paediatric DRLs, mostly for a limited set of examinations. The existing paediatric DRLs are often adopted from old European Commission recommendations or from rarely updated surveys performed by other countries. Furthermore, the lack of a standardized methodology for establishing DRLs in children prevents the comparison among those already available.

Recently, an EC project on new European Guidelines for DRLs in Paediatric Imaging (PiDRL) was awarded to a consortium lead by ESR with the involvement of ESPR, EFRS, EFOMP, and STUK. This project resulted in a series of recommendations concerning the methods to establish new DRLs in children. These recommendations include the definition of local, national, and European DRLs, the set of examinations for which DRLs should be established, grouping of children, dosimetric parameters, and instructions on how to make good use of DRLs. The PiDRL guidelines also provide a set of European DRLs (EDRLs), based on the median value of the distribution of national DRLs for a defined clinical imaging task surveyed for standardised patient groupings. These EDRLs provide an interim solution for countries without national DRLs (NDRLs), until such NDRLs become available.

Future steps to be taken are the establishment and use of new EDRLs according to the PiDRL recommendations. The involvement and joint efforts of authoritative bodies, scientific societies, and stakeholders are pivotal to this aim.

http://www.eurosafeimaging.org/wp/wp-content/uploads/2014/02/European-Guidelines-on-DRLs-for-Paediatric-Imaging_Revised_18-July-2016_clean.pdf.

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[I253] Basics of deep learning

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Deep learning has attracted much interest from the medical community due to its successful application to medical imaging problems which were thought to be purely within the human realm. The growing amount of well-curated medical image data and the increasing availability of affordable resources has allowed to apply deep learning to many different imaging modalities.

In this talk, we will cover what deep learning is, its different flavors and some recent state-of-the-art applications to medical imaging.

We will first look at Convolutional Neural Networks, the main workhorse in medical imaging and look at relevant applications in mammography, chest CT and digital pathology. Finally we will show some applications of deep generative models to the reconstruction of images.

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[I254] From image quality to care outcome

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Medical physicists have a long tradition of measuring image quality with objective metrics including contrast, noise and resolution, and their frequency-based derivatives. These methods have supported our main tasks related to quality assurance and optimisation.

Along with the technical imaging modality development, the optimisation process has transformed into more demanding and multi-professional challenge where the image quality metrics should evolve accordingly from technical towards clinical presentation. In the parameter level, this development may include clinical task function and observer related parameters supplementing the traditional MTF and NPS parameters. New methods enable model observer based detectability and diagnostic accuracy estimates. Ultimately, we should aim beyond the concept of technical quality, to extend our methods and knowledge towards measuring and optimising the diagnostic value in terms of care outcome.

Modern radiological imaging technology, reconstruction and post-processing techniques provide new and mostly non-linear image output. In part, this explains the need for more complicated analysis of image quality compared to the traditional and more linear image output. Improvement in radiological optimisation requires also patient-specific and indication-specific adjustment of imaging parameters and analysis methods. One size and purpose simply does not fit all patients and applications. Both of these aspects – nonlinearity and patient/indication specificity – aim to improve diagnostic information content and representation of indication-specific image features in radiology.

Improved optimisation process and more consistent imaging quality (evaluated by target value, its uncertainty and precision) require objective and quantitative connections from diagnostic and technical parameters to clinical outcome parameters. Comprehensive methodology to enable this approach involves combining several types of data together, as described in a recent publication from an international summit [1]. Artificial intelligence (AI) based deep learning methods – including data quality control and validation – are prerequisites for this kind of data analysis, due to inherent non-linearity of the problem and large amount of heterogeneous data which is not equitable by traditional methods. Our medical physicist professional role should follow this development and incorporate AI & deep learning topics accordingly into our educational programs.

Reference

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[I255]

Abstract not available.

[I256] A review of medical laser accidents: A simple burn to death by laser

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After the invention of the laser by Maiman in 1960, Ophthalmology took advantage of the laser immediately and reported the first