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The new capabilities for ensuring radiation protection of individuals undergoing medical exposure

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The work is dedicated to the development of the new capabilities for ensuring radiation protection of individuals undergoing medical exposure in radiation oncology and diagnostic radiology: a) special 3D printer for effective production of anthropomorphic human phantoms; b) the free Radiation Therapy Planning System (RTPS) for dose calculations in radiation therapy; c) special open source software tools for computer aided education (to teach himself and in dedicated groups) in radiation protection fields.
The work is being performed according to the main directions of IAEA project RER9147 (Ukrainian part) and partly supported by grant 9903 of STCU.
Presently the firms which produce anthropomorphic phantoms, use a standard complex technology with limited assortment. Therefore, phantoms are very expensive, that doesn't allow developing extensive network of phantoms for professional training of medical personnel and control of treatment quality. We have proposed to develop an approach based on a 3D printing tool (with tissue-equivalent "inks" of various types, large speed and precision) that can provide validation tests for the whole chain for ionizing radiation in medicine. This technique will be applicable for radiotherapy and X-ray diagnostics sites and can provide a new level of professional training for the clinical staff and students.
We study the possibility to build in Ukraine the pilot project of systems for education in cancer hospital and audits in hospitals of therapeutic dose (check of all chain: methods-equipment-personal) by regulatory officers and inspectors using detectorized anthropomorphic phantoms, produced by 3D printer. Such approaches are possible and for diagnostic radiology.
Purpose of new free RTPS: a) independent check of dose calculation by main RTPS for treatment of cancer patients; b) safe for patients (because main RTPS does not used) education of students (in medical physics) and personal of hospitals for obtaining of skills and experience of work with RTPS.
Special open source software tools for computer aided education of medical physicists and radiation protection specialists are based on the MOODLE platform.

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