Propositions accompanying the thesis

Optimizing Planning and Delivery of High-Precision Robotic Radiotherapy and Intensity-Modulated Proton Therapy

1. The treatment time of high-precision robotic radiotherapy using the CyberKnife and IMPT can be reduced substantially without compromising the (robust) quality of a treatment plan. (Chapters 3 and 6)

2. One should not image and correct for a moving tumor too often during a treatment, when this results in an elongation of the treatment time and residual tracking errors remain. (Chapter 4)

3. An iterative treatment planning approach allows for many degrees-of-freedom to be dealt with in an efficient way. (Chapter 5)

4. Even when a moving tumor can be perfectly followed with a proton beam, tumor tracking will result in dose degradation in the presence of tissue density variations. (Chapter 8)

5. The price of robustness is much lower for range errors than for setup errors in IMPT for head-and-neck cancer patients. Online position verification should therefore be given a higher priority than in-vivo range verification, for this patient group. (Chapter 9)

6. Large amounts of valuable patient and treatment data are lost or remain unused in current radiotherapy practice. Radiotherapy treatments could greatly benefit from a proper collection, storage and analysis of this data, preferably in an international multi-center fashion. It is time for a widespread introduction of 'Big Data' in the field of radiotherapy.

7. Since it is obviously inconceivable that all religions can be right, the most reasonable conclusion is that they are all wrong. (Christopher Hitchens)

8. Dutch health care spending has doubled in the years 1999-2011 from 44 billion to 90 billion euro. I wonder whether the well-being of the Dutch population would have improved more if this money was spent on education.

9. Switching from a PTV-concept to robust treatment planning will require physicians and physicists to think differently about what constitutes a good radiotherapy treatment.

10. There should be standard patient-sets and comparison metrics to benchmark new optimization and image-registration methods in radiotherapy. This would differentiate the true advances from pseudo advances in this field.

11. Science is the poetry of reality. (Richard Dawkins)