The ability to predict and reduce toxicities by applying a learning health system (LHS) model is thus an important goal. The quality of life (QOL) of irradiated head and neck cancer (HNC) patients is significantly limited by toxicities leading to weight loss. The purpose of this study was to determine the impact of patient and tumor characteristics on time-to-treatment (TTT) from diagnosis in HNC patients treated with curative intent radiation therapy (RT).

Materials/Methods: From August 2004 to May 2011, 131 non-metastatic and non-recurrent biopsy proven HNC patients completed definitive RT at an urban academic safety net hospital. Patient and tumor factors examined included: race/ethnicity (Black, White, Hispanic, Other), English proficiency (English proficient, EP, Limited English proficient, LEP), marital status (Married, Non-married), insurance coverage (Private/Medicare, Medicaid/Free care), age at diagnosis (years) (median, =50) and AJCC stage (stage I-III versus stage IV). TTT was calculated from date of biopsy to date of first treatment received (surgery, induction chemotherapy/IC, radiotherapy alone/RT or concurrent radiotherapy/CCRT). Analysis of Variance was performed using SAS version 9.1 to determine the drivers of TTT. Data were analyzed using a 0.05 level of significance. Results: The median TTT was 41 days (range 6-249 days). Surgery, IC, RT or CCRT was the first treatment received in 45 (34.4%), 22 (16.8%), 13 (9.9%) and 51 (38.9%) patients, respectively. TTT did not differ by first treatment received (time to surgery 48 days, time to IC 47 days, time to RT 40 days and time to CCRT 51 days), P=0.802. No statistically significant differences in TTT were noted for gender (P=0.637), race/ethnicity (P=0.996), marital status (P=0.737), insurance coverage (P=0.836), age at diagnosis (P=0.571), and AJCC stage (P=0.889). TTT among EP and LEP patients was 46 and 57 days, respectively (P=0.197). Conclusion: Limited English proficient patients had longer TTT compared to EP, although this result failed to reach statistical significance. Other patient and tumor factors were not found to be predictive of TTT.
aim of this study is to determine the predictors for weight loss based on the outcomes of similar patients previously treated with radiation therapy (RT) to develop a real-time clinical decision-support system.

**METHOD AND MATERIALS**
From a database of systematically captured prospective data elements, NCI-CTCAEv4.0 toxicity assessments and all aspects of RT planning, 326 HNC patients with longitudinal records from 2007 to 2014 were identified. The records consisted of 2,985 variables, including planned dose-volume histogram at 1% volume increments (2,020 variables), distance between planning target volume (PTV) and organs at risk, diagnostic ICD-9 code, QOL and toxicities during treatment. Weight loss of 5kg or more at 3 months post-RT was predicted by the Classification and Regression Trees algorithm. Two different prediction models at the time of RT planning and at the end of treatment were developed.

**RESULTS**
Weight loss predictors during treatment were 1) patient reported outcome of oral intake, 2) ICD-9 code, N stage, 3) nausea, esophagitis/pharyngitis, skin toxicity, pain intensity, 4) dose to larynx, parotid, cricopharyngeal muscle and 5) minimum distance between low dose PTV and larynx. The weight loss prediction at RT planning was also developed excluding assessment variables during treatment. The sensitivity of the model at treatment / RT planning was 0.988 / 0.860 and the positive predictive value (PPV) was 0.467 / 0.451 respectively.

**CONCLUSION**
The informatics framework combined with data mining tools can facilitate large-scale analysis predicting for weight loss and is encouraging for the development of a LHS model to reduce the risk of toxicities. The two prediction models at RT planning / treatment show the potential for a real-time decision-support based on the incremental data collection in each patient’s RT course. Given the importance of diagnostic modality, we believe that incorporation of imaging features is an important next step to improve PPV.

**CLINICAL RELEVANCE/APPLICATION**
The weight loss prediction model at RT planning / treatment can support decisions regarding treatment planning and toxicity management during treatment.

**MSRO25-04 Short Treatment Time and Excellent Treatment Outcome in Accelerated Hyperfractionated Radiation Therapy for T1 Glottic Cancer**

**ABSTRACT**

Purpose/Objective(s): Accelerated hyperfractionated radiotherapy was performed as treatment for patients with T1 glottic cancer, and its utility was evaluated based on treatment outcomes and adverse effects.

Materials/Methods: Subjects were 58 men (median age, 70 years) who underwent radiotherapy at a University Hospital between January 2000 and November 2013. Tumor classification was Tis (6.9%) in 4 patients, T1a (65.5%) in 38, and T1b (27.6%) in 16. Histological examination revealed squamous cell carcinoma in the majority of cases (55 patients, 94.8%). Travel time from home to hospital was 2 h for 25 patients (43.1%). Laser vaporization was performed prior to radiotherapy in 38 patients (65.5%), and 19 patients (32.8%) received concurrent chemotherapy with an agent such as S-1. Patients were irradiated twice daily (morning and evening) using an irradiation container.

Most patients received a dose of 1.5 Gy/fraction up to a total of 60 Gy. Results: The median overall treatment time was 30 days (range, 26–45 days), with a median observation period of 59.6 months. After completion of radiotherapy, a complete response was achieved in 46 patients (80.0%), while the local control rate was 90.0%. Grade 4 acute mucositis was observed in 2 patients (3.4%). The median tumor control time was 9 months. The weight loss prediction model at RT planning / treatment was developed.

**METHOD AND MATERIALS**
From a database of systematically captured prospective data elements, NCI-CTCAEv4.0 toxicity assessments and all aspects of RT planning, 326 HNC patients with longitudinal records from 2007 to 2014 were identified. The records consisted of 2,985 variables, including planned dose-volume histogram at 1% volume increments (2,020 variables), distance between planning target volume (PTV) and organs at risk, diagnostic ICD-9 code, QOL and toxicities during treatment. Weight loss of 5kg or more at 3 months post-RT was predicted by the Classification and Regression Trees algorithm. Two different prediction models at the time of RT planning and at the end of treatment were developed.

**RESULTS**
Weight loss predictors during treatment were 1) patient reported outcome of oral intake, 2) ICD-9 code, N stage, 3) nausea, esophagitis/pharyngitis, skin toxicity, pain intensity, 4) dose to larynx, parotid, cricopharyngeal muscle and 5) minimum distance between low dose PTV and larynx. The weight loss prediction at RT planning was also developed excluding assessment variables during treatment. The sensitivity of the model at treatment / RT planning was 0.988 / 0.860 and the positive predictive value (PPV) was 0.467 / 0.451 respectively.

**CONCLUSION**
The informatics framework combined with data mining tools can facilitate large-scale analysis predicting for weight loss and is encouraging for the development of a LHS model to reduce the risk of toxicities. The two prediction models at RT planning / treatment show the potential for a real-time decision-support based on the incremental data collection in each patient’s RT course. Given the importance of diagnostic modality, we believe that incorporation of imaging features is an important next step to improve PPV.

**CLINICAL RELEVANCE/APPLICATION**
The weight loss prediction model at RT planning / treatment can support decisions regarding treatment planning and toxicity management during treatment.

**MSRO25-05 Are Contouring Time and Multimodality Imaging Prognostic Factors for Radiation Therapy of Head and Neck Cancer?**

**ABSTRACT**

Purpose/Objective(s): To determine the predictors for weight loss based on the outcomes of similar patients previously treated with radiation therapy (RT) to develop a real-time clinical decision-support system.

Materials/Methods: Subjects were 58 men (median age, 70 years) who underwent radiotherapy at a University Hospital between January 2000 and November 2013. Tumor classification was Tis (6.9%) in 4 patients, T1a (65.5%) in 38, and T1b (27.6%) in 16. Histological examination revealed squamous cell carcinoma in the majority of cases (55 patients, 94.8%). Travel time from home to hospital was 2 h for 25 patients (43.1%). Laser vaporization was performed prior to radiotherapy in 38 patients (65.5%), and 19 patients (32.8%) received concurrent chemotherapy with an agent such as S-1. Patients were irradiated twice daily (morning and evening) using an irradiation container.

Most patients received a dose of 1.5 Gy/fraction up to a total of 60 Gy. Results: The median overall treatment time was 30 days (range, 26–45 days), with a median observation period of 59.6 months. After completion of radiotherapy, a complete response was achieved in 46 patients (80.0%), while the local control rate was 90.0%. Grade 4 acute mucositis was observed in 2 patients (3.4%). The median tumor control time was 9 months. The weight loss prediction model at RT planning / treatment was developed.

**METHOD AND MATERIALS**
From a database of systematically captured prospective data elements, NCI-CTCAEv4.0 toxicity assessments and all aspects of RT planning, 326 HNC patients with longitudinal records from 2007 to 2014 were identified. The records consisted of 2,985 variables, including planned dose-volume histogram at 1% volume increments (2,020 variables), distance between planning target volume (PTV) and organs at risk, diagnostic ICD-9 code, QOL and toxicities during treatment. Weight loss of 5kg or more at 3 months post-RT was predicted by the Classification and Regression Trees algorithm. Two different prediction models at the time of RT planning and at the end of treatment were developed.

**RESULTS**
Weight loss predictors during treatment were 1) patient reported outcome of oral intake, 2) ICD-9 code, N stage, 3) nausea, esophagitis/pharyngitis, skin toxicity, pain intensity, 4) dose to larynx, parotid, cricopharyngeal muscle and 5) minimum distance between low dose PTV and larynx. The weight loss prediction at RT planning was also developed excluding assessment variables during treatment. The sensitivity of the model at treatment / RT planning was 0.988 / 0.860 and the positive predictive value (PPV) was 0.467 / 0.451 respectively.

**CONCLUSION**
The informatics framework combined with data mining tools can facilitate large-scale analysis predicting for weight loss and is encouraging for the development of a LHS model to reduce the risk of toxicities. The two prediction models at RT planning / treatment show the potential for a real-time decision-support based on the incremental data collection in each patient’s RT course. Given the importance of diagnostic modality, we believe that incorporation of imaging features is an important next step to improve PPV.

**CLINICAL RELEVANCE/APPLICATION**
The weight loss prediction model at RT planning / treatment can support decisions regarding treatment planning and toxicity management during treatment.
Jan Tille, Bern, Switzerland (Abstract Co-Author) Nothing to Disclose
Nando Mertineit, Bern, Switzerland (Abstract Co-Author) Nothing to Disclose
A Geretschlaeger, Basel, Switzerland (Abstract Co-Author) Nothing to Disclose

PURPOSE

In the DEGRO-Quiro Trials correlation of clinical outcome with contouring time in the planning process of radiation therapy and the amount of multimodality imaging has not been analyzed. To evaluate if contouring time and multimodality imaging are prognostic factors for radiation therapy of advanced head and neck cancer 207 patients were analyzed retrospectively between 2001 and 2012.

METHOD AND MATERIALS

Before 2007 radiation treatment planning CT was done without contrast enhancement, MR imaging and 18F-FDG PET/CT as additional imaging modalities were used only occasionally. From 2007 contrast enhanced planning CT in addition to multimodality imaging consisting of MR imaging (including DWI and ADC) and 18F-FDG PET/CT was used routinely for every head and neck cancer patient. Additionally, in unclear or equivocal imaging findings of lymph nodes a re-report was performed with a higher sensitivity at the expense of specificity to minimize geographical miss in the contouring procedure for radiation treatment and to maximize the binary decision for each lymph node (malignant vs benign). The re-reports were done in conjunction with radiooncologists, nuclear physicians and radiologists. The mean contouring time was 60 min before 2007 and 150 min after 2007 (including the time of a re-report). Clinical outcome (local, regional and locoregional control) of advanced oropharyngeal, laryngeal and hypopharyngeal cancers with lymph node metastases was assessed in two groups (group I: 2001-2007 vs group II: 2008-2012).

RESULTS

Group I: n=113, group II: n=94. Regional recurrence was significantly reduced in group II (log-rank-test p = 0.03. regional control after 1, 2 and 3 years was 88%, 79% and 76%, respectively as compared to 95%, 92% and 88%, retrospectively. Locoregional control for 207 patients shows no difference in survival (p = 0.08), inclusion of 340 patients leads to a p-value p < 0.05.

CONCLUSION

Imaging findings of multimodality imaging and a critical re-report of these imaging findings in conjunction with a longer contouring time may have an impact on clinical outcome of advanced head and neck cancers. However, this overtime is not reimbursed.

CLINICAL RELEVANCE/APPLICATION

A close collaboration of radiooncologists, nuclear physicians and radiologists in the radiation treatment planning process may have a benefit for patients with advanced head and neck cancer.

MSRO25-06 Lessons from a Standardized Program Using PET-CT to Avoid Neck Dissection after Primary Radiation Therapy for N2 Squamous Cell Carcinoma of the Oropharynx: Beware the Late Recurrence and Salvage Is Unlikely

ABSTRACT

Purpose/Objective(s): To report the results of a standardized program using positron emission tomography (PET)-computed tomography (CT) approximately 12 weeks after primary radiotherapy to determine the need for a planned neck dissection in patients with radiographic N2 squamous cell carcinoma (SCC) of the oropharynx.Materials/Methods: Fifty consecutive patients with T1-4 and hemineck radiographic stage N2A-B SCC of the oropharynx for whom the only indication for planned neck dissection was a positive PET-CT performed ~12 weeks after completing primary treatment with radiotherapy. Endpoints to determine the value of 12-week PET-CT in identifying residual neck disease were pathologic status of planned neck dissection specimens and neck recurrence at any time during the follow-up period.Results: All patients at risk for neck recurrence at last follow-up had =1 year of follow-up after PET-CT (median, 2.0 years). Results of PET-CT to identify residual neck disease were as follows: Sensitivity and positive predictive value: 0% (zero true positive); Specificity: 89% (4 False Negatives), and negative predictive value: 91% (6 False Positives); 25% (1/4).Conclusion: PET-CT approximately 12 weeks after radiotherapy for oropharyngeal cancer is an excellent way to identify patients who do not need neck dissection, but low-risk is not no-risk. Approximately half of neck recurrences present over 2 years after negative PET-CT and the chance of successful salvage is low. Accurate results for this kind of program will require long-term follow-up and support a policy of frequent neck imaging for years in patients with N2 oropharyngeal cancer who do not undergo neck dissection after primary treatment with radiotherapy.

MSRO25-07 Megavoltage Radiation Therapy of Skin Malignancies of the Nose Using Custom Nasal Paraffin Bolus

ABSTRACT

Purpose/Objective(s): To treat surface malignancies, bolus materials are used to enhance the dose delivered at the surface and
to reduce hot and cold spots due to sharp surface irregularities and oblique incident angles. Radiation treatment of skin malignancies on the nose is challenging due to the irregular surface anatomy of the nose to which homogenous dose must be delivered. Materials/Methods: Superflab is a commonly used bolus material that is non-conformal for irregular surface contours of the nose making it difficult to reproducibly apply and maintain. Additionally, air gaps from non-conformal bolus will result in dose inhomogeneity. We present our experiences and outcomes using custom-made paraffin bolus to conform to the shape of the nose for the treatment of basal cell cancer (BCC) or squamous cell cancer (SCC). A mold of the patient’s nose was created and a negative impression filled in with a paraffin rectangular block. Minimum thickness was 1.5 cm laterally and 1 cm anterior-posteriorly. Thin coating of petroleum jelly was applied within bolus to reduce air gaps. Nine patients were treated to 60 Gy at 2 Gy per week parallel opposing 6 MeV photon beams using three-dimensional conformal treatment planning. Six patients had BCC and three patients had SCC. Six patients had two or more distinct sites of disease. Results show that 100% prescription isodose line conforms to the planned target volume and dose to critical structures are well below tolerance limits. Daily kilovoltage orthogonal and weekly cone beam CT show close patient and wax bolus contact and reproducibility. Six thermoluminescent dosimeters (TLD) chips (LiF) were used to measure doses deposited and matched the planned dosimetry for each patient. TLD measurements showed a 2.6% average difference between planned dose and delivered dose. Results: Of the 9 patients treated with this method, maximum hot spot was 102.7% (101.1%-104%) for all 9 plans. Mean follow-up time was 25 months (10 – 58 months). Of the 9 treated, two patients developed new lesions on the nose and one patient had recurrent disease at the columella. Acute side effects were erythema and congested nose. None of the patients developed RTOG Grade 3 skin toxicity immediately following radiation treatment. Followup visits reported no telangiectasia and good cosmetic outcomes. Conclusion: This study demonstrates a practical approach to radiotherapy of the nose which minimizes air gaps and daily setup variability, while achieving dose homogeneity with minimal hotspots.

**MSR025-08 Superior Carotid Artery Sparing by Proton Radiation Therapy Compared to IMRT/VMAT for Reirradiation of Locally Recurrent Cancers of the Base of Tongue**

Monday, Nov. 30 11:40AM - 11:50AM Location: S103CD

Participants
Upeandra Parvathaneni, MBBS,FRANZCR, Seattle, WA (Presenter) Nothing to Disclose
Yolanda D. Tseng, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Quang Dang, Seattle, WA (Abstract Co-Author) Nothing to Disclose
George E. Laramore, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Kent McCorm, CMD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Jay J. Liao, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose

**ABSTRACT**

Purpose/Objective(s): Salvage treatment options for isolated in-field local recurrences in the base of tongue (BOT) after previous radiotherapy (RT) are limited. Total glossectomy is extremely morbid and re irradiation (reRT) is often preferred in an attempt to preserve function. However, the close anatomical proximity of the carotid arteries to the BOT makes it difficult to avoid this structure with photon based conformal planning such as IMRT or VMAT. Adding radiation dose to a previously irradiated carotid artery may increase the risk of a carotid blow out, which is a fatal complication. Although a clear dose threshold for this complication has not been established, a treatment plan that delivers the least dose to the carotid would be preferred. We hypothesized that compared with photon based planning (IMRT/VMAT), proton radiotherapy (PRT) may decrease the dose to the carotids as there is no exit dose distal to the target, thereby limiting cumulative dose to surrounding organs at risk (OARs). We compared the dose to carotid arteries and other OARs with IMRT/VMAT versus PRT for two patients who had reRT for locally recurrent cancers of the tongue base. Materials/Methods: Comparative plans with photons using an IMRT or VMAT technique and PRT with uniform scanning or pencil beam scanning technique were generated for two patients on Eclipse and RayStation planning systems. Both patients had BOT recurrences that were located centrally within the high dose region of previous RT fields. They also received elective nodal RT for their initial BOT cancers and hence their carotid arteries were irradiated. The patients developed local recurrences after one and 3 years following initial RT. The BOT recurrences were treated to a dose of 66-72 Gy. Elective nodal RT was not given with reRT. Target cover and OAR doses, including dose to the carotid artery were evaluated by standard dose volume histograms. Results: In both patients, the proton plans spared the surrounding OARs including carotid arteries better than IMRT or VMAT photon plans. For patient 1, mean dose to both carotids was lower with protons (right, 3.0 vs 28.0 Gy; left, 4.8 vs 15.7 Gy). Dose to the spinal cord (max, 0 vs 14.9 Gy) was also lower with protons versus photons. Similarly, in patient 2, the proton plan had lower mean dose to both carotids (right, 5.9 vs 15.9 Gy; left, 0.7 vs 8.1 Gy) and parotids (right, 1.6 to 19.0 Gy; left, 0 vs 10.7 Gy). Both techniques provided adequate target coverage. Conclusion: Compared with conformal photon techniques such as IMRT/VMAT, proton radiotherapy reduces dose to previously irradiated carotid arteries and other surrounding OARs during treatment of recurrent cancers of the base of tongue. In the re irradiation setting, this advantage may translate to a reduced risk of a fatal carotid blow out. This case study suggests that proton therapy should be considered for reirradiation of locally recurrent tongue base cancers.

**MSR025-09 Hyperbaric Oxygen Therapy for Radiation Induced Toxicity: A Retrospective Review from a Single-Institution**

Monday, Nov. 30 11:50AM - 12:00PM Location: S103CD

Participants
Leah Katz, MD, MPH, New York, NY (Presenter) Nothing to Disclose

**ABSTRACT**

Purpose/Objective(s): Adverse radiation (RT) side effects pose an important barrier to progress in the field of radiation oncology. While hyperbaric oxygen therapy (HBOT) is recognized as an effective treatment for RT side effects, in particular for osteoradionecrosis (ORN); many radiation oncologists fail to refer patients. We evaluated NYU’s HBOT experience over the past three years to assess its safety and efficacy in treating various RT toxicities. It is our hope that clinicians consider HBOT more frequently and develop a prophylactic referral pattern.

Materials/Methods: A retrospective 3-year (2013-2015) chart review of a prospectively maintained database was performed. Thirty-three patients were evaluated with a median age of 62 (range 37-80) years. Of the 9 patients treated at the NYU Hyperbaric Center with no adverse
effects. Results: Each RT injury category was evaluated. Symptoms associated with RT soft tissue injury included chronic wound infection, vaginal bleeding/pain, rectal pain, dyspareunia, and perineal pain. 38% of patients had complete resolution of symptoms after HBOT alone, 31% underwent adjuvant flap closure with complete wound healing, and 31% experienced no wound healing. For radiation cystitis, 60% had complete symptom resolution within a one month period after HBOT. A single patient treated for a rectal bladder fistula enjoyed complete resolution of the fistula with cessation of rectal urine drainage within one month after HBOT. Patients with ORN of the mandible with BRONJ stage I experienced complete resolution of intraoral deficits. Patients with BRONJ stage 2 experienced complete resolution of infection after HBOT with adjuvant debridement. Patients with BRONJ stage 3 experienced complete fracture healing after HBO with adjuvant mandibulectomy. Conclusion: The NYU experience demonstrates both safety and efficacy in ameliorating symptoms and improving patient quality of life with various types of RT morbidity. Our data encourages early referral to HBOT in an effort to save patients time, medical costs, energy, and psychological stress associated with ineffective medical measures. This study encourages further research with longer follow-up to better define the benefit and durability of HBOT.