

SBRT is a novel cancer treatment strategy where ultra-high doses per fraction are used, generally in the range of 6 to 20 Gy per fraction, in a hypofractionated regimen of 5 or fewer fractions. Such high doses per treatment were inconceivable in the past because of concerns about radiation-induced injury to normal tissue if large volumes of OARs were irradiated to high doses. However, with recent technical advancements in highly-conformal treatment planning, image-guided radiotherapy, and delivery technologies, it has become possible to deliver safely very large fractional doses of radiation to lesions in the lung, liver, spine, and prostate. Since SBRT involves technically sophisticated patient repositioning and treatment delivery procedure, it is not uncommon for a treatment to last 40 minutes. Clinicians are usually concerned of a possible compromise in treatment efficacy for individual fractions that require long treatment time because of tumor intra-fraction motion and patient involuntary movement during radiation delivery, as well as a theoretical risk of intra-fractional radiation damage repair within tumor cells in the context of prolonged fractional delivery time. In this session, methods for effective, optimal and accurate planning, and efficiency and robustness in the delivery of SBRT, including QA, will be presented so that these concerns are minimized. Furthermore, the technical challenges associated with the clinical implementation of SBRT will be discussed, thereby allowing the wide application of SBRT using current treatment planning and delivery technologies (fixed-field 3DCRT/IMRT, dynamic arcs, rotational IMRT).

The specific objectives of the session are to:

1. Describe secure and comfortable immobilization techniques to minimize patient movement, techniques accounting for internal organ motion, and accurate patient repositioning methods using online imaging
2. Discuss treatment planning methods to ensure coverage of tumor volume within high dose regions with very rapid fall-off to surrounding OARs, including the use of Monte Carlo algorithms
3. Describe quality assurance and verification techniques for fixed-field (3DCRT, IMRT) and rotational (static/dynamic arcs, VMAT/Rapid Arc/Tomo) delivery, usually characterized by many small beam segments, and the assessment of target conformity coverage, and high dose “spillage” region