Only few structures for some specific metrics, such as Dmean rectum and D98% parotid glands exhibited deviations larger than 3%. g-analysis (2%) on the three planes at isocenter showed a pass-rate higher than 98% for all cases. Clinical evaluation in ten patients showed very good agreement with the dose calculation on the CT as expressed by the D2%, D98% and Dmean of the delineated structures. Several drawbacks were also found: the limited FOV of the kV-CBCT, which impairs the dose evaluation of those structures in its vicinity and the difference in beam profile of the kV-CBCT with respect to the CT, reducing the accuracy of the dose estimation at nearby the surface of the patient.

**Conclusions:** The generation of three kV-CBCT specific HU-RED curves for the pelvis, thorax and H&N cases resulted in accurate dose calculation on kV-CBCT images. Very good agreement was found with the CT-based dose calculated plans according to DVH dose parameters and g-evaluation. Limitations of the kV-CBCT warrant some caution when evaluating dose differences for adaptive radiotherapy.

**OC-0165**

FSD measurements are obsolete when treating prostate IMRT and VMAT

E. Forde1, J. Booth2, T. Eade2, A. Kneebone2, M. LeMotte2, M. Leech1

1Trinity College Dublin, Discipline of Radiation Therapy, Dublin, Ireland Republic of
2Royal North Shore Hospital, Northern Sydney Cancer Centre, Sydney, Australia

**Purpose/Objective:** Given the complexity of modulated fields, the validity of the traditional central axis FSD measurement is now being questioned. This study aims to quantify the impact a change in patient body contour, away from the central axis, has on target dose when treating prostate IMRT and VMAT for definitive and post prostatectomy prostate cancer.

**Materials and Methods:** A total of 39 patients, 22 definitive and 17 post prostatectomy, were included in this retrospective dosimetric study. Both IMRT and VMAT plans were calculated with a prescription dose of 80Gy and 64Gy for definitive and post surgical cases respectively. The treatment plan was applied to each of the patients’ weekly cone beam scans and all plans were recalculated with the homogeneity correction inactivated allowing for direct dosimetric comparison. FSDs were recorded for each IMRT field on each scan. The CTV D100, PTV D98, PTV D95, PTV D2, PTV mean and PTV median doses along with the 98% and 95% conformity indices and homogeneity index were recorded for all 712 plans analyzed. Statistical analysis included repeated measures ANOVA and Friedman’s tests for the whole treatment course. Individual CBCT dependant variables were further analysed using paired samples T tests and Wilcoxon Signed Rank tests.

**Results:** A total of 712 plans were created, 6408 dependant variables analysed and 2502 FSD measurements recorded. Of the FSD measurements taken from CBCTs for the IMRT plans, 96.3% and 100% were within 1cm from the planned value for definitive and post prostatectomy patients respectively. For the definitive cohort, an increase in dose was observed across each metric measured (p<0.05). Subsequent analysis revealed 83.3% of individual measurements from CBCTs were significantly different (p<0.05) from the original planned value. For the post prostatectomy cohort only the IMRT homogeneity index (p=0.000) and the VMAT PTV D98 (p=0.009), 98% (p=0.006) and 95% (p=0.002) conformity indices and homogeneity index (p=0.022) were significantly different from the planned value based on measures of variance. Analysis of the individual CBCTs for this group revealed 88% and 71.4% of endpoints measured were statistically similar to the original plan for IMRT and VMAT respectively.

**Conclusions:** IMRT and VMAT beams are complex in nature. The endpoints analysed in this research indicate statistical differences to target doses despite the FSD measurements being within the nominal tolerance. The traditional central axis measurement is an insufficient indicator for dosimetric variation with modulated beams. As such a volumetric approach to contour variation, through the use of CBCT, is essential when treating with IMRT or VMAT.

**OC-0166**

The importance of creating an ITV with variable bladder filling status when using IMRT to treat cervical cancer

N. Bhuva1, A. Patel1, L. Roden1, A. Taylor1

1Royal Marsden Hospital, Radiotherapy, London, United Kingdom

**Purpose/Objective:** The use of IMRT for cervical cancer can significantly reduce dose to normal tissue. However, there is substantial uterine motion during treatment resulting from variation in bladder and rectal filling and this risk of a geographical miss has limited the implementation of IMRT. A population based CTV-PTV margin requires 15-30mm to ensure coverage throughout treatment but this encompasses large volumes of normal tissue. Daily online imaging with an adaptive approach may reduce margins but is very resource intensive. IMRT can still be safely introduced if internal motion throughout treatment can be accurately predicted to individualise volumes.

Our aim was to assess whether variable bladder filling scans can be used to predict uterine position during treatment and compare methods for generating the final PTV.

**Materials and Methods:** A retrospective analysis was performed of 11 patients treated with primary chemoradiotherapy for cervical carcinoma. Patients underwent ‘bladder full’ radiotherapy planning scans and ‘bladder empty’ pre-treatment diagnostic imaging, with images co-registered on the treatment planning software. The uterus and cervix were contoured on the planning scan to generate the CTV_{urea} and an isotropic 15mm expansion made to generate the unmodified PTV_{urea}. A manually modified PTV was made by the clinician taking into account the change in uterine position between scans. CBCT verification was performed weekly during treatment. The unmodified and
modified PTVs were overlaid and compared on each of the diagnostic, planning and verification scans, and coverage of tumour classified as well covered, borderline or not covered. Our second approach involved forming an ITV as a composite volume of the uterus on the bladder full and bladder empty scans. Isotropic expansions of 7, 10, 12 and 15mm were then applied to determine if a composite PTV would consistently encompass the target on CBCT images.

Results: A total of 40 CBCT images were reviewed for 11 patients. The unmodified PTV did not fully cover the target in 16/40 scans (40%) and on at least one scan in 6/11 patients (55%). Modified PTV’s provided full coverage on every scan but one (98% coverage) in which the bladder volume was overfilled (200% volume) compared to the planning scan. Isotropic expansions of 10mm and 12mm to the ITV provided adequate coverage on 37/40 and 39/40 CBCT’s respectively. The composite PTV offered reduced or comparable treated volumes to the manually modified PTV.

Conclusions: A standard CTV-PTV margin does not ensure adequate target coverage. It is important to use bladder status to predict uterine motion but an additional margin is also required due to the impact of rectal filling and tumour regression. We recommend forming a composite CTV from ‘bladder empty’ and ‘bladder full’ imaging with a 10 or 12mm PTV expansion to ensure an optimal balance between adequate coverage and minimisation of normal tissue toxicity.

OC-0167
Is radiographer led localisation for patients with metastatic spinal cord compression a feasible option?
C. Lacey1, C. Ockwell1, I. Locke1, K. Thomas2, J. Hendry1, H. McNair2
1Royal Marsden NHS Foundation Trust, Radiotherapy, London, United Kingdom
2Royal Marsden NHS Foundation Trust, Clinical R&D, London, United Kingdom

Purpose/Objective: To compare treatment fields localised between radiographers and clinicians, to investigate if there is parity between them. Critically analyse geographical variations that exist and assess the subsequent feasibility and impact of a radiographer led service.

Materials and Methods: 23 patients with metastatic spinal cord compression (MSCC) were prospectively sampled and once a field to treat the patient had been approved by a clinician, the CT data set was anonymised. 4 different radiographers not involved in the original planning performed a localisation for each patient. This gave a total of 92 localisations to be compared to the clinicians approved fields. Agreement between a radiographer and clinician was defined as ≤0.5cm between field length, width and 3 isocentre coordinates. If any one of the five parameters was greater than this tolerance, the localisation was not in agreement. The primary end point in this study was to investigate whether agreement between radiographer and clinician was achieved in minimum of 97% of the localisations. A secondary end point was to assess the patient pathway efficiency and the potential time that could be saved with a radiographer led approach.

Results: 90/92 localisations showed parity therefore the rate of agreement between radiographers and clinicians in the localisation of radiotherapy fields for MSCC was 97.8% under the 0.5cm tolerance defined. In all of the measurable parameters, the average differences were less that 0.2cm such that there was a statistically significant difference in the data from the 0.5cm median (p<0.0001) that would establish no agreement between clinician and radiographer. Therefore robust parity between the two groups was established. An average delay in waiting for a clinician to approve the original field was 54 minutes (median and range were 48 and 141 minutes respectively).

Conclusions: A very strong rate of agreement has been established along with minimal geographical or geometric differences in the localised fields. It has also been highlighted that considerable time could be saved in the patient’s pathway by removing the need to wait for clinician approval of the treatment field. By conducting this study, evidence has been collected that has enabled inferences to be drawn that a radiographer led service for the localisation of MSCC is a feasible option for improving the associated pathway and subsequent patient experience.

OC-0168
The impact of dose to the salivary apparatus on quality of life in patients treated with IMRT for head and neck cancer
A. Durcan1, M. Leech1
1Applied Radiation Therapy Trinity, Discipline of Radiation Therapy, Dublin, Ireland Republic of

Purpose/Objective: This study examined the radiation doses delivered to salivary apparatus in patients receiving intensity modulated radiotherapy (IMRT) to the H&N over the past 7 years. It examined the efficacy of parotid sparing, the effects of radiation dose to the submandibular glands (SMGs), minor and sublingual salivary glands on the incidence and severity of subjective xerostomia and investigated the quality of life of surviving patients.

Materials and Methods: 7 years of retrospective dosimetric data were assessed based on the plans of surviving H&N cancer patients that were treated by IMRT. SMGs and a new surrogate contour representing the minor oral and sublingual tissue target (MOIST) were outlined. Doses received by the salivary apparatus were statistically analysed in conjunction with the EORTC QLQ-C30 and H&N35 module results which was completed by participants.

Results: Mean global QoL was 66.6 out of 100. Emotional functioning had the lowest scores amongst the functional scales and physical functioning ranked the highest. The results of the questionnaire were compared according to age and staging. There were no significant differences in any of the scores of males and females who completed the EORTC QLQ-C30. Regarding age, a statistically significant difference in physical functioning score across four different age groups (<50 years: n = 4, 50 – 59 years: n = 10, 60- 69 years: n = 20, >70 years: n = 7), p =.034 was identified. Significant differences in the physical functioning level, p= .024, fatigue symptoms, p= .006, and pain symptoms, p= .028 of patients with early stage disease and those with locally advanced disease were observed.

Patient global QoL scores were not significantly different to scores of a normal population after IMRT. Global QoL scores were not influenced by gender, stage or treatment modalities in conjunction with IMRT. Dry mouth was the most prevalent symptom. Dry mouth scores were not influenced by gender, stage or the addition of different treatment modalities such as chemotherapy or surgery. There was a moderate and statistically significant relationship between xerostomia score and global QoL, R = .428, N=39, p<0.01. Mean dose to the salivary apparatus was not correlated with subjective xerostomia. Mean dose to the salivary apparatus was not shown to have an impact on severity of subjective xerostomia. Mean dose to the individual salivary glands was not correlated with global QoL scores.