Development of a Comprehensive MRI Training Programme: European Medical Imaging Technology Training (EMIT)

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Synopsis:
The present project aims to produce a comprehensive MRI training programme for medical physicists, to be introduced in hospitals as work-linked training. The programme, of approximately 80 days duration, includes curricula, timetables, training tasks, training materials (electronic and Internet-based) and a large image database. The training consists of approximately 50 tasks with emphasis on practical and experimental MRI physics activities, but also with the opportunity to learn from simulation tools, realistic image sets and documents. The programme is also expected to be relevant to other disciplines.

Introduction:
Professional training in medical physics and engineering is becoming increasingly important. Currently, schemes for trainees in MRI are sparse, although the application of these imaging modalities increases every year. Within the Leonardo Da Vinci EU project European Medical Radiation Learning Development (EMERALD), a consortium of universities and hospitals in Europe has previously developed three training modules in medical radiation physics (diagnostic radiology, nuclear medicine and radiotherapy). The objective of the present Leonardo project European Medical Imaging Technology Training (EMIT) is to extend this work to ultrasound and magnetic resonance imaging (MRI).

General project description:
The aim of this project is to produce a comprehensive MRI training programme primarily for medical physicists, but also of relevance to other disciplines, to be introduced in hospitals as work-linked training. The project includes the development of curricula, timetables, training tasks and training materials (electronic and Internet-based) for an MRI training module of 80 days duration. The module encompasses the physics and engineering of MR imaging and spectroscopy together with clinical application, and consists of a workbook with tasks, leading to the attainment of specified competencies, and a large image database (IDB) including a PC type image browser (ThumbsPlus). The multimedia training material (including course guide, e-workbook and image database) will be published on CD-ROMs and on an Internet website. This structured training programme will be disseminated via the Internet and through a special dissemination conference. In order to achieve wide usability, the project will also develop a digital dictionary of terms covering the whole field of medical imaging technology (both ionising and non-ionising radiation) in five languages (English, French, German, Italian, Swedish).

Training topics:
The MRI training module is divided into 20 submodules including, for example, the MRI unit and its environment, properties of basic and advanced pulse sequences, gel phantom design and manufacturing, MRI signal and contrast, k-space properties, image artifacts, MR angiography and flow quantification, MR spectroscopy (MRS), comprehensive MRI/MRS quality control/quality assurance (QC/QA) routines, image file transport protocols and MR image formats, post-processing (image realignment and fusion, fMRI, perfusion, diffusion, etc.), patient and staff safety, MR compatibility tests, commissioning, siteplanning and installation procedures. The submodules are divided into approximately 50 tasks. The trainee is guided towards an understanding of practical MRI physics, and the training process is based on the opportunity to use various types of equipment, to apply existing imaging protocols and software, to perform measurements, collect results, calculate parameters and to draw conclusions from the observations. Practical tasks are supplemented by simulation and post-processing software, and by the IDB with images illustrating MRI and MRS equipment, surrounding equipment, phantoms and test objects, basic clinical examples, artifacts, QA equipment and procedures.

Discussion:
Being very expensive, contemporary medical imaging equipment can not be purchased solely for training purposes, and such equipment is also intensively used in routine clinical work. As a result, young medical physicists often have limited time for hands-on training in hospitals. One solution is to employ modern educational technology as a complement to practical exercises. By providing off-site familiarisation with advanced MRI equipment, for example, by use of the IDB and simulation software, optimal use of actual scanner time is facilitated by the present training material. Finally, although the training modules are primarily intended for the initial training of young medical physics graduates, they might also be useful to established physicists, for continuous professional development or life-long training, and to other hospital professionals, for example, technologists/radiographers or radiologists. For further information see 

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