Purpose/Objective: The mean transition has same dimension, according to the space covered by the objects during phases bin. The motion direction is obtained by reverse mode, otherwise uncorrected track is provided by the DVF module. Graph (Figure 1b) shows the displacement of 2 ROIs in S-I directions per phases. A strong correlation ($R^2$=0.95) with position, time and direction of the inserts (cube and sphere) is obtained (Figure 1c).

Conclusions: DIR algorithms and DVF can be used to calculate motion object. A strong correlation with ROI mapping and spatial-time variable can obtained by 4DCT and hybrid deformable grid. Using DVF we can evaluate, adequately, the motion direction and distance between points. ROI Center of Mass is not reliable with motion. An anthropomorphic phantom, with 8 ribs, 2 tumors (Figure 1d) is under developing, using LEGO® Mindstorms, to evaluate accuracy and criticalities in lung district of DIR, DVF and to understanding uncertainties on dose mapping during radiation, using TLD.

Electronic Poster: Physics track: Implementation of technology, techniques, clinical protocols or trials (including QA and audit)

EP-1548
A comparative audit of IMRT and VMAT for prostate cancer
J. Dewhurst1, J. Lucas1, M.J. Hardy1
1The Christie NHS Foundation Trust, Christie Medical Physics & Engineering, Manchester, United Kingdom

Purpose/Objective: IMRT is an established treatment option for patients with prostate cancer, as it allows the delivery of highly conformal doses to the target whilst lowering doses to OARs. In many centres, including ours, the provision of static field IMRT has been supplanted by VMAT which offers faster treatment times and greater monitor unit efficiency. The results of published dosimetric comparisons between IMRT and VMAT for prostate cancer have varied, typically with small sample sizes. Here we present a retrospective dosimetric audit of clinical IMRT and VMAT treatment plans for prostate cancer with a large sample size (N = 1344).

Materials and Methods: Our standard prostate treatment is a three dose level integrated simultaneous-boost technique based on the CHHiP trial, with a prescription dose of 60Gy in 20 fractions, delivery of which has moved from five-field step-and-shoot IMRT to predominantly single arc VMAT using Elekta linear accelerators. Planning is performed using the Philips Pinnacle TPS. Automatically populated dosimetric summary forms (AutoForms) are routinely generated at our centre for the purposes of optimisation and reporting. Prostate AutoForms were collected and cross-referenced with treatment planning system PDF reports to determine which patients were treated with IMRT or VMAT. Patients with artificial hip replacements were excluded as we do not treat these patients with VMAT.

All data collection was fully automated. Target, rectum and bladder dosimetric statistics were compared using histograms and Mann-Whitney U tests, with a significance level of 0.01. It should be noted that our standard VMAT inverse optimisation class solution is slightly different to the IMRT version. However, all plans have been individually optimised by suitably trained individuals.

Results: The volume of rectum receiving 41% of the prescription dose or greater, V41%, and V88% were significantly lower for VMAT than IMRT. However, V68% and V95% were significantly higher. Bladder dose statistics (V68%, V81% and V100%) were lower for VMAT but the differences were not significant.

The percentage of the prescription dose covering 99% of each target volume, D99%, was significantly higher for VMAT than for IMRT. Sharp cut-offs at tolerance values were much more pronounced in the histograms for IMRT than for VMAT, supporting anecdotal evidence that coverage tolerances are more easily achieved using VMAT. Heterogeneity, defined as the difference between the maximum and minimum percentage dose to 1cc of the target volume, was significantly lower for VMAT than IMRT.

Conclusions: We have performed a large dosimetric audit, comparing IMRT and VMAT for prostate cancer. Bladder dose statistics are not significantly different. Some rectum dose statistics are significantly greater for VMAT and others for IMRT. However, VMAT shows a clear advantage over IMRT in coverage statistics. Most strikingly of all, the dose to the target volume was much more homogeneous for VMAT than for IMRT.
Purpose/Objective: Beam Output variations have been associated with suboptimal patient’s outcome. As such, Beam Output Auditing (BOA) is an important aspect of the quality assurance (RTQA) program for all members of the Global Harmonisation Group (GHG). This study details the BOA results stemming from one of the GHG members participating actively in clinical trials and assesses factors that could be associated with suboptimal beam outputs within its network.

Materials and Methods: A retrospective review of all BOA reports from 2005 onwards, available in the RTQA database, was conducted, based on the following parameters: center, country, date of audit, beam energies and treatment machines audited, auditing organisation, percentage of agreement between dose stated by the center and measured dose in reference conditions and ratio of measured dose over stated dose.

Results: Four-hundred and sixty-one BOA-reports, stemming from February 2005 until December 2013, were assessed. In total, the results of 1790 photon beams and 1366 electron beams, delivered by 755 different treatment machines, were analyzed. On average 4 beams (range: 1-65) and 2 treatment units (range: 1-17) were audited during a BOA process. The majority of beams (91.1%) were within the optimal limit of ≤3%. Only 13 beams (0.4%; n=9 electrons; n=4 photons), were out of the range of acceptance of ≤5% and 8.5% were within the non-optimal range (3-5%) of acceptance. No association was observed between the size of the center and the compliance of the BOA cutoff tolerance limit.

Conclusions: Our analysis shows that the majority (66.9%) of centers present beam output variations within the 3% tolerance cutoff and only 0.4% of all beam results were found discrepant in respect to a ± 5% level. Although these results are promising, a further gradually amelioration should be pursued together with the global harmonizing of the guidelines for beam output audits as the optimal number of beams to be audited and the optimal BOA acceptance criteria are not agreed upon yet among clinical trial organizing groups.

EP-1550
Visualisation of data in radiotherapyUsing web services for optimisation of workflow
F. Heinemann1, S. Kirrmann1, M. Gainey1, F. Röhner1, M. Hall1, G. Bruggmoser1, M. Schmucker1
1Universitätsklinik Freiburg, Clinic for Radiotherapy and Radiation Oncology, Freiburg, Germany

Purpose/Objective: Every day a large amount of data is produced within a radiotherapy department, although this data is available in one form or other within the centralised systems, it is often not in the form which is of interest to the user. Additionally the appropriate programs (clients) must be installed and maintained on all workstations. Moreover, few employees record or alter data, but merely want to retrieve data. Thus the idea was conceived, to present the user with all relevant information in a simple and effective manner. Ultimately the aim is to optimize clinical procedures, enhance transparency and improve revenue.

Materials and Methods: In our working group many internal procedures were examined, to find out whether relevant information suitable for our purposes lay therein. After the results were collated it was necessary to select an effective software platform. After a more detailed analysis of all data it became clear that the implementation of Web services was appropriate. It was fortunate that in our institute several such web-based information services had already been developed over the last few years with which we gained experienced. Only for a few applications did we have to use MS-Windows conform software tools in order to have direct access to data and programs of the operating system; by and large this consisted of communication processes, which were not directly accessed by the user, rather than background applications that run on servers.

Results: By employing web services we reached high effectiveness, transparency and efficient information processing for the user. Furthermore, we achieved an almost maintenance-free and low support system. In addition due to wide spread use of web-based technology the training effort was effectively nil since practically every user can master the use of a web-browser. Moreover, we strived for high acceptance amongst staff members. The aim of the project presenting the user with web-based information from the departmental system MOSAIQ TM, physician letter system MEDATEC and the central finding server MiraPlus (laboratory, pathology and radiology) could be implemented without restrictions.

Conclusions: Due to wide spread use of web-based technology the training effort was effectively nil since practically every user can master the use of a web-browser. Moreover, we strived for high acceptance amongst staff members and have improved our effectiveness a considerable time saving.

The many MOSAIQ-specific parts of the system can be readily used by departments which use MOSAIQ as the departmental system.