

Topics for PIANOFORTE Call 1 – final text

A2

Developing a knowledge base for a better understanding of the disease pathogenesis of ionising radiation-induced cancer to improve human health risk assessment.

While the role of DNA damage in the carcinogenic process following ionising radiation exposure has been extensively studied, it is clear that other factors modulate cancer development, such as the cellular and tissue microenvironment, immune status, metabolic processes and epigenetic factors.

The proposals should focus on the investigation of the role of epigenetics, metabolic status, immune status, cellular interactions and microenvironmental effects using biologically relevant experimental *in vivo* or *in vitro* models and/or biologically based models for risk.

Since our current understanding of radiation carcinogenesis is almost exclusively based on high dose ionising radiation, while at low doses other mechanisms may prevail priority should be given to low dose studies.

Proposals may address one or several research areas of the topic.

D1

Individualised diagnostic and therapeutic procedures for optimisation of benefit/risk ratios.

Individualization and optimization of diagnostic and therapeutic procedures with a focus on optimal efficacy in combination with high safety for patients are of high priority. While progress has been made, there is a need for additional research to complement and build upon the work carried out in recent projects.

Imaging of anatomical structures is a major task in clinical practice, therefore improved optimisation is needed in terms of increasing diagnostic efficacy and reducing radiation-induced side effects. In radiotherapy, the aim is also to increase treatment efficacy with reduced toxicity and secondary radiation-induced side effects on health.

The proposal should focus on the development of evidence-based procedures encompassing one or more of the following applications:

- in the diagnostic and imaging field applications such as molecular imaging, interventional procedures or theranostic applications
- in radiation therapy applications such as various external beam radiotherapy protocols or radiopharmaceutical therapies.

The proposed evidence-based procedures should rely on the assessment of benefits and risks based on patient data.

G2

Development of risk assessment and risk management approaches and technological capabilities to cope with scenarios arising from threats due to war or armed conflict situations or natural disasters taking into consideration social, ethical and legal issues.

This call topic aims to develop risk assessment and risk management approaches and technological capabilities to cope with threats due to war or armed conflict situations or natural disasters, that have not been previously studied, taking into consideration social, ethical and legal issues.

Proposals should focus on identifying and addressing gaps related to one or more of the following objectives within a war, armed conflict or significant natural disaster situation:

- Review of whether the current assumptions made in the existing systems for radiation emergency preparedness and response are resilient in armed conflict, war or natural disaster situations
- Development of event scenarios relevant to the above situations, including assessment of potential source terms for both attacks on nuclear facilities but also in relation to nuclear detonation scenarios;
- Further improvement, evaluation and operationalization of inverse modelling for localisation and quantification of unknown emission sources of radioactive material, including exploitation of different types of monitoring data, capabilities to handle multiple-source scenarios and potential employment of novel approaches such as artificial intelligence and big-data technologies;
- Uncertainty quantification in the abovementioned scenarios, development of advanced methods to improve calculation efficiency of uncertainties, such as artificial intelligence or machine learning methods, efficient computational and/or statistical methods and the integration of latest developments in risk science;
- Monitoring strategies with mobile and advanced monitors in such armed conflict situations or natural disasters, relying also on a citizen science approach and providing early detection of threats;
- Development of indicators for protective action strategies that can be applied even with little information on the affected area, with consideration of technical and non-technical aspects;
- Development of communication strategies including methods and materials appropriate for use in such situations;
- Social and psychological challenges for emergency responders and citizens and their impacts on the effectiveness of protective actions, the legal foundations and practical arrangements for emergency response and recovery;
- Societal resilience, stakeholder involvement and ethical considerations.