Think tank meeting: challenging questions for medical physicists in radiation oncology

24 October 2019, Budapest, Hungary

The think-tank to discuss questions that challenge medical physicists in radiation oncology, organised by the European SocieTy for Radiotherapy and Oncology (ESTRO) physics future group and the ESTRO physics committee, took place in Budapest just before the ESTRO physics workshop (October 24, 2019). The major aim of this initiative was to gather several experts, including radiation oncologists, therapists and non-radiotherapy scientists, to debate the major challenges in radiation oncology that medical physicists could help solve in the next ten years. The idea was to summarise the challenges in four provocative questions.

The preparation phase for this event started 18 months before it was held: the future core group first selected the "in-field" experts and concomitantly launched a call to the whole ESTRO medical physics community to provide provocative questions to them. More than 100 questions/statements were collected, including many highly provocative and scientifically challenging proposals. The core group analysed these contributions and categorised them into four major areas. Finally, four provocative statements, one from each area, were formulated following the criteria shown in Figure 1.

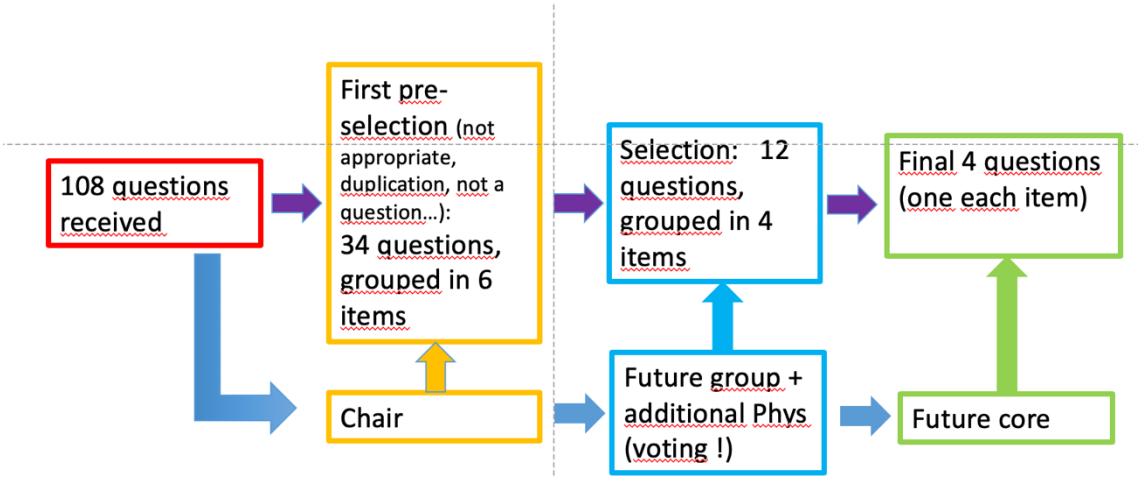

Figure 1. Schema of the question selection process

At the end of the process, four provocative statements with extended aims/questions were defined as follows:

Aim: Medical physicists will transform tumour target definition from an art to a science

Questions: Clinical target volume (CTV) is by definition invisible: can it be modelled (radiomics, artificial intelligence (AI), deep learning...) rather than guessed by clinicians? If so, how can physicists contribute? How can medical physics help with image-based characterisation of tumour-cell infiltration? What is the target in the era of immunotherapy?

Aim: Medical physicists will be leaders in the changing world of radiation oncology

Questions: Radiotherapy (focusing too much on technology) is in danger of being reduced (returning) to a service of "interventional radiology" that is provided for medical oncologists. Will medical physics need to take over tasks of the radiation oncologist? Should medical physics provide the service, while radiation oncologists return to the core, i.e. the patient?

Aim: Medical physicists will drive development and implementation of AI in radiation oncology

Question: How can medical physicists contribute to the maximal exploitation of automation, AI and big data to enhance effectivity, efficiency and safety in radiotherapy?
Aim: Medical physicists will substantially contribute to modelling biological effects in the era of personalised radiation oncology

Questions: Aren't even simple models that are validated on small but high-quality datasets at least as interesting as the results obtained with the "new toys"? How can medical physicists contribute to model effects of concurrent treatment? Can they contribute to the understanding of the migration mechanisms of tumour cells?

After the selection of the questions, eight out-of-field experts whose work was related to the debated topics were selected and invited, including physicists not working in medical physics, engineers, industry representatives and non-radiation oncology physicians. Each statement was debated by four invited key-note speakers who comprised a mixture of in-field and out-of-field experts. The largest amount of time was given to the out-of-field experts. The talks were followed by a debate among 35 attendees, of whom 21 were medical physicists. The debaters were given ample time to share their views.

If we evaluate the meeting in terms of the level of discussions, we can confidently state that it was a success. Lively, in-depth discussions were provoked by high-level, inspiring talks that offered visions of the future for the rapidly evolving medical-physics domain. The discussion showed that medical physics was alive in radiation oncology and that much would be requested of this specialism to contribute substantially in these rapidly changing times, with plenty of challenges and changing roles and responsibilities that would require adaptation of the profile of medical physicists in the near future.

The outcome of the meeting will be summarised in a vision paper expected to be published in 2020. We hope that this paper will highlight what the future may bring to medical physicists in radiation oncology and what actions are required from the ESTRO physics community to facilitate a bright future for our youngest colleagues.

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