# 2021 ESTRO Physics Workshop: Science in Development
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Mining the radiotherapy dose: exploring dose-response patterns in radiation therapy

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The aim of our two-day workshop on mining the radiotherapy dose was to discuss the key aspects of voxel-based analysis (VBA) for the exploration of dose-response patterns in radiation therapy. This emerging methodology promises to identify new paths towards optimum treatment strategies for each patient.

Besides the instructive contributions from the invited speakers, who addressed the key aspects of VBA – spatial normalisation (Professor O. Acosta, France) and statistical analysis (Dr M. Witte, The Netherlands Cancer Institute, The Netherlands) – we were happy to have participants involved in the discussions from across Europe, including Sweden, Germany, UK and Italy, and some from Australia. Based on participant feedback and discussion (see figure), we were able to define four potential outputs that would form the follow-on work after this workshop.
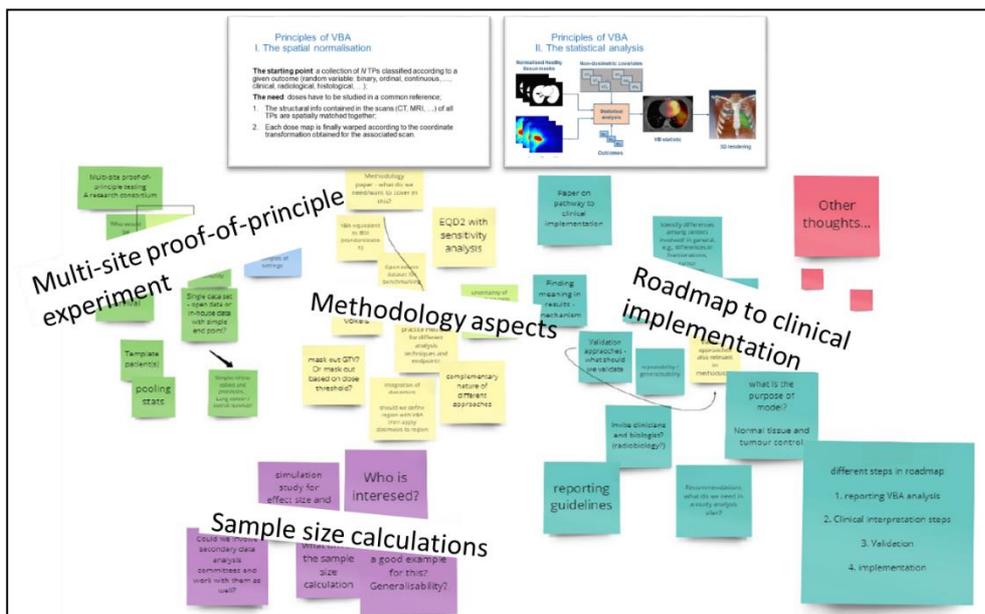
These main outputs can be summarised as follows:

1) the creation of a research consortium that will perform the first multi-site VBA experiment. We defined the first– but not all – characteristics for this proof-of-principle experiment, which should be simple for inclusion and should define the pathway to larger studies and research questions, such as registration template choice and evaluation of spatial normalisation;
2) production of a paper on possible ways to implement VBA in clinics, taking into account the emerging exemplars on which some groups are currently working;
3) performance of a simulation study for sample size calculations. One of the possible effects that could be deepened is the variability in the size of significant substructure identified by a VBA experiment as a function of the sample size;
4) a methodology paper, which has been proposed as an updated version of the VBA cookbook published in 2020 (Palma et al., 2020), in which were defined unified recommendations and the best practice methods for different analysis techniques and endpoints.

Summing up, we believe that by holding this workshop on mining the radiotherapy dose, we fulfilled our initial purpose; that is to say, we laid the foundation of a VBA community within the European SocieTy for Radiotherapy and Oncology (ESTRO) in order to build new pathways to a common and standardised VBA methodology, thus ensuring its future clinical validation and adoption.

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