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CALL FOR PROPOSALS

Coordinated Research Project (CRP) on "**Evaluation and Optimization of Paediatric Imaging**" (E2.40.20)

Background information

Optimized **paediatric imaging applying ionizing radiation** depends not only on the application of established protocols, but also on the experience of the personnel and the suitability of the equipment. This leads to wide variations on image and dose characteristics between departments, which have to be investigated and optimized. This requires extensive dose audits that may lead to the modification of examination procedures and, in some cases, of equipment, to allow dose reduction. However dose audits might be complicated, as the dosimetry for paediatric patients undergoing either diagnostic radiology or nuclear medicine requires special consideration, in addition to the general dosimetric methodologies used for adult patients.

A major activity of a previous coordinated research project was associated with the dosimetry of paediatric patients, which consists a critical group of patients for Diagnostic Radiology, due to dose (due to their increased radiosensitivity) and imaging (lack of standardized protocol due to the range of body sizes) requirements. This activity has led to the publication of IAEA HHS-24 related to the dosimetry of paediatric patients.

Nuclear medicine is a unique and valuable method that contributes to the diagnosis and assessment of many diseases in children. Although in the past there has been a rather large variation of paediatric radiopharmaceutical administered activities, adhering to recent standards for paediatric radiopharmaceutical administered activities can help assure that the lowest administered activity are employed and that the diagnostic value of the studies is preserved. Radiation exposures in children can be reduced further by optimizing routine protocols, application of advanced image processing and potentially with the use of advanced imaging systems.

This new CRP, that will cover **medical physics aspects of paediatric imaging in both Diagnostic Radiology and Nuclear Medicine**, partially builds on the results of the aforementioned activities and publications. It would tentatively cover comparison of clinical performance, dosimetry, image quality evaluation, optimization, etc. fields where the support and role of the clinical qualified medical physicist is considered crucial.

Through this CRP, the potential of the Member States to develop and implement state of the art research in paediatric imaging, will be enhanced through the training of specialized medical physicists. This will have a direct impact to both the clinical services and the research potential of the Member States.

Overall Objective

The overall objective of this project is to enhance the capabilities of Member States to improve the **efficiency of existing modalities** for paediatric medical imaging, as well as to **implement and enhance optimization techniques and methodologies** for advanced paediatric medical imaging. The ultimate benefit of this CRP is to the large number of paediatric patients undergoing diagnostic procedures with ionizing radiation.

Specific Project Objectives

- To quantify, in terms of dose and image quality, the practices involving paediatric patients in Diagnostic Radiology and Nuclear Medicine.
- To assess the impact of training on optimization, with particular emphasis on typical delivered doses and administered activities, with respect to Diagnostic Reference Levels (DRL)
- To provide guidelines and assist Member States on the evaluation of paediatric imaging practices and optimization methodologies.
- To develop tools suitable for training or information for paediatric clinical practice.

Project Activities

Under the framework of the **CRP participants are expected to contribute to the coordinated research activities**, designed to evaluate current practice and facilitate the development of optimization strategies for paediatric imaging.

The CRP participants are also expected to propose **individual research activities on optimization** of local interest in the field of paediatric imaging applying ionizing radiation and benefit from the support of experienced researchers.

Common activity

The common activity will comprise the following

- Preliminary collection of data on paediatric imaging practice and related equipment in participants' institutions.
- Introductory teaching on paediatric dosimetry and image quality evaluation.
- Collection of paediatric dose data in accordance with techniques of HHS 24 in Diagnostic Radiology and administered activities in Nuclear Medicine.
- Review of collected data, image quality and associated protocols with identification of appropriate optimisation techniques.
- Implementation of identified optimisation techniques.
- Repeat of data collection exercise.
- Review of impact of both training & optimisation strategies.
- Progression of DRL or reference administered activities at participant's institution.

Participants' research activities

Examples of possible areas of research include, but are not limited to:

- Organ specific risk based dosimetry models.
- Comparison of different risk evaluation models, across paediatric patient size, sex and age, with particular emphasis across modalities.
- Biokinetic data collection.
- Collection and analysis of biokinetic data in selected nuclear medicine procedures commonly used for paediatric patients, across weight, size, sex and age.
- Phantom based optimization studies.

- Use of physical or mathematical phantoms for optimization of paediatric imaging across weight, size, sex and age.
- Image quality tools.
- Development of image quality software tools that could potentially simulate images acquired with different settings or processed differently.
- Training/clinical practice tools.
- Development and/or evaluation of tools suitable for training or information for paediatric clinical practice such as web based modules, phone apps, pamphlets and posters.
- Use of CT in PET/CT.
- Development of standardized protocols for the use of the CT component in PET/CT for paediatric patients.

During the 1st RCM individual research activities will be reviewed and possible collaborations among different research teams will be explored.

Requirements for the applicants

- **Regular paediatric workload** (number for DR and NM should be specified in the proposal). A reasonable minimum number could be 150 paediatric patients per year for DR and 50 paediatric patients per year for NM.
- Applicants must have **access to quality control and calibrated dosimetry equipment**.
- Participating institutions must have **established QC procedures in place**, and provide corresponding description.
- Applicants must **submit a list of available equipment** used for paediatric imaging in the institution, specifying vendor, model and age (e.g. for NM: dose calibrators, gamma cameras, PET, QC phantoms; for DR: imaging equipment including whether dedicated to paediatric, dosimetry and QC equipment)
- Due to the nature of the CRP, the proposed **CSI should be a medical physicist** experienced in diagnostic radiology and/or nuclear medicine working in a clinical environment.
- At least one **radiologist or nuclear medicine physician** is expected to be part of the main research team of the proposal.
- Applicants must submit a proposal for an **individual paediatric imaging optimization project**.
- Applicants must comply with their **institutional legal and ethical requirements**.
- As the **basic language of the CRP will be English**, participants must have sufficient proficiency to deliver and follow presentations and express themselves in this language without difficulty.

Evaluation criteria for the submitted proposals

The submitted proposals should include all the necessary information related to the available infrastructures and human resources of the institution, as well as the details of the proposed research, as described in the requirements for applicants, in order to allow proper evaluation of the proposal.
The main criteria for the evaluation of the proposals are:

- **Originality** of the individual research proposal (15%).
- **Significance** and **impact** of the individual research proposal (15%).
- **Appropriateness** of the facility (20%).
- **Scientific and clinical background** of the applicant (15%) and the research team (15%). Priority will be given to participants covering both DR and NM and to teams including not only an imaging medical physicist, but also radiologists or NM physicians.

- **Potential for success** within the time limit of the CRP (20%).

Linkage of the proposal to relevant national TC projects, indicating that this topic is considered a national priority, would be considered advantageous.

Input

A maximum number of six Research Contracts and six Research Agreements are expected to be awarded under this CRP.

Research Contracts are generally awarded to institutions in developing countries or countries in transition insofar as they can effectively carry out the research. Research Contracts are awarded for an initial duration of one year with the possibility of renewal. Each Research Contract awarded in the framework of this CRP is associated with an annual financial support of 4,000 euros per year for a period of 3 years (subject to annual review).

Research Agreements, which are not associated with any financial support, are generally awarded to institutions in developed countries. Agreements within a CRP are awarded for the entire duration of the CRP.

All participants of the CRP are eligible to attend the Research Coordination Meetings at the Agency's expense.

Applications –Duration

Information on the IAEA Coordinated Research Programme and how to apply for Research Contracts and Research Agreements can be found at http://www-crp.iaea.org/.

Proposals should be officially submitted by May 31, 2015.

The expected duration of the CRP is 3 years (2015-2018) and the first Research Coordination Meeting is initially planned for **November 16-20, 2015** in Vienna, Austria.

For further information related to this CRP, potential applicants could contact Mr Harry Delis (H.Delis@iaea.org) and Mr Gian Luca Poli (G.L.Poli@iaea.org), Project Officers, Dosimetry and Medical Radiation Physics Section, Division of Human Health, Department of Nuclear Science and Applications, IAEA.