East of England Radiotherapy Network:

Prostate Protocol V3.0

Contents

UNCONTROLLED IF PRINTED
EofE RTN Prostate Protocol V3
Author: Helen Swannie
Date Agreed: December 2025
Date to be reviewed: December 2026

1.0 Indications and patient population

This protocol covers external beam radiotherapy treatment in the following situations:

a. **Treatment of localised prostate cancer with curative intent**

i. Prostate +/- SV radiotherapy

ii. Prostate +/- SV radiotherapy and pelvic lymph node radiotherapy

EBRT should be considered in combination with brachytherapy dose escalation (LDR or HDR)[1] for intermediate and high risk localised prostate cancer following MDT discussion. Where necessary patients may be referred for the brachytherapy boost component with the EBRT delivered locally.
For brachytherapy treatment refer to EOE RT HDR Prostate Network Protocol[2]

b. **Post – operative radiotherapy (PORT)**

i. Following publication of the RADICALS trial and ARTISTIC meta- analysis[3,4] early salvage prostate bed radiotherapy rather than adjuvant PORT is recommended. Planned adjuvant PORT may be indicated in individual cases following MDT discussion. The use of additional pelvic lymph node radiotherapy is at clinician discretion.

c. **Palliative radiotherapy**

i. In low volume (as per CHAARTED and STAMPEDE[5]) de-novo hormone sensitive metastatic prostate cancer[6]

ii. For local control/palliation in other groups of patients

1.1 Curative treatment eligibility

1.1.1 Inclusion criteria

a. **T1-T4N0-1M0 adenocarcinoma of the prostate.**
   For information on the management of other histological subtypes, e.g. small cell carcinoma, refer to the EOE Cancer Alliance Guidelines for the Management of Prostate Cancer (14-1C-113g)
b. **Life expectancy >10 years in low/intermediate risk disease**
c. **Life expectancy >5 years in high-risk disease**

1.1.2 Exclusion criteria

a. **Absolute:**

a. **Previous pelvic radiotherapy**
b. **Active inflammatory bowel disease**

b. **Relative:**
a. **History of inflammatory bowel disease**
b. **Previous major pelvic surgery**
c. **Significant bowel dysfunction from other causes**
d. **Significant LUTS that cannot be optimised**
e. **Large gland volume**
If gland volume >100cc +/- significant LUTS (IPSS>10 , Q max <10ml/sec) consider TURP/HoLEP prior to RT or a longer course of neoadjuvant ADT

1.1.3 Essential Pre-Radiotherapy investigations

a. Histological confirmation of prostate adenocarcinoma
b. PSA
c. Pelvic MRI (CT if MRI incompatible pacemaker or unable to tolerate MRI)
d. Bone scan in all high-risk patients – i.e. one or more of G4+4; PSA>20 or T3 or higher and in any patient symptomatic with bone pain or raised ALP
e. Consider additional cross-sectional imaging if high risk disease to exclude distant metastatic disease

1.1.4 Preparation for localised prostate radiotherapy treated with curative intent

- Signed, written informed consent. Use of standard RCR consent form recommended National radiotherapy consent forms | The Royal College of Radiologists (rcr.ac.uk)
- Consider entry into clinical trials (EofE RTN Clinical Trials database)
- Bowel and bladder preparation as per departmental guidelines
- If patient has one or two THRs, request either metal artefact reduction reconstruction on CT planning scan or an MRI planning scan.
- Where possible obtain a radiotherapy planning MR and fuse to the planning CT to facilitate dominant lesion delineation and rationalise target volume definition[7]
- Consider use of hydrogel rectal spacer e.g. in patients planned for HDR brachytherapy (www.nice.org.uk/guidance/ipg752)
- Consider method of IGRT to be used (CBCT; gold seed fiducials if suitable and where available)[7]
- ADT may be given for 3-6 months prior to EBRT (may be omitted in patients with Gleason grade group 1; T1/2N0M0 disease).
  Patients with high-risk disease should be offered extended androgen deprivation following completion of RT. Consider ADT in the post-operative setting pending

results of clinical trials (e.g. RADICALS[3]). Offer lifestyle advice and how to manage ADT side effects.

- Patient should be given written patient information sheet detailing treatment and should be offered a copy of their consent form.

2.0 Localisation

Localisation	Notes	
Position	Supine	Refer to local policies[7]
Immobilisation and supports	Prostate board with knees adequately supported	
	Feet in foot stocks	
Organ pre-requisites	Empty rectum, typically <4cm A-P	
	Bladder comfortably full	
Contrast	For all patients receiving pelvic node RT	
CT acquisition	Slice thickness: 2.0-2.5mm slices	
	Scanning limits P +/- SV Superior = Top of L5, Inferior = 4cm below ischium	
	Scanning limits P + N Superior scan limit = Top of L3, Inferior – 4cm below ischium	

3.0 Dose prescription[8]

Intent	Dose (Gy)/#	#/week	Comments
a. Localised prostate cancer with curative intent	60Gy/47-48Gy/20# P/SV 44-47Gy/20# pelvic nodes	5	**Overall treatment time >=27 days[9]. Departments may wish to adopt CHHiP 3 dose level or PIVOTAL Boost/PACE C 2 dose level approach for P and SV**
	55Gy/20# P/SV	5	**If required for OAR sparing or co-morbidities**
	74Gy/59.2-60Gy/37# P/SV 55/37# to pelvic nodes	5	**If unsuitable for hypofractionation**
	37.5Gy/15# P/SV with HDR boost 46Gy/23# P/SV +/- pelvic nodes with HDR boost	5	**15Gy HDR boost approx. 2 weeks prior to or after EBRT**
	46Gy/23# P/SV +/- pelvic nodes with LDR boost	5	**110Gy LDR boost[11]**
	Stereotactic radiotherapy (SBRT) 36.25Gy in 5#	Max 3	**For patients meeting PACE-B trial criteria[12]**
b. Post-operative prostate bed radiotherapy	66Gy/33# 52-54Gy/33# to pelvic nodes	5	**Pelvic nodal radiotherapy at clinician discretion**
	52.5-55Gy/20# 44/20# to pelvic nodes	5	
c. Palliative radiotherapy	36Gy/6#	1	**Recommended dose fractionation for low volume hormone sensitive metastatic prostate cancer**
	55Gy/20#	5	**Alternative for low volume hormone sensitive metastatic prostate cancer**
	36Gy/6#	1	**Varying dose/fractionation schedules at clinician discretion for local control/palliation of symptoms.**
	30Gy/10#	5	
	20Gy/5#	5	
	21Gy/3#	3	
	8Gy/1#	1	

4.0 Target volumes

- Outlining is performed with reference to the diagnostic MRI scan and in line with ESTRO-ACROP consensus guidelines 2018[13] or according to trial protocol if applicable.
- Standard target volume nomenclature should be used: https://www.aapm.org/pubs/reports/RPT_263.pdf
- Target volumes should match agreed naming conventions unless there are operational reasons for use of other naming. PTV ProKnow nomenclature should be used for NHSE ProKnow Collections and Scorecard Templates for upload.

4.1 Curative radiotherapy GTV/CTV

- **GTV**
  - It is helpful to outline the dominant intraprostatic lesion (DIL) as the GTV, but the entire prostate gland will be included in the CTV_Prostate

- **CTV**
  - **CTV_Prostate (CTVp)** is defined according to consensus guidelines[14] and encompasses the entire prostate gland and any microscopic extraglandular extension and/ or extension of GTV into SVs. Care should be taken to exclude the base of the bladder (unless involved) and the urogenital diaphragm (unless apex affected).
  - **CTV_Seminal vesicles (CTVsv)**will vary and is dependent on trial protocol if applicable or individual risk[14]
    - For low-risk cases no inclusion or inclusion of proximal 1.4cm of the SV (in the axial plane) according to institutional policy
    - For intermediate-risk cases inclusion of at least proximal 1.4cm of the SV (in the axial plane)
    - For high-risk cases inclusion of at least 2.2cm of the SV (in the axial plane)
    - Where the SVs extend significantly posteriorly around the rectum, the posterior tips of the SVs may be excluded at the clinician's discretion to improve the dose distribution to the rectum
  - **CTV_nodes (CTVe)** is best created by a multi-step process such as that described in the PIVOTAL-Boost Trial Atlas, initially outlining pelvic vessels, and using a bowel expansion technique. 2021 amendments to the RTOG/NRG atlas guidelines[14] indicate that the nodes to be included extend superiorly to the bifurcation of the aorta though this has not yet been adopted in UK trial guidelines.

4.2 Post-operative radiotherapy CTV

- **CTV_Prostate Bed (CTVpb)**
  - Several guidelines exist for contouring the postoperative prostate bed CTV.[15-19] Additional information is available in the POPS trial protocol. The CTV will vary depending on operative histological findings (SV involvement, positive apical margin etc)
  - The addition of pelvic lymph node radiotherapy (CTV as for primary curative radiotherapy above) is at clinician discretion

4.3 Curative / adjuvant radiotherapy PTV

- PTV margins from CTV for primary curative radiotherapy are as defined for each department with reference to departmental verification methods and audit.
- PTVpb = CTVpb +7-10mm

4.4 Palliative radiotherapy

- **Low volume de novo metastatic prostate cancer**
  - CTV includes prostate gland and base of seminal vesicles if involved macroscopically[5]
- **Palliative radiotherapy for local control/symptoms**
  - CTV includes all symptomatic macroscopic disease

5.0 Organs at risk

- Aim for the use of standard nomenclature as per Global Harmonization Group consensus guidelines: https://www.thegreenjournal.com/action/showPdf?pii=S0167-8140%2820%2930294-2

Structure name	Description
Rectum	Superiorly rectosigmoid junction (anterior reflection at ~S3), minimum 2cm above CTV_SV; inferiorly c.2cm below lowest prostatic apex contour/inferior border of ischial tuberosities
Bladder	Whole bladder excluding CTV_P
Bowel	All bowel loops up to min of 2cm above sup most PTV
PenileBulb	Best visualised on MRI T2 sequences
Femur_Head_L or _R	Optional. If femoral head not contoured, then clinician accepts optimal constraints may not be met.
Urethra	Prostatic urethra - the lumen-mucosal interface, extending from bladder neck to the membranous urethra.

5.1 Constraints

- OAR dose constraints for Radical and Palliative dose schedules are shown below.
- If any dose constraints fail, the planner will discuss with a consultant prostate oncologist whether the plan is acceptable or whether alterations to CTV, dose/fractionation, or compromise on PTV coverage should be made on an individual patient basis.

Radical dose schedules - Localised prostate cancer

- **20 fraction treatments – 60Gy/20#/daily**
  - Radical Prostate/SV Only
    - PTVp_6000 = 60Gy
    - PTVpsv_4700-4800 = 47-48Gy
  - Radical Prostate/SV and pelvic lymph nodes
    - PTVp_6000 = 60Gy
    - PTVpsv_4700= 47Gy
    - PTVe_4400-4700 = 44-47Gy
  - These constraints also to be used when Radical patients are treated with 55Gy/20#

Structure name	Constraint (Gy)	Optimal	Mandatory
Rectum	V20	85%[20]	-
	V24	70%	80%
	V30	57%[20]	-
	V32	51%	65%
	V40	38%[20]	50%
	V48	27%	35%
	V50	22%[20]	-
	V52	-	30%
	V56	-	15%
	V60	0.01%[20]	3%
	V64	0%	1%
	V67	-	0%
	D_{mean}	<= 35Gy	-
Bladder	V40	50%	-
	V48	25%	50%
	V60	5%	35%
Bowel	V36	78cc	158cc
	V40	17cc	70cc
	V44	14cc	28cc
	V48	0.5cc	6cc
	V52	-	0cc
PenileBulb	V22	50%	-
	V48	10%	-
Femur_ Head_ L or _R	V40	5%	50%

- OAR constraints from PIVOTAL BOOST protocol v2.3 May 2020 (without HDR) and updated CHHiP anorectal constraints 2020[20].

- **37 fraction treatments – 74Gy/37#/daily**
  - Radical Prostate/SV Only
  - Radical Prostate/SV and pelvic lymph nodes
    - PTVp_7400= 74Gy
    - PTVpsv_5920-6000 = 59.2-60Gy
    - PTVe_5500= 55Gy

Structure name	Constraint (Gy)	Optimal	Mandatory
Rectum	V30	80%	-
	V40	65%	-
	V50	50%	60%
	V60	35%	50%
	V65	-	30%
	V70	-	15%
	V74	-	3%
Bladder	V50	50%	-
	V60	25%	-
	V65	-	50%
	V70	5%	35%
	V74	-	5%
Bowel	V45	78cc	158cc
	V50	17cc	110cc
	V55	14cc	28cc
	V60	0.5cc	6cc
	V65	-	0cc
PenileBulb	V27	50%	-
	V60	10%	-
Femur_Head_L or _R	V50	5%	50%

- OAR constraints from PIVOTAL trial protocol. Penile bulb and femoral head constraints from Atlanta V2.0 December 2021[21]

- **SBRT - 36.25Gy/5#**
    - Radical Prostate/SV Only

Structure name	Constraint (Gy)	Optimal	Mandatory
Rectum	18.1	-	50%
	29	-	20%
	36	1cc	2cc
Bladder	18.1	-	40%
	37	5cc	10cc
Bowel	18.1	-	5cc
	30	-	1cc
PenileBulb	29.5	50%	-
Femur_Head_L or _R	14.5	5%	-
Urethra (if visualised)	42	50%	-
	45	<0.001cc*	-

- OAR constraints from PACE trials; *PACE-NODES

Palliative dose schedules

- **Prostate and SV +/- nodes**
    - **55Gy/20#/4 weeks**
    - PTVpsv_5500 = 55Gy
    - PTVe_4400 = 44Gy (clinician discretion)

Structure name	Constraint (Gy)	Optimal	Mandatory
Rectum	V22.6	70%	80%
	V29.7	51%	65%
	V37.4	38%	50%
	V44.6	27%	35%
	V48.4	-	30%
	V52.3	-	15%
	V55	3%	5%
Bladder	V37.4	50%	-
	V44.6	25%	50%
	V55	5%	35%
Bowel	V37.4	-	17cc
PenileBulb	V20.2	50%	-
	V44.6	10%	-
Femur_Head_L or_R	V37.4	5%	50%

- OAR constraints from ATLANTA protocol V2.0
    - **Prostate and SV ONLY**

- **36Gy/6#/6 weeks**
- PTVpsv_3600 = 36Gy

Structure name	Constraint (Gy)	Optimal	Mandatory
Rectum	V14.8	70%	80%
	V19.4	51%	65%
	V24.5	38%	50%
	V29.2	27%	35%
	V31.7	-	30%
	V34.2	-	15%
	V36	3%	5%
Bladder	V24.5	50%	-
	V29.2	25%	50%
	V36	5%	35%
Bowel	V24.5	-	17cc
PenileBulb	V24.5	50%	-
	V29.2	10%	-
Femur_Head_L or _R	V24.5	5%	50%

OAR constraints from ATLANTA protocol V2.0 December 2021

Structure name	Constraint (Gy)	Optimal	Mandatory
Rectum	V33.3	-	50%
	V27.8	-	60%
	V16.7	-	80%
Bladder	V33.3	-	25%
	V27.8	-	50%

Alternative OAR constraints from STAMPEDE[5] trial

EBRT + Brachytherapy dose schedules

Constraints are for the EBRT plans only, separate constraints for brachytherapy are included in the EofE ODN protocol for HDR Prostate[2].

- **Prostate and SV 37.5Gy/15# +15Gy HDR**

Structure name	Constraint (Gy)	Optimal	Mandatory
Rectum	V25	38%	50%
	V30	27%	35%
	V33	-	30%
	V36	-	15%
	V37.5	3%	5%
Bladder	V25	50%	-
Bowel	V36	78cc	158cc

OAR constraints from PIVOTAL BOOST trial protocol v2.3 May 2020 (with HDR) for 37.5Gy/15#

- **Prostate and SV +/- nodes 46#/23# +15Gy HDR or 110Gy LDR**

Structure name	Constraint (Gy)	Optimal	Mandatory
Rectum	V18.6	80%	-
	V24.9	65%	-
	V31.1	50%	60%
	V37.3	35%	50%
	V40.4		30%
	V43.5	-	15%
Bladder	V31.1	50%	-
	V37.3	25%	-
	V40.4	-	50%
	V43.5	5%	35%
Bowel	V37.6	78cc	158cc
	V41.8	17cc	110cc
	V46	14cc	28cc
	V50.2	0.5cc	6cc
	V54.4	-	0cc

OAR constraints scaled from Pivotal trial protocol 74Gy/37# to 46Gy/23# assuming Rectum/Bladder receive 74Gy and Bowel receives nodal dose of 55Gy

6.0 Planning process/ technique

- VMAT/RapidArc or IMRT for radical RT
- VMAT/IMRT or Simple field arrangements for palliative RT

7.0 Peer Review/ Contour QA

- Prospective peer review should occur for cases where considerable individual judgement is required[22]. This may include
    - Radical prostate and pelvic nodal volumes
    - Post-operative prostate bed +/ nodes
    - Patients receiving an HDR or LDR boost
    - Difficult volumes at consultant request
- A proportion of standard radical prostate volumes should be reviewed retrospectively. If a patient develops significant acute or late toxicity retrospective peer review should occur.
- A description of the contouring (planning note) and of the peer review process including changes made should be saved in the patient record.
- The peer review process and outcomes should be audited.

8.0 Target verification

- Daily online IGRT with soft tissue matching or fiducials[7]

Modality	Frequency	Match point	Additional information
CBCT	Daily	Prostate	Kv planar if gold fiducials in place +/- CBCT

9.0 Side effects

- Acute and late side effects are detailed in the RCR National Consent Form for prostate RT National radiotherapy consent forms | The Royal College of Radiologists (rcr.ac.uk)

10.0 References

1. NHS England Clinical Commissioning Policy: Brachytherapy dose escalation with external beam radiotherapy for intermediate and high risk prostate cancer (adults) (210502P). https://www.england.nhs.uk/wp-content/uploads/2021/07/1831-Policy-for-publication-Final-1.pdf. Accessed 31 Oct 2021

2. East of England Radiotherapy Network Prostate Brachytherapy Protocol V2.0

3. Parker et al. Timing of radiotherapy after radical prostatectomy (RADICALS-RT); a randomised controlled phase 3 trial. Lancet 2020; 396; 1413-21

4. Vale et al. Adjuvant or early salvage radiotherapy for the treatment of localised and locally advanced prostate cancer; a prospectively planned systemic review and meta-analysis of aggregate data. Lancet 2020; 396; 1422-1431.

5.Parker et al. Radiotherapy to the primary tumour for newly diagnosed, metastatic prostate cancer (STAMPEDE); a randomised controlled phase 3 trial. Lancet 2018; 392; 2353-66

6. NHS England Clinical Commissioning Policy: External beam radiotherapy for patients presenting with hormone sensitive. Low volume metastatic prostate cancer at the time of diagnosis [P2008092P]. https://www.england.nhs.uk/wp-content/uploads/2020/11/1901-external-beam-radiotherapy-for-patients-presenting-with-hormone-sensitive-low-volume-metastatic-prostate-.pdf. Accessed 31 Oct 2021

7. The Royal College of Radiologists. On target2: updated guidance for image-guided radiotherapy. London: The Royal College of Radiologists, 2021.

8. RCR Radiotherapy dose fractionation; Prostate Cancer 4th edition. Accessed 18 Sept 2025.

9. Dearnley et al. Conventional vs hypofractionated high dose intensity-modulated radiotherapy for prostate cancer: 5 year outcomes on the randomised, non-inferiority, phase 3 CHHiP trial. Lancet Oncol 2016; 17; 1047-60.

10. Morris et al. Androgen suppression combined with elective nodal and dose escalated radiation therapy (the ASCENDE-RT trial). IJROBP 2017; 98(2) 275-285

11. Henry, Ann et al. GEC-ESTRO ACROP prostate brachytherapy guidelines. Radiotherapy and Oncology 167 (2022), 244 – 251.

12. Tree et al. Intensity-modulated radiotherapy versus stereotactic body radiotherapy for prostate cancer (PACE-B): 2-year toxicity results from an open-label, randomised, phase 3, non-inferiority trial. Lancet Oncol 2022; 23; 1308-20.

13. ESTRO ACROP consensus guideline on CT and MRI based target volume delineation for primary radiation therapy of localised prostate cancer. Radiotherapy and Oncology 127 (2018) 49-61

14. Hall et al. NRG Oncology Updated International Consensus on Pelvic Lymph Node Volumes for Intact and Postoperative Prostate Cancer. IJROBP 2021; 109 (1) 174-185

15. Michalski et al. Development of RTOG consensus guidelines for the definition of the clinical target volume for postoperative conformal radiation therapy for prostate cancer. IJROBP 2010; 76; 361-368

16.Poortmans et al. Guidelines for target volume definition in post-operative radiotherapy for prostate cancer, on behalf of the EORTC radiation oncology group. Radiother Oncol 2007; 84; 121-127

17. Sidhom et al. Post-prostatectomy radiation therapy: Consensus guidelines of the Australian and New Zealand radiation oncology genito-urinary group. Radiother Oncol 2008;88;10-19

18. Wiltshire et al. Anatomic boundaries of the clinical target volume (prostate bed) after radical prostatectomy. IJROBP 2007; 69; 1090-1099

19. Robin et al. Prostate bed Delineation Guidelines for postoperative radiation therapy: on behalf of the francophone Group of Urological Radiation Therapy. IJROBP 2021; 109, No 5, 1243-1253.

20. Wilkins A et al. Derivation of Dose/Volume Constraints for the Anorectum from Clinician- and Patient-Reported Outcomes in the CHHiP trial of Radiation Therapy Fractionation. IJROBP Vol 106; no 5 928-938, 2020.

21. Connor MJ, Shah TT, Smigielska K, *et al* Additional Treatments to the Local tumour for metastatic prostate cancer – Assessment of Novel Treatment Algorithms (IP2-ATLANTA): protocol for a multicentre, phase II randomised controlled trial. *BMJ Open* 2021; **11**: eO42593. Doi: 10.1136/bmjopen-2020-042953.

22. The Royal College of Radiologists. Radiotherapy target volume definition and peer review – RCR guidance. London: The Royal College of radiologists, 2017. Ref No BFCO(17)2.

11. 0 Members of the protocol drafting committee

Cambridge University Hospital NHS Foundation Trust: Dr Simon Russell, Dr Elumalai, Andrew Styling, David O'Doherty, Diane Whitney, Hannah Chantler, Jenny Mehrer

East Suffolk and North Essex NHS Foundation Trust: Dr Muthukumar, Dr Eric Lee, Dr Venkitaraman, Dr Samaha Nawaz, Danielle Thurlow, Shafi Sayed, Jason Glassford, Elaine Seabeck, Charusheela Joshi, Jonathon Poole, Eleni Bakola

Mid and South Essex NHS Foundation Trust: Dr Abby Cyriac, Lorraine Bessell, Michael Barlow, Natalie Turner

Norfolk and Norwich University Hospital NHS Foundation Trust: Dr Helen Swannie, Glynn Thomas, Elaine Broomes, Catherine Palmer

North West Anglia NHS Foundation Trust: Dr Aristoula Papakostidi, Dr Sayeuri Buddu, Dr Sarah Treece, Aileen Considine, Jaak Joe, Aquila Sharif

12.0 Amendment History

A record of changes in this document

Date	Updated version number	Previous version number	Page Number/ Section (updated version)	Details
06/03/23	V1.0			New Document
19/03/24	V2.0	V1.0	Through out 1.2.4 3.0 5.1 p14 10	Added abbreviated names for Targets e.g. CTVe. Updated elective nodal nomenclature from n to e in line with Proknow reporting. Reference to NICE guidelines added for rectal spacers 46Gy/23# +/- pelvic nodes (instead of just + nodes) with HDR boost added, as option to give 46Gy/23# for localised disease when not treating nodes. Updated formatting for all constraints table OAR constraints for EBRT with HDR boost added as not covered by ODN HDR Prostate protocol. Updated reference to ODN HDR Prostate protocol V2.0 as now issued.
23/05/24	V2.1	V2.0	15	Mandatory constraint for rectum V40.4 corrected to 30% and optimal constraint removed
09.12.25	V3	V2	Section 11	Membership updated
			Section 4	Target volume information updated
			Section 3	Dose prescription table updated
			Section 5	OAR structures updated
			Section 5	OAR constraints tables added for px updates
			Throughout	60Gy for elective nodes removed from px and OARs etc.