West Midlands Radiotherapy
Operational Delivery Network

WM Radiotherapy Clinical Protocol

Head and Neck Radiotherapy Protocol

Revision history

Version	Date	Summary of changes
0.1	25.11.2020	UHCW protocol: Author Dr A Chan, Reformatted: L Farthing
0.2	13.01.2021	Updated Dr A Hartley, Dr M.O'Beirn
0.3	02.03.2021	Nasopharynx Dr C Fong.
0.4.3	04.05.2021	MPE Review: G Webster MPE and Head of Radiotherapy Physics WAH
0.4.4	23.08.21	Update: A. Hartley & P. Sanghera Review: G Webster MPE
Final	03.09.2021	Submitted to EAG
	03.09.2021	Approved EAG
1.0	03.09.2021	Ratified Final
1.01	17.11.2021	Minor correction L.Farthing & Dr M O'Beirn
2.0	24.11.2023	No changes to content but change of documentation date
Review Date		December 2025

Approved by

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Related documents

Title	Owner	Location
RCR Dose Fractionation	RCR	https://www.rcr.ac.uk/publication/radiotherapy-dose-fractionation-third-edition

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Purpose

To provide a standardised departmental protocol for planning and delivery of external beam radiotherapy (conformal or IMRT) for Head and Neck cancers within the West Midlands. This protocol is based on a number of Trial protocols, such as NIMRAD, CompARE and DeEscalate as well as the Royal College of Radiologists (RCR) Dose Fractionation Guidance Version 3 March 2019

Radiotherapy for Head and Neck cancers is delivered across the West Midlands as part of the collaborative partnership, working with effective peer review between services.

1. Indications

All patients will be discussed at the Head & Neck MDT.
Radiotherapy booking and consent forms are completed with any specific instructions for patient set-up indicated by the clinician.
All radical patients except T1-T2 glottic cancers and edentulous patients will undergo dental assessment and extractions prior to radiotherapy planning.
All patients will undergo CT-based treatment planning with volumetric assessment of dose volume histograms to ensure PTV coverage and OAR / PRV exclusion.

Head and Neck cancers predominantly Squamous Cell Carcinoma's and therefore priority Category 1. Please refer to Guidelines for the management of unscheduled treatment interruptions, RCR 4th, 2019 and all subsequent editions

Information & Consent

- Each Patient should be consented with individualised information of planned treatment, individualised risk / benefits and toxicities
- Booking form and consent completed by IR(ME)R practitioner
- Patients should also receive a Local patient information sheet or MacMillan information booklets

Responsibilities

- To comply with the Ionising Radiation (Medical Exposure) Regulations 2017 the following roles are defined:
- Referrer & Practitioner: The consultant clinical oncologist is responsible for the care of the patient including correct referral for treatment consent, justification prescription and treatment authorization as defined in departmental protocol but in accordance with this regional protocol.
- Operators: Radiographers, physicists and technologists Consultant clinical Oncologists and other medical staff are responsible for individual tasks associated with the plan production, verification and treatment delivery as per departmental protocols but in accordance with this regional protocol and are undertaken on the auspices of the practitioner.
- It is the responsibility of department management teams to ensure departmental protocols are consistent with this regional protocol and that any disagreement with the content of this protocol is raised through the West Midlands EAG.

2. Immobilisation

The following instructions for patient set-up are general and can be specified if different on the booking form. All patients will require a thermoplastic beam directional Shell (BDS)

Neck position:

All patients will be treated in the supine position with neck neutral, arms at their side and shoulders comfortably resting caudally, with immobilisation for popliteal fossa and feet as required

Mouthbite:

At the discretion of the prescribing clinician a mouthbite may be required and will be specified on the booking sheet. General indications are for:

- anterior tongue
- floor of mouth
- hard palate /maxillary antrum
- Nasal cavity.

The clinician will determine if a mouthbite is needed in these situations depending on patient tolerability and whether reproducibility will be foreseen. A mouthbite is not needed for posterior tongue or oropharyngeal tumours unless there is anterior tongue involvement.

Bolus:

- Bolus will be specified by the clinician on the RT Request and regions which require bolus will be identified by the clinician. These include: palpable primary / nodal disease; skin involvement; anterior commissure involvement for laryngeal cancers.
- Bolus for the purposes of improving dose coverage should be considered if the CTV is within 3-5mm of the patient's skin surface, according to local protocols. Bolus is not warranted for subclinical nodal regions.

3. Planning CT scan

- Patients should be considered for IV contrast at the discretion of the clinician to aid target volume delineation and providing adequate renal function (refer to local policy for IV contrast). The use of IV contrast at the time of CT planning does not significantly affect dose calculation in head and neck IMRT plans (Dawson LA et al. Acta Oncol 2008).
- Patients will undergo CT scanning with slice thickness 2-2.5mm
- See as per local protocols for scanning levels protocol
- All diagnostic imaging (CT, MRI and PET scans) will be available for target volume delineation.
- Patients should have an MRI scan prior to commencing neoadjuvant chemotherapy to determine pre-chemotherapy target volumes. MRI should be used to aid soft tissue discrimination in pharyngeal cancers particularly in the presence of dental artefacts. MRI fusion should be used to improve target volume delineation particularly for nasopharyngeal cancers and other cancers with gross nerve involvement.

4. Dose Prescription and Target Volume Delineation

Dose prescription and recording for Intensity-Modulated Radiotherapy (IMRT) will conform to the Principles of ICRU 83.

	66-70Gy/33-35	60Gy/30	65Gy/30	55Gy/20
High Dose CTV	66-70Gy	60Gy*	65Gy	55Gy
Intermediate dose CTV	63Gy	60Gy	60Gy	50Gy
Low Dose CTV	56Gy	54Gy	54Gy	46Gy

*Postop boost volume criteria (65Gy/30 or 66Gy/33): close margin ≤ 1mm, positive margin (R1-resection), extracapsular extension. 70Gy/35 can be considered for R2-resection.

- IMRT will be prescribed to the median dose point on the dose volume histogram (DVH) such that the prescription dose is received by 50% of the PTV (D50%).
- Maximum dose is defined as D2%.
- Minimum dose is defined as D98%.

Efforts should be made to ensure the robustness of plans. This can include beam direction selection or other avoidance strategies (e.g. ensuring robustness to shoulder movement) or the use of temporary density overrides during optimisation to allow necessary fluence outside the patient without generating excessive doses. The impact of patient changes during treatment on target coverage and doses to OARs should be assessed and replans instigated where appropriate.

Mitigation of the dosimetric impact of metal implants in the patient should be done using artefact-correction software within the CT scanner where available, with bulk density overrides of affected regions being carefully applied where necessary.

5. Contouring

Contouring will conform to the Principles of ICRU 50 and 62 generally.

5.1. GTV (Gross Tumour Volume)

The GTV represents the grossly involved regions of primary tumour or involved nodes as defined by clinical examination, examination under anaesthetic and on imaging. Grossly involved nodes are defined as those greater than 1cm in short axial dimension or any size with necrosis radiographically. Smaller nodes may be determined to be grossly involved based on clinical suspicion.

5.2. CTV (Clinical Target Volume)

CTVs are contoured in relation to gross targets and regions of subclinical spread, and should be limited by potential barriers to tumour spread such as bone, fascial planes, air cavities and external contour. International Contouring guidelines e.g Grégoire, 2018 (“5 + 5 mm” margin concept) exist but must be used with caution as heavily reliant on accurate delineation of GTV. Clinician discretion regarding CTV expansion is advised if extent of GTV is not certain. Due to lack of evidence base in certain clinical scenarios these guidelines can be used in primary treatment setting only (not postoperative) and not following neoadjuvant chemotherapy.

<u>Subclinical Nodal Regions</u>

Neck nodal regions deemed at risk of subclinical spread of tumour will be treated with the prophylactic dose as defined by the consensus guidelines (Biau et al. Selection of lymph node target volumes for definitive head and neck radiation therapy: a 2019 Update,Radioth Oncol (2019) 10.1016/j.radonc.2019.01.018)

Patients with ipsilateral ≥N2a involvement should be considered and all patients with ≥N2b should have the contralateral neck treated regardless of the primary site in oropharyngeal cases. Patients with N0 or N1 disease may be considered for ipsilateral neck irradiation only in well lateralised tonsillar cancers.

Intermediate Risk CTV

Nodes < 1cm not thought to harbour gross disease but deemed to be at more risk than subclinical disease may receive an intermediate dose.

Unknown primary IMRT

Patients with an unknown primary cancer will not have a gross primary target and panmucosal or selected mucosal primary sites may be chosen for irradiation. A CTV will be contoured for the candidate mucosal sites for irradiation.

5.3. Planning Target Volume

PTVs are geometric expansions of the CTVs accounting for internal motion and set-up error. All CTVs will have a corresponding PTV which will be an isotropic expansion specific for each centre following local IGRT audit. If no IGRT data is available, a 5mm isotropic expansion is suggested. Deviations from the centre-specific PTV margin may be permitted following Peer Review and MPE discussion.

PTV_XXXX (i.e. full expansion with dose level identification 'XXXX' specified in cGy)

PlanPTV_XXXX (i.e. restricted from any higher dose PTVs and, where considered appropriate, skin surface)

[n.b. the naming convention above is illustrative only as RTTQA have not yet adopted a protocol.]

For planning purposes, when PTVs overlap the higher dose is respected. Dose should be reported to both PTV and PlanPTV. Additional volumes created by modifying the PTV may be required for optimisation purposes but should not be reported on.

Treatment planning techniques should ensure adequate robustness in any modified regions of the PlanPTV near skin surface.

6. Organs at Risk (OAR)

The following OAR are recommended to be contoured. It may not be necessary to include all OAR constraints during optimization but this will provide dosimetry data and highlight unexpected high dose regions. All neural tissue constraints should be respected with high priority unless specified otherwise by the clinician. OAR particularly neural structures should be kept to as low as reasonably possible and early communication between clinician and planners should guide planning goals.

Structure names below are consistent with the international consensus guidelines endorsed by RTTQA (Mir et al, Radiother Oncol 2020;150:30-39), though PRV naming is illustrative only pending RTTQA recommendation. Centres are encouraged to adopt the structure names below for future audit and research purposes. Bracketed terms require a selection to be made (e.g. OpticNrv_L) while 'XX' requires a value to be stated showing the expansion (e.g. OpticNrv_L_03).

ICRU83 recommends the use of 'near-max' tolerances, suggested here as 0.01cc or 0.1cc, though centres may use other values if justified.

		33-35#	**30#**	**20#**
SpinalCord	Max 0.01cc Max 1cc	46Gy 44Gy	46Gy 44Gy	38Gy 36Gy
SpinalCord_XX	Max 0.01cc Max 1cc	48Gy 46Gy	48Gy 46Gy	40Gy 38Gy
Brainstem	Max 0.01cc Max 0.01cc Max 1cc Max 1cc	46Gy* 54Gy† 44Gy* 52Gy†	46Gy* 54Gy† 44Gy* 52Gy†	40Gy 36Gy
Brainstem_XX	Max 1cc	46Gy* 54Gy†	46Gy* 54Gy†	38Gy
Brain	Max 0.01cc Max 1cc	60Gy 58Gy	60Gy 58Gy	45Gy 43Gy
OpticChiasm	Max 0.01cc	48Gy	48Gy	38Gy
OpticChiasm_XX	Max 0.01cc	50Gy	50Gy	40Gy
OpticNrv_(L/R)	Max 0.01cc	48Gy	48Gy	38Gy
OpticNrv _(L/R) _XX	Max 0.01cc	50Gy	50Gy	40Gy
Eye_(L/R)	Max 0.01cc	40Gy	40Gy	35Gy
Lens_(L/R)	Max 0.01cc	6Gy	6Gy	4Gy
Parotid_(L/R)	Mean	26Gy	24Gy	18Gy
Bone_Mandible-PTV **Bone_Mandible**	Max 1cc Max 1cc	100% 105%	100% 105%	100% 105%
Cochlea_(L/R)	Mean	40Gy	40Gy	35Gy
BrachialPlex_(L/R)	Max 0.01cc	62Gy	60Gy	52Gy
Normal tissue outside contoured volume	Max 1cc	107%	107%	107%

* Optimal † Mandatory

7. Larynx Cancer Treatment

Aim:
Laryngeal/pharyngeal function preservation using radical radiotherapy with surgery for salvage if required

Tis/T1a/b N0 glottic

- Radiotherapy – 50Gy / 16 (3 weeks 1 day, small volume only) or 55Gy / 20 (4 weeks)

T2 N0 glottic, T1-2 N0 supraglottic

- Radiotherapy - 55Gy / 20 (4 weeks)

T3 N0 glottic / supraglottic

- Chemo-radiotherapy - 70Gy / 35 (over 7 weeks with cisplatin) or 65Gy / 30 (6 weeks)
- Radiotherapy – Altered fractionation schedules include 70Gy/35, 65Gy/30 (6 weeks).

Any T N+ M0 or T3 N0/+ M0 larynx

- Discussions at Head & Neck MDT, potential options:

- Chemo-radiotherapy (70Gy/35 or 65Gy/30 with cisplatin) with reservation of surgery to primary or neck if required
- Primary surgery and neck dissection with postoperative radiotherapy (60-66Gy / 30-33 over 6-6.5 weeks) +/- concurrent chemotherapy

- Indications for postoperative radiotherapy (see Oral Cavity Cancer)

- To consider concurrent carboplatin/ if not fit to receive cisplatin with primary radiotherapy.
- To consider concurrent cetuximab if platinum-based chemoradiotherapy contraindicated
- To consider altered fractionation schedule if not fit for either cisplatin or cetuximab dependent on patient factors.
- Neoadjuvant chemotherapy with TPF can be considered in patients with unresectable Stage III-IVB SCCHN.
- Any available clinical trials encouraged.

8. Hypopharynx Cancer Treatment

Aim:
Laryngeal/pharyngeal function preservation using radical radiotherapy with surgery for salvage if required

- T1-2 N0 hypopharynx
  Radiotherapy schedules include 70Gy/35 (6 weeks DAHANCA), 65Gy/30 (6 weeks)

- T3-4 N0, T1-4 N+ hypopharynx
  Discussions at Head & Neck MDT, potential options:
  Chemoradiotherapy (70Gy/35 or 65Gy/30 with cisplatin) with reservation of surgery to primary or neck if required
  Primary surgery and neck dissection with postoperative radiotherapy (60-66Gy / 30-33 over 6-6.5 weeks) +/- concurrent chemotherapy

Indications for postoperative radiotherapy (see Oral Cavity Cancer)

- To consider concurrent carboplatin/cetuximab if not fit to receive cisplatin with primary radiotherapy.
- To consider altered fractionation schedule if not fit for either cisplatin or cetuximab dependent on patient factors.
- Neoadjuvant chemotherapy with TPF can be considered in patients with unresectable Stage III-IVB SCCHN.

Any available clinical trials encouraged.

9. Oropharynx Cancer Treatment

- T1-2 N0 oropharynx

Radiotherapy schedules include 70Gy/35 (6 weeks DAHANCA), 65Gy/30 (6 weeks)

- T3-4 N0, any T N+ oropharynx

Chemoradiotherapy (70Gy/35 or 65Gy/30 with cisplatin)

- To consider concurrent carboplatin/ if not fit to receive cisplatin with primary radiotherapy.
- To consider concurrent cetuximab if platinum-based chemoradiotherapy contraindicated
- To consider altered fractionation schedule if not fit for either platinum chemotherapy or cetuximab dependent on patient factors.
- Neoadjuvant chemotherapy with TPF can be considered in patients with unresectable Stage III-IVB SCCHN.

Any available clinical trials encouraged.

10. Oral Cavity Cancer Treatment

Oral cavity is primarily treated with surgery.

<u>Resectable oral cavity</u>
Indications for postoperative radiotherapy: presence of any absolute indication or 3 (or more) relative indication

- Absolute (concurrent cisplatin recommended, 65-66Gy in 30-33Gy):
  - Involved surgical margins
  - Extracapsular nodal extension
- Relative (60Gy/30):
  - Oral cavity site
  - T3/4
  - ≥1involved node
  - Close resection margin (< 5mm)
  - Perineural invasion
  - Lymphovascular invasion
  - Poorly differentiated

<u>Unresectable oral cavity</u>
Chemoradiotherapy (70Gy/35 or 65Gy/30 with cisplatin)

- To consider concurrent carboplatin if not fit to receive cisplatin with radiotherapy.
- To consider concurrent cetuximab if platinum-based chemo-radiotherapy contraindicated

To consider altered fractionation schedule if not fit for either cisplatin or cetuximab dependent on patient factors. Any available clinical trials encouraged.

11. Nasopharyngeal Cancer Treatment

WHO type III (undifferentiated carcinoma) is the most common and is endemic in populations originating from regions in Southern China, Southeast Asia, Southern Asia, Middle East, and Africa. It is strongly associated with EBV (70% have positive EBV DNA titres).

WHO type I (keratinizing squamous carcinoma) is more usually associated with risk factors typical for squamous carcinoma of head and neck.

Please refer to International consensus guidelines for CTV delineation (Anne Lee et al, Radioth Oncol 2018) and planning/OAR optimisation (Anne Lee et al IJROBP 2019).
Peer review of target volumes is strongly recommended for this rare and complex tumour site.

For tumour involving skull base or for teenage/young adult patients – discussion/referral for NHS Proton Beam Therapy Panel may be appropriate

T1-2 N0: IMRT alone – 70Gy / 35
T1-2 N1: IMRT alone or concurrent chemo radiation – (70 Gy / 35 over 7 weeks with cisplatin) with 3 cycles (neo-) adjuvant chemotherapy

Stage III-IV: Level I evidence for induction chemotherapy (TPF [Sun et al, 2016 Lancet Oncology] or TP [Hui et al, 2009 JCO] or Gemcitabine + Cisplatin [Zhang et al. 2019 NEJM] followed by concurrent chemo-radiation. In selected cases of T3-4 N0 with relative low risk of distant metastasis, induction chemotherapy may be omitted.
Stage IVc: palliative chemotherapy with consideration of consolidation/palliative radiotherapy may be appropriate depending on chemotherapy response

12. Unknown Primary Carcinoma of Head & Neck

Definition = metastatic carcinoma with no primary site evident after history, clinical examination and imaging.

- Most are squamous cell carcinoma or poorly differentiated/undifferentiated carcinoma.
- Adenocarcinoma in the neck is almost always associated with a primary below the clavicles but a salivary gland, thyroid or parathyroid primary tumour must be excluded.
- If lymphoma is suspected, an excisional biopsy is recommended.

Most likely head and neck primary site are: tonsil (45%), base of tongue (40%), pyriform fossa (10%).

The following investigations should be completed:

- PET-CT - MRI may provide further imaging evidence/improve targeting of biopsy of HNSCC not otherwise evidence on PET-CT/clinical assessment, especially in tonsil/tongue base sites
- EUA with panendoscopy, bilateral tonsillectomy, biopsies of nasopharynx, base of tongue, both pyriform sinuses as well as any other suspicious areas seen. Bilateral

tonsillectomy identifies a contralateral tonsillar primary in 10% (possibly higher in HPV-related disease) and may make surveillance examination easier.
- Scalp examination
- Upper GI endoscopy
- Consider robotic mucosectomy

All patients should undergo a neck dissection for full pathological staging and confirmation of histology to tailor dose and volumes of (chemo-) radiotherapy.

- Patients with > pN1 or with ECS should be recommended to receive radiotherapy to candidate mucosal sites with consideration of contralateral neck irradiation and concurrent chemotherapy.
- Patients with pN1 with no ECS following a neck dissection can be considered for active surveillance by a head and neck surgical oncologist.

13. Salivary Gland Cancer Treatment

Salivary gland cancers display a remarkable histological diversity. The most common malignant histology of the parotid gland is mucoepidermoid carcinoma. The most common malignant histology of the submandibular and minor salivary glands is adenoid cystic carcinoma.

- Acinic cell carcinoma usually occurs only in the parotid gland.
- Adenoid cystic carcinoma has the lowest risk of nodal involvement (<8%) but has the highest propensity for perineural spread. An MRI to skull base is recommended to tailor radiotherapy dose and volume of gross nerve involvement.
- Surgery is the mainstay of definitive treatment for salivary gland cancers. Maximal resection with preservation of the facial nerve is employed unless the nerve is enveloped by tumour.
- Neck dissection is recommended for clinically involved nodes or high grade histology.

Indications for postoperative radiotherapy lack randomised data. Postoperative radiotherapy is considered in all despite complete surgical resection except for low grade mucoepidermoid or acinic cell carcinomas. Patients with pathological nodal involvement are recommended to receive postoperative radiotherapy.

- Postoperative radiotherapy (60Gy/30 with boost to 66Gy for sites of positive/close margins or ECS.
- Boost to 66-70Gy can be considered for sites of gross nerve involvement tracking to the skull base which are unresectable).
- Radical radiotherapy can be considered for medically inoperable or unresectable tumours. The role of concurrent chemotherapy lacks randomised data but can be considered at the clinician's discretion in patients who are fit to receive this.
- Radiotherapy – 70Gy / 35 (7 weeks) or 55Gy/20 (5 weeks)
- Pleomorphic adenomas is the most common benign salivary gland neoplasm. They commonly arise from the superficial lobe and are managed by superficial parotidectomy.

Postoperative radiotherapy for pleomorphic adenoma is only indicated in recurrence and microscopic residual disease which cannot be managed surgically. Macroscopic residual disease should be managed surgically.

- Postoperative radiotherapy 50Gy/25# or 45Gy/25# (5weeks)

- For tumour involving skull base or for teenage/young adult patients – discussion/referral for NHS Proton Beam Therapy Panel may be appropriate

14. Paranasal / Sinonasal Cancer Treatment

The maxillary antrum is the commonest site (70%) with the most common histology being SCC. Adenocarcinoma, adenoid cystic carcinoma, esthesioneuroblastoma, melanoma, lymphoma, plasmacytoma and sarcoma also seen.

Most cases are locally advanced and requires a combined treatment modality approach with surgery and radiotherapy.

T1-2 N0 M0:

Discussions at Head & Neck MDT, with access to appropriate Skull Base Expert
Potential options:

- Surgery ± Postoperative radiotherapy (for close or positive margins)
- Primary radiotherapy
- Choice depends on size, location and expected functional/cosmetic outcome

T3-4 N0/+ M0:

Discussions at Head & Neck MDT, potential options:

- Resectable disease: Surgery ± Postoperative radiotherapy
- Unresectable or medically inoperable: Primary radiotherapy or chemoradiotherapy

For patient with chemo sensitive pathology then consider (T)PF regime. If a response is seen then consider radical therapy options post chemotherapy, including chemoradiation.

For tumour involving skull base or for teenage/young adult patients – discussion/referral for NHS Proton Beam Therapy Panel may be appropriate

15. Thyroid cancer treatment

Primary treatment surgical with postoperative radio-iodine dependent on risk factors.
Indications for External Beam radiotherapy:
<u>Unresectable Disease</u>

- Salvage after surgical recurrence
- Postoperative for Medullary, poorly differentiated tumours or patients unsuitable for radio-iodine
- Palliation

<u>Dose Fractionation:</u>

- As per Head and Neck 65gy/30, 55Gy/20 if inoperable/ recurrence
- Postoperative 60/30# - with boost if required-66/33 or 65/30 (See Section 4)
- Palliative Dose: 20Gy/5, 8gy Single

16. Palliative Radiotherapy for Head & Neck Cancer

Indications for palliative radiotherapy:

- Pain
- Bleeding
- Airway obstruction after tracheostomy
- Local control

The following radiotherapy schedules can be considered depending on tumour and patient factors:

- 8Gy single, 24Gy / 3#
- 20Gy / 5# (1 week) and consideration of 20Gy/5# at a later date such as at 4 weeks depending on response and patient fitness
- 30-36Gy/5-6 # (weekly, elderly HN skin)

Treatment technique: Virtual simulation, 3Dconformal or IMRT planning as appropriate depending on tumour and patient factors.

Treatment Verification

Complex IMRT planning: A minimum of on line CBCT fractions 1-3 then weekly with systematic error correction with Daily CBCT with on line correction as directed. For reduced CTV-PTV margins around critical structures, daily cone beam CT is recommended.

Simple Virtual simulation treatments may be verified with 2D imaging, fractions 1-3 then weekly as directed locally.

Each department should have policies and processes in place to evaluate dose during therapy in case of anatomical change and/or significant weight loss. Where significant changes have occurred Dose Assessments and Urgent replanning will be required to ensure dose constraints are maintained.

Please refer to local verification documentation

On Treatment Review

Patients reviewed weekly for radiotherapy toxicities. After completion of treatment patients are seen in out-patient clinic for regular medical review
Contact support should be available during and after therapy, including access to acute admission for toxicity management.

Treatment Letter

On resolution of acute toxicities a summary of the radiotherapy dose and toxicities experienced are documented.