MINIMUM TRAINING REQUIREMENTS FOR THE PRACTICE OF MEDICAL ULTRASOUND IN EUROPE

Appendix 8: Vascular Ultrasound

Level 1 Training and Practice

- Practical training should involve at least two half day ultrasound clinics per week over a period of 6 months, with approximately four to six examinations performed daily by the trainee under supervision.
- A minimum of 250 imaging examinations of different types, equally distributed (eg carotid, lower limb venous, peripheral arteries etc) should be undertaken if this is the first practical training module undertaken.
- Examinations should encompass the full range of pathological conditions listed below.
- A log book listing the types of examinations undertaken should be kept.
- Training should usually be supervised by a Level 2 practitioner in vascular ultrasound. In certain circumstances it may be appropriate to delegate some of this supervision to an experienced level 1 practitioner with at least two years of regular practical experience. This will usually mean that training is carried out in dedicated vascular duplex sessions supervised by an accredited vascular physician/radiologist/technologist/scientist.
- Trainees should attend an appropriate theoretical course which fully covers all areas of the required knowledge base and should read appropriate textbooks and literature.
- During the course of training the competency assessment sheet should be completed as this will determine in which area or areas the trainee can practise independently.

Level 1 Knowledge Base

- Physics and technology, ultrasound techniques and administration (see Appendix 2).
- To have full working knowledge of the principles, techniques, instrumentation and practical working knowledge of real-time and Doppler ultrasound, and equipment controls. This includes colour flow and power Doppler, colour and pulsed wave, scale, gain, filter, priority, angle correction, electronic steering, invert, sample gating, power output, colour amplitude, velocity measurement, spectral changes and all other parameters required to perform a complete diagnostic vascular duplex study.
- Sectional and ultrasonic anatomy including common normal variants
  - peripheral extremity and pelvic arteries
  - peripheral extremity and pelvic veins
  - abdominal aorta visceral arteries
  - extracranial vessels
- Pathology and results of treatment in relation to ultrasound
EFSUMB
EUROPEAN FEDERATION OF SOCIETIES FOR ULTRASOUND IN MEDICINE AND BIOLOGY
'Building a European Ultrasound Community'

Appendix 8: Vascular Ultrasound

– peripheral extremity arteries: patency, stenosis, occlusion, aneurismal dilatation
– peripheral extremity veins: patency, occlusion, deep venous thrombosis, reflux and incompetence
– abdominal vessels: patency, occlusion, aneurysmal dilatation of aorta
– extracranial vessels: patency, occlusion, stenosis
– appearances and sequelae of common surgical or endovascular interventions including angioplasty, stenting, grafts, Miller vein cuffs, dissections, and neointimal hyperplasia

Level 1 Competencies to be Acquired

To be able to:
– perform continuous wave hand-held Doppler and segmental pressures (ABPI)
– Lower extremity peripheral arteries and grafts

To be able to:
– perform a complete imaging ultrasound examination of the common iliac to popliteal and calf arteries
– recognise and assess patency, occlusion, stenosis and aneurysmal dilatation, and measure approximate extent of abnormality
– diagnose > 50% stenosis and assess the length of stenosis
– follow-up patients after surgical and endovascular procedures, recognise common complications like arterio-venous (AV) fistulas and pseudoaneurysm formation

• Peripheral veins
  Lower extremity deep veins

To be able to:
– perform a complete imaging ultrasound examination of inferior vena cava, common iliac
– external iliac to popliteal and calf deep veins
– perform compression and augmentation
– recognise acute femoro-popliteal venous thrombosis
– recognise, diagnose and locate reflux

• Lower extremity superficial veins
  To be able to:
  – identify the saphenofemoral and saphenopopliteal junctions
  – recognise and locate clinically relevant venous reflux, incompetence and perforators
  – perform vein mapping and marking

• Abdominal vessels
  To be able to:
  – recognise and locate patency and occlusion of the abdominal aorta and large visceral arteries, (including renal arteries, superior mesenteric artery and celiac trunk)
- recognise and size aneurysmal dilatation of the abdominal aorta large visceral arteries

**Extracranial vessels**

To be able to:
- recognise and locate patency, occlusion, plaque and stenoses in the carotid vessels and vertebral arteries

**Level 2 Training and Practice**
- Practical training should include at least one year of experience at Level 1 with continuous ongoing weekly ultrasound clinics.
- A log book of all examinations undertaken should be kept.
- Supervision of training should be undertaken by someone who has achieved at least Level 2 competence in vascular ultrasound and has had at least 2 years’ experience at that level.

**Level 2 Knowledge Base**
- Peripheral arteries and grafts
- Peripheral deep and superficial veins
- Abdominal Aorta branches
- Transcranial Doppler ultrasound:
  - ultrasonic anatomy, common normal variants and principles and practice of the technique
  - clinical indications and ultrasonic findings in common clinically relevant Abnormalities

**Level 2 Competencies to be acquired**
- Competencies will have been gained during training for Level 1 practice and then refined during a period of practice

To be able to:
- perform a complete imaging ultrasound scan and identify all abnormalities detailed in Level 1 in the upper and lower extremities, from common iliac to pedal vessels and subclavian to radial and ulnar arteries and veins and to identify all kinds of non-atherosclerotic diseases (vasculitides, compression syndromes, etc), as well as all kinds of vascular malformation

**Extracranial vessels**

To be able to:
- recognise and diagnose patency, occlusion, stenosis, reverse flow and steal in the carotid and vertebral vessels
- grade degrees of carotid stenosis and plaque type in accordance with local criteria and standards, and to follow-up patients after endarterectomy, carotid artery stenting, and angioplasty

**Abdominal vessels**
To be able to:
- recognise common normal variants, aneurysmal dilatation, patency, stenosis and occlusion of the major abdominal and iliac vessels, including the mesenteric and renal vessels

Level 3 Training and Practice
- A Level 3 practitioner is likely to spend the majority of their time undertaking vascular ultrasound.
- He/she will accept tertiary referrals from Level 1 and 2 practitioners.
- He/she should have the capability to utilise developing technologies and ultrasound techniques,
- develop research and teaching skills and the performance of specialised examinations including the use of non-invasive physiological studies, contrast agents, intravascular or intra-operative ultrasound and ultrasound guided interventional procedures (like US guide treatment of pseudoneurysms, US guided RFA of varicose veins, etc).

Maintenance of skills: All Levels
- Having been assessed as competent to practise there will be a need for continued medical education and maintenance of practical skills.
- A trainee should continue to perform ultrasound scans during the remainder of his/her training programme, ideally one session weekly and at least 300 examinations per year.
- A similar minimum ongoing commitment should be required from a trained practitioner. It is recognised that due to training or clinical circumstances such further ultrasound practice may be intermittent. If a significant period has elapsed after the use of such skills, a period of re-training is required which should be agreed and documented with the practitioner, local trainers and assessors.
- Practitioners should:
  - include ultrasound in their ongoing continued medical education (CME) and continued professional development (CPD)
  - audit their practice
  - participate in multidisciplinary meetings
  - keep up to date with relevant literature

'EFSUMB is grateful to the Royal College of Radiologists, London, for their permission to adapt their 'Ultrasound Training Recommendations for Medical and Surgical Specialties' document published in 2005. Adaptations of these have been undertaken by members of the EFSUMB Education and Professional Standards committee for use elsewhere in Europe.

Whilst every attempt has been made to provide accurate and useful information, neither EFSUMB nor members of EFSUMB nor other persons or institutions contributing to the formation of these guidelines make any warranty, express or implied, with regard to accuracy, omissions and usefulness of the information herein. Furthermore, the same parties do not assume liability with respect to the use, or subsequent damages resulting from the use of the information contained in these guidelines'.

The Minimum Training Recommendations for the Practice of Medical Ultrasound were published under the EFSUMB Newsletter section in the Ultraschall in der Medizin/European Journal of Ultrasound, Volume 27, issue 1 February 2006 page 79-105.

This document has been revised in July 2008 and has been published on the EFSUMB website.
### Core Knowledge Base Level 1

**Trainee**  
**Trainer**

<table>
<thead>
<tr>
<th>Trainer Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Essential Principles
- Physics and technology
- Practical instrumentation/use of ultrasound controls
- Ultrasound techniques
- Administration
- Sectional and ultrasonic anatomy
- Pathology in relation to ultrasound

#### Competencies/skills to be acquired - Level 1

<table>
<thead>
<tr>
<th>To be competent to perform/diagnose the following:</th>
<th>To be competent to perform/diagnose the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Essential Principles</strong></td>
<td><strong>Peripheral superficial veins</strong></td>
</tr>
<tr>
<td>• CW hand-held Doppler and segmental pressures</td>
<td>• recognise normal anatomy and common variants</td>
</tr>
<tr>
<td>• caliper measurements of distance and size</td>
<td>• identify sapheno-femoral and sapheno-popliteal junctions</td>
</tr>
<tr>
<td>• colour flow and spectral analysis</td>
<td>• diagnose reflux, incompetence, perforators</td>
</tr>
<tr>
<td>• velocity measurement and Doppler angle</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Peripheral arteries and grafts</strong></td>
<td><strong>Abdominal ultrasound</strong></td>
</tr>
<tr>
<td>• recognise normal anatomy and common variants</td>
<td>• recognise patency and occlusion of aorta</td>
</tr>
<tr>
<td>• scan common iliac to calf arteries</td>
<td>• recognise and size aortic aneurysm</td>
</tr>
<tr>
<td>• recognise patency, occlusion and aneurysm</td>
<td></td>
</tr>
<tr>
<td>• recognise and differentiate 50% stenosis and measure the length of occlusion</td>
<td></td>
</tr>
<tr>
<td>• follow-up patients after surgical/endovascular treatment and recognise common complications</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Peripheral deep veins</strong></td>
<td><strong>Extracranial vessels</strong></td>
</tr>
<tr>
<td>• recognise normal anatomy and common variants</td>
<td>• recognise normal anatomy and common variants</td>
</tr>
<tr>
<td>• Scan external iliac to popliteal veins</td>
<td>• recognise patency, occlusion, plaque and stenosis</td>
</tr>
<tr>
<td>• perform compression and augmentation</td>
<td>• other competencies acquired</td>
</tr>
<tr>
<td>• recognise acute femoro-popliteal DVT, iliac, femoro-popliteal and LE DVT</td>
<td></td>
</tr>
<tr>
<td>• diagnose and locate reflux</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General</strong></td>
<td><strong>Other competencies acquired</strong></td>
</tr>
<tr>
<td>• know when to refer to a more expert ultrasonologist</td>
<td></td>
</tr>
</tbody>
</table>
### Competencies/skills to be acquired - Level 2

<table>
<thead>
<tr>
<th>Trainee Signature</th>
<th>Date</th>
<th>Trainer Signature</th>
<th>Date</th>
</tr>
</thead>
</table>

To be competent to perform/diagnose the following:

- Assessment from iliac to pedal arteries and veins
- Assessment from subclavian to radial and ulnar arteries and veins
- Patency, occlusion, stenosis, reverse flow, and steal in the carotid and vertebral vessels
- Grade degrees of carotid stenosis and plaque type
- Normal variants, aneurysmal dilatation, patency, stenosis, and occlusion of major abdominal and iliac vessels
- All kinds of non-atherosclerotic disease (vasculitis, compression syndromes)