should be familiar with the Venous Clinical Severity Score [37, 165-167] and other scaling systems such as the Venous Disability Score, Venous Segmental Disease Score, as well as general and venous-specific quality of life scales.

F. Infection control

The trainees should be familiar with the universal precautions, aseptic and sterile techniques, sterlilisation methods especially as it applies to the use of multi-use endovenous laser fibers.

G. Medico-legal issues, registration, certification and medical ethics

The trainees should be familiar with their local law as it applies to the practice of Medicine, registration and certification requirements, and medical ethics. Individual member countries are encouraged to develop a Code of Conduct as it applies to the trainees. The trainee should be able to:
- Obtain an informed consent
- Develop strategies to deal with unforeseen complications and unfulfilled expectations
- Develop strategies to deal with litigious or psychologically disturbed patients

SECTION 5: READING LIST

A. Textbooks

The following list is limited to English language publications.

1. General phlebology

The Fundamentals of Phlebology: Venous Disease for Clinicians
Fronek, H
American College of Phlebology
ISBN-13: 978-1-85315-774-5

The Vein Book
Bergan, J.
Academic Press.
ISBN-13: 978-0-12-369515-4
ISBN-10: 0-12369515-5

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Relevant vascular chapters

B. Journals

The following Journals should supplement the trainee's local phlebology journal.

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Journal of Vascular Surgery
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ISSN: 0301-1526 (Print)
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