The Great Debate: The Future of IGRT Is...
…Megavolt CT - J. Pouliot
…Kilovoltage CT – J. Sonke
…Ultrasound-Based Hybrids – W. Tome
…MRI Guidance – J. Lagendijk
…3D Deformable Image Registration – K. Brock

Introduction: Image-guided radiation therapy (IGRT) promises to reduce or eliminate conventional limitations posed by geometric uncertainty, opening the way for dose escalation, margin reduction, innovative treatment techniques, hypofractionation, patient-specific protocols, reduced normal tissue toxicity, and increased tumor control. This symposium presents a debate regarding the numerous technologies brought to bear in IGRT, including image- and information-based technologies for therapy guidance. **Topics and Speakers:** The symposium features five distinguished speakers. **Dr. J. Pouliot** will present on the topic of megavoltage (MV) CT and cone-beam CT (CBCT), reviewing the advances and advantages associated with imaging the patient in the treatment position with the therapy beam itself. **Dr. J.-J. Sonke** will present the case for kilovoltage (kV) CBCT, discussing the latest advances in CBCT technology, image quality and accuracy, and protocols for offline, adaptive, and online 3D and 4D guidance. In light of the radiation risk posed by such modalities, **Dr. W. Tome** will present a strategy that hybridizes MV or kV CBCT (obtained at weekly intervals) with 3D ultrasound (obtained for daily guidance), wherein a (weekly) gold-standard 3D ultrasound image provides close correspondence to CBCT. In this way, conventional uncertainties in ultrasound-based alignment are minimized, and accurate daily ultrasound guidance is achieved with a ~80% reduction in cumulative dose to the patient. **Dr. J. Lagendijk** will offer an innovative approach in which the treatment machine is fully integrated with magnetic resonance imaging (MRI), allowing precise soft-tissue visualization for online guidance, verification, monitoring, and biological optimization. The technological challenges and advances in such development are described, including potential applications in treatment of the prostate, cervix, liver, and lung. Finally, **Dr. K. Brock** will argue that the future of IGRT lies not within a given imaging modality, but in the use of multiple structural and functional modalities geometrically resolved by means of deformable modeling. By combining diagnostic quality images with daily IGRT, accurate tumor targeting can be achieved in a manner that accounts not only for daily setup error but also morphological deformation and physiological change over the course of treatment. **Format:** The debate will consist of three rounds: 1.) a summary / overview of each IGRT approach; 2.) presentation, debate, and rebuttal regarding the role of each approach in the future of IGRT; and 3.) open format question and answer from the panel and audience. Time and technology permitting, a winner will be informally determined by feedback from the audience.