The development of image guided and adaptive radiotherapy (IGRT/IGART) has brought new challenges to the work of radiotherapy departments worldwide. Challenges include changes in workflow, handling of new tasks, movement of staff between different roles at accelerators and resource management - all requiring optimisation while maintaining treatment quality of the individual patient. The recent introduction of IGRT, from 2D/2D IGRT to 3D volumetric IGRT based on cone-beam CT (CBCT), has revealed the need for adaptation. In the pelvic region inter-fractional changes are predominantly random, making plan selection strategies - from a library of pre-planned treatment plans - the most obvious type of IGRT. For other treatment sites such as head and neck and lung, where gradual changes such as weight loss and tumour shrinkage are dominating, adaptive re-planning during the course of RT seems to be more appropriate. In this presentation we will share our experience in implementation of IGRT using 2D/2D images and later CBCT for nearly all treatments with curative intent, as well as our more recent experience with implementation of IGART for bladder cancer.

IGRT was implemented in our whole department for most tumour sites treated with curative intent. During this process, all RTTs were educated in a Virtual training centre with 3D accelerator and an IT-lab. Our first step was introduction of IGRT using orthogonal x-ray images, which was implemented in 2008. The next step was taken in 2009, where IGRT using daily cone-beam CT (CBCT) was implemented, again department-wide and for all pelvic, head and neck, and thoracic treatment sites. IGRT implementation was done without extended time slots for each treatment, only a general daily IGRT ‘buffer’ was scheduled in the implementation period at each accelerator. The time used for image registration evaluation and how it changed with increasing experience was analysed. Off-line check of the match was performed by either an oncologist or physicist.

Online plan selection for bladder cancer has been implemented with a three-step training program. Step 1 was a four-session e-learning module including ‘ART in general’, ‘Image quality’, ‘Bladder cancer and anatomy’ and ‘Plan selection process’. Step 2 was a full day training seminar with presentations, 3D visualisation of patient anatomy and hands-on training in selection of the most appropriate treatment plan. Step 3 was half a day seminar including presentations, wrap-up, short hands-on and a test. The test was performed using retrospective data for eight bladder cancer patients with in total 196 CBCT’s. RTTs were working in teams of two, as they do in their daily routine. For each team 16 treatment fractions were randomly chosen. The concordance of the plan selections relative to expert selections was evaluated and the consequences of a wrong choice were assessed. Maximum deviations (i.e. bladder outside the selected plan) in the 6 directions was 6 mm Superior, 2 mm inferior, 1 mm anterior, 5 mm posterior, 3 mm left and 3 mm right. The corresponding frequencies of treatment fractions with deviations were 7%, 4%, 1%, 4%, 2% and 1%, respectively. Time used for the selection of treatment plan was mean 2 min: 10 sec (range 0.20; 5:31); this increased did not result in the need for increasing the time-slot for the plan selection treatment. Preliminary clinical plan selections as well as the resulting dose delivered will be presented.

We have developed a concept for ‘Department wide’ implementation processes in IGRT and IGART, with successful image registration strategies and treatment times. In this presentation we will share our experience in the MedAustron building was constructed within 18 months with the sandwich method that uses concrete panels between which the excavated soil is loosely placed and subsequently compacted to the density of concrete. The used technology allowed saving 25000 cubic-meters of the concrete, 7500 tons of steel and shortening construction time by 6 months.

The development of the equipment that will be installed and used at the MedAustron is performed within cooperation with several industrial and scientific partners. The MedAustron centre comprises an