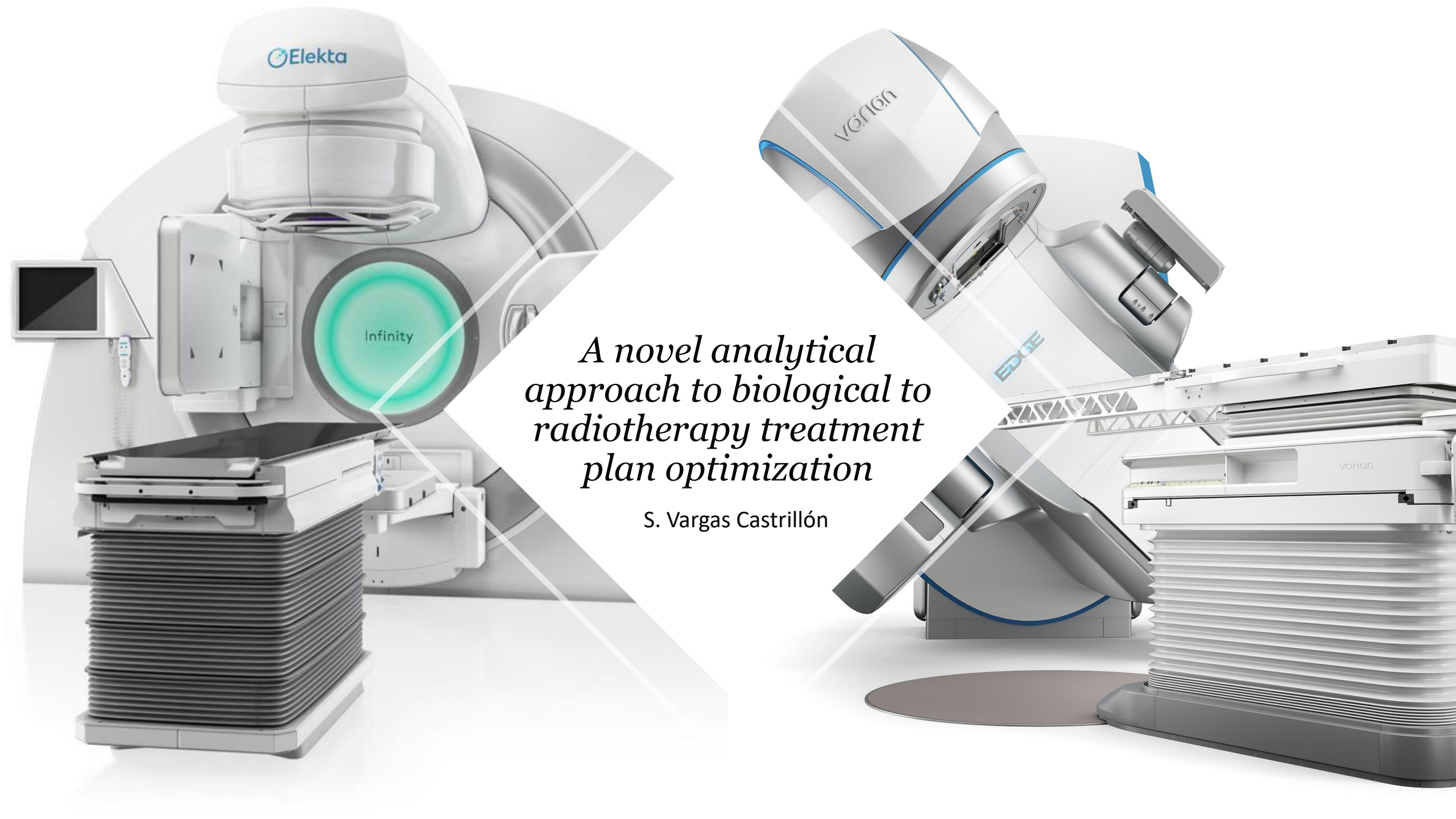

A novel analytical approach to biological to radiotherapy treatment plan optimization

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Introduction

- Modern radiation therapy techniques (e.g. VMAT) allow the treatment planning and delivery of complex treatments.
- Figures of merit for the quality of a plan have evolved during the past years.
- Radiobiological indices, relating plans to specific clinical goals, have been proven useful tools for this kind of assessment.
- The process of optimization of a treatment plan is greatly facilitated when plans can be characterized according to the degree of closeness to their radiobiological indices target values. This characterization requires the availability of a measure of closeness to the objective dose distribution that can be related to the values of the index.
- One such measure of closeness is presented in this study.

Methods

- For a particular DVH curve, the function F(z)=1-DVH is a distribution function for some random variable (absorbed dose for random points inside the tumour, in this case).
- Between distribution functions, such as F and G, the Lévy distance dL(F,G) is available, and therefore, it can be defined as a measure of closeness between absorbed dose distributions.
- TCP is represented as an operator on the set of probability distributions T. Its continuity ensures that upper and lower bounds for its values can be found for all distribution functions within distance R_0 from F_0. Hence, given a tolerance on TCP, tolerances on dose distributions can be designed.

Conclusions

- TCP is just one of the functionals on DVHs that can be treated within this framework, as long as their properties of continuity and differentiability can be assessed.
- Other radiobiological indices could be treated using this same approach.
- These other indices can also be used to assess treatments plans.
- This novel approach leads to a simple method which can help facilitate the choice of a treatment plan.

Thanks for your attention!