AbstractID: 7796 Title: USING CONFORMAL RADIOBIOLOGY TO FIND THE BEST TREATMENT PLAN

How can we use TCP and NTCP models in optimising radiotherapy outcome? The most basic or *Level-I optimisation* is to take an existing 'standard' treatment plan with its standard total dose and fraction size, compute the NTCP and then adjust the total dose until an acceptable NTCP value is obtained: *isotoxic customised dose prescription.* This will yield immediate benefits in, for example, lung-tumour radiotherapy. *Level-II optimisation* uses the TCP and NTCP functions 'upfront' in the optimisation process to determine the beam weights and even angles, or, in the case of IMRT, to perform 'inverse planning'. A typical criteria might be 'Maximise the TCP for NTCP = 2.5%' or 'Minimise the NTCP for TCP = 90%'. In this *Level-II* mode no constraints need be set regarding uniform dose in the target volume – the TCP model will take of this. However, maximum doses may well need to be set outside the target volume.

Another exciting area is the connection between fractionation sensitivity and dose distributions in normal tissues. The 'classical' LQ-based Withers isoeffect formula can be easily modified to reflect increasingly conformal dose distributions in organs at risk. The validity of this modification has been effectively demonstrated by the safe use of very large fractions in treating lung tumours with (highly conformal) body stereotaxy; the oversimplified BED concept would have forbidden such effective regimens.

We need to start using radiobiologically based optimisation, without waiting until the TCP and NTCP models are 'perfect'. The clinician may still use conventional tools such as single-CT slice isodoses and DVHs to approve a radiobiologically optimised plan but she/he is going to find a marked improvement in the *quality* of such a plan.

Educational Objectives:
1. Appreciate the potential of using TCP and NTCP models in treatment plan optimisation
2. Understand what is meant by 'isotoxic' dose prescription
3. Understand the limitations of the Withers' isoeffect formula and how it can be modified to approximately account for dose distributions in organs at risk