AbstractID: 9016 Title: Analysis of inter- and intra-fraction breathing patterns using the Varian Real time Position Management system

Purpose: To analyse respiratory waveforms for key parameters that may be used to characterise patients' breathing patterns for the purpose of distinguishing between patients, tailoring gated treatment for individuals and determining the suitability of patients for gated radiotherapy. **Method and Materials:** The Varian Real time Position Management (RPM) system was used to record the breathing waveforms of three volunteers. The RPM marker was placed on the volunteers': chest, sternum and abdomen. Waveforms were captured for 1min on several days in each position, and a 5min waveform captured in the sternum position. From the resulting waveforms, four key parameters were determined using customised software, and compared between inter- and intra-fraction measurements. Also, the breathing waveforms of three patients were captured for 1min over several days and analysed similarly. **Results:** The key parameters investigated were: frequency of breathing, maximum amplitude of inhale and exhale, asymmetry of the breathing pattern and the maximum potential duty cycle of both inhale and exhale. The intra-fractional differences were smaller than the inter-fraction differences for the volunteers, although this was not the case for the patients. The frequency of breathing ranged from 8 to 16, and 4 to 12 for the patients and volunteers respectively. The maximum amplitudes were noticeably different between the volunteers for both inhale and exhale, although the patient group showed marked differences only on the maximum exhale amplitude. The volunteers' and patients' waveforms were reasonably symmetric and the longest duty cycles were observed on the inhale for both patients and volunteers. **Conclusion:** The breathing patterns of the volunteers and patients indicate that the differences within a subject are smaller than the differences between subjects. We conclude that the RPM can be used to reproducibly record the waveforms from which these four key parameters may be derived to tailor gated radiotherapy for an individual.