NHS England

Modernising Radiotherapy Services in England – developing proposals for future service models

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Developing proposals for future service models

Engagement Guide

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Promoting Equality

Equality and Health Inequalities statement

Promoting equality and addressing health inequalities are at the heart of NHS England's values. Throughout the development of the policies and processes cited in this document, we have:

- Given due regard to the need to eliminate discrimination, harassment and victimisation, to advance equality of opportunity, and to foster good relations between people who share a relevant protected characteristic (as cited under the Equality Act 2010) and those who do not share it; and

- Given regard to the need to reduce inequalities between patients in access to, and outcomes from healthcare services and to ensure services are provided in an integrated way where this might reduce health inequalities

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1. Introduction

1. In 2014, NHS England and Cancer Research UK together set out a vision for the future of radiotherapy services (**A Vision for Radiotherapy, 2014 - 2024**) (https://www.cancerresearchuk.org/sites/default/files/policyfeb2014radiotherapy_vision2014-2024_final.pdf) which would enable people across England to receive, and have access to, modern and innovative radiotherapy, which has been shown to be clinically and cost effective. Implementation of this vision would provide patients with substantially improved outcomes, higher cure rates and fewer side effects from their treatment.

2. This ambition for modern, innovative radiotherapy services was echoed in the independent Cancer Taskforce report (2015), (https://www.england.nhs.uk/wp-content/uploads/2016/05/cancer-strategy.pdf) specifically highlighting the need to tackle variation in the quality of services provided.

3. Clinical leadership is central to the way that specialised services are commissioned in England, an approach reinforced within the report of the independent Cancer Taskforce as being essential in achieving improvement in cancer survival and quality of services. The proposals contained within this engagement guide have been developed by the Radiotherapy Expert Advisory Group (EAG), a sub-group of the Radiotherapy Clinical Reference Group with membership comprising clinical, service, patient and public voice representatives and patient groups.

4. This engagement guide sets out NHS England's case for change and proposals, at an early stage in development, for modernising radiotherapy services through the establishment of networked non-surgical clinical oncology services. Our aim is to turn the ambition for radiotherapy services set out in the Taskforce report and the Vision for Radiotherapy publications into a reality. This will mean that people who require radiotherapy treatment will get access to high quality, safe and efficient services regardless of where they live.

5. Adoption of our proposals would mean the creation of approximately fourteen "networked" provider configurations (10.2 Appendix 2), closely mirroring emerging arrangements for Cancer Vanguards and Alliances and existing radiotherapy patient flows – particularly where care is more specialised. The final composition of these networks is not definite at this point. NHS England does not consider that these proposals will impact on the current number of radiotherapy delivery sites in England.

6. NHS England has recently announced a national radiotherapy equipment investment programme. This is an integral component of radiotherapy modernisation and will enable networked services to develop effective linkages - improving and streamlining clinical practices, such as treatment planning. The investment programme sits outside this engagement exercise.

7. NHS England is currently expanding access to more specialist and innovative forms of radiotherapy, such as Stereotactic Ablative Radiotherapy (SABR) and intracranial Stereotactic Radiosurgery / Radiotherapy (SRS/SRT), and will

continue to review access to these services in the short term. However, it is acknowledged that networked radiotherapy services will, over time, have an important and active role to play in implementing the expanding portfolio of innovative radiotherapy treatments and clinical trials within defined networked geographies, as the radiotherapy modernisation programme progresses.

8. It is important to us that everyone with an interest in radiotherapy services, in particular those that use or work in the service, and who are potentially affected by the proposals, have the opportunity to comment. This will enable NHS England, in partnership with patients, clinicians and other key stakeholders, to develop a revised service specification ready for public consultation early in 2017.

9. Should these proposals be adopted, NHS England – working with Sustainability and Transformation (STPs) structures, Cancer Vanguards and Cancer Alliances, will be seeking to complete a phased programme of implementation over the next 24 months.

2. Background

10. Radiotherapy is a core part of modern cancer treatment. It can cure cancers, can assist in alleviating symptoms and is cost effective. It is second only to surgery in its effectiveness in treating cancer and around 40% of patients who are cured receive radiotherapy as part of or the whole of their cancer treatment.

11. The use of radiotherapy is beneficial in the treatment of a broad range of different clinical conditions and cancer patient groups. Referral for radiotherapy treatment is made to a consultant clinical oncologist who is a member of the specific tumour site multi-disciplinary team (MDT).

12. NHS England took responsibility for commissioning all radiotherapy services in England from 1 April 2013. In October of that year, the organisation adopted a service specification for radiotherapy which set out the detail of the services it would commission.

13. The radiotherapy service specification (http://www.england.nhs.uk/commissioning/spec-services/npc-crg) includes paediatric radiotherapy, total body irradiation and stereotactic ablative radiotherapy (SABR) which is commissioned routinely for the treatment of early stage non-small cell lung cancer. The service specification forms the scope of the service review. Please note this review excludes intracranial SRS/SRT services which were subject to a previous review by NHS England.

14. In December 2015, NHS England approved the commencement of a service review in radiotherapy with the aim of securing improvements to services and delivery of the ambitions set out in the Vision for Radiotherapy document.

15. The objectives of the NHS England's Radiotherapy service review are to:

- ensure that clinically effective and economically efficient reconfigured clinical and service models for the provision of radiotherapy services are developed to achieve improved patient outcomes;
- ensure optimum and geographically equitable access to innovative radiotherapy treatments delivered in a clinically coherent and cost effective configuration
- identify, review and understand the evidence base to support the recommendations;
- engage with stakeholders and the public about any changes;
- develop the necessary commissioning products to enable service change, i.e. service specifications; and
- develop a sustainable resourcing approach to equipment replacement and upgrades.

16. To support this process, NHS England established an Expert Advisory Group (EAG) for Radiotherapy as a time-limited sub-group of the Radiotherapy Clinical Reference Group (CRG). The role of the EAG is to support the service review through the provision of expert clinical advice and to develop any required commissioning products, such as the service specification.

17. EAG members were selected through an 'expressions of interest' process open to the existing membership of the Radiotherapy CRG. The membership is multi-disciplinary and includes: (i) clinical oncologists; (ii) patient and public voice (PPV) representatives; (iii) medical physicists; (iv) radiographer managers and (v) commissioners.

18. The patient and public engagement representatives of the EAG describe the ambitions for patients:

"The best radiotherapy service should offer timely treatment, not delayed by staff absences or lack of appropriate equipment. This is not easily achievable in some smaller centres and so inter-service co-operation is needed so that patients are not disadvantaged. Creating sustainable networked teams will also allow people's holistic needs to be fully assessed from their diagnosis, treatment and beyond, so that long term support to optimise quality of life is routinely offered".

"We would like to see local, accessible services where the very best holistic care is assured, and, for rare or complex conditions, regional or national services where a concentration of experience is required for the highest standards to be achieved"

3. The Case for Change

19. Historically, radiotherapy services have developed independently and separately across England and autonomously within each provider organisation which has been exacerbated by the competitive nature of healthcare and a skills shortage amongst the professional groups. Each service tends to work in an isolated fashion to develop clinical practice. This culture has created an environment of competition which has resulted in minimal opportunities for sharing and learning

between clinical teams.

20. A number of new services, whether independent providers or satellite services of larger trusts, have developed over the last 10 years, on occasions at the boundary of two cancer referral networks, and in response to previous national activity modelling which suggested a need for large increases in radiotherapy capacity.

21. This development has helped to improve access to radiotherapy services for patients, but has resulted in, in some cases, complex pathway and governance arrangements and service sustainability challenges across the wider geography.

22. There is evidence of wide variation in:
    - clinical practice and quality of treatment;
    - access to advanced radiotherapy;
    - access to intensity modulated radiotherapy;
    - access to equipment with cone beam CT, image guided radiotherapy adaptive capability;
    - local strategies for equipment replacement which has resulted in an urgent need to replace and upgrade radiotherapy equipment and associated infrastructure;
    - entry into clinical trials limited by, amongst other factors, inadequate equipment capability and quality;
    - new technology evaluation using the Commissioning through Evaluation principles such as evaluating the use of new imaging modalities during treatment
    - subspecialisation to a maximum of two broad clinical areas
    - robust cover arrangements;
    - follow-up practice
    - staff recruitment and retention, expertise and clinical leadership;

23. Radiotherapy services face a significant challenge in terms of workforce shortages. The EAG consider the recruitment and continued development of all professional groups, including those in leadership roles, as of critical importance to the delivery of high-quality care.

24. Effective clinical leadership of services will enable services to create and implement cohesive clinical and service strategy, unlocking the potential of technological advancement and clinical research for the benefit of patients.

25. Clinical leadership is also integral to establishing effective clinical governance arrangements and building more resilient teams. Rigorous quality assurance programmes are a hallmark of high-quality, safe services and have a substantial and positive impact on team morale. In-turn, this build momentum in the development of services and supports successful recruitment and retention of people.

26. The clinical environment is rapidly changing. A clear example of this is the commissioning of two Proton Beam Therapy centres in England. These centres offer tremendous opportunity for advancing patient care, however they also have

the potential to put an additional strain on the finite, highly-skilled workforce.

27. The EAG consider that the challenges faced by radiotherapy services, now and in the future, will encourage and exacerbate a patchwork of service delivery. This is not sustainable and offers little resilience in a rapidly changing clinical environment.

28. In order to address this, the EAG has developed proposals that balance the need for local provision where appropriate and the concentration of expertise where necessary.

29. It is proposed that defined clinical subspecialist clinical oncology groups, working as part of integrated multi-professional teams, should be configured to serve populations sufficiently sized to underpin the full range of cancer surgery services and their supporting MDT structures. This clearly places radiotherapy networked services within the wider emerging Cancer Alliance/Vanguard and Sustainability and Transformation (STP) structures, reinforcing the need to develop coherent clinical pathways for patients. In addition, the adoption of electronic networking solutions now offers far-reaching opportunities for ambitious change.

3.1 Radiotherapy capacity and demand

30. A CRG-led review to assess the future demand for external beam radiotherapy concluded that a number of factors will have a significant impact on future linear accelerator capacity.

31. Evidence suggests that approximately 40% of cancer patients should receive radiotherapy as part of their treatment. A capacity planning exercise has modelled future radiotherapy activity levels for England predicated on an unprecedented 2% increase in patient numbers per year, in line with cancer incidence.

32. The CRG recognises that the impact of changes in clinical practice and technology over the next 5–10 years would significantly affect the activity projections associated with these changes and, therefore, the number of machines required in the future. This is particularly important as in general, the average number of fractions associated with an episode of care is likely to reduce.

33. These anticipated changes include: a trend of reducing fractionation; requirements for treatment imaging; capitalising on equipment efficiencies that are associated with new equipment; equity of patient access to innovative radiotherapy by concentrating some specialist treatments in a smaller number of centres; a move towards seven day services; and specifically that all treatment machines should be fully operational on all five week days as a minimum.

34. Seven-day working is a cornerstone of NHS England's strategic ambition and whilst we remain committed to ensuring that seven-day working is achieved, there is recognition of balancing these opportunities with the practical requirements of delivering safe and highly effective radiotherapy treatments.

35. Should a networked service envisage a re-provision of activity and capacity to a new location within their geography, the case must be substantiated in terms of; demonstrating for that population an existing differential access rate to radiotherapy, the capacity required to meet current activity levels for that population involved to include efficiencies and machine utilisation; and an assessment of the impact of this reprovision on existing cancer patient pathways particularly those outside the networked geography.

36. Any service located at the boundary of two cancer referral networks (potentially crossing two networked radiotherapy services) should be:

    - associated with a single networked oncology service - accessed by clinical oncologists from a single networked service so as not to fragment patient care.
    - linked to a lead provider that owns the activity delivered locally; and operates through a single governance arrangement which defines the team responsibilities;
    - restricted to a single multi-provider networked service to ensure robust, integrated and consistent pathways of care.

4. Clinical and service design principles

37. To support the development of these proposals, the EAG has produced a number of overarching principles to guide the modernisation of radiotherapy services and the development of future clinical commissioning products.

38. **Clinical services must be sustainable and delivered in a consistent way** such that best patient outcomes are assured by designing service and clinical models that: (i) ensure resilience to change; (ii) reduce variation in quality; (iii) ensure access to expert care, clinical trials and advanced radiotherapy technologies (iv) ensures appropriate treatments are delivered only by clinical oncology teams treating sufficient tumour specific cancer patient numbers (usually at least 50-100 per delivery site per indication per year) to maintain expertise and competence and to minimise variation in clinical practice.

39. **There must be collective population-based oversight of individual tumour sites across the networked service by the sub-specialist team** rather than a hospital specific catchment population perspective. This means that the hospital is a vehicle to serve the population rather than the catchment population defining the services for its local hospital.

40. **There must be alignment and national oversight of a programme of radiotherapy equipment replacement and upgrade to deliver the quality requirements.** This should include any associated treatment planning systems, licences and networked IT linkages to produce an infrastructure capable of delivering advanced radiotherapy to all appropriate patients, as well as promoting clinical research activity which, in turn, will drive service development.

41. **There must be a focus on the quality of radiotherapy treatment throughout the whole pathway** from expert patient assessment, target volume outlining, radiotherapy treatment planning, treatment delivery, including image guidance through a 'networked team' approach. Survivorship management must include a clear plan for prospective collection not only of tumour control data for all radically treated patients but also routine assessment of toxicity and Quality of Life including Patient Reported Outcome Measures according to an agreed national template.

42. **There must be a focus on ensuring improved access to radiotherapy trials. This will include facilitation of radiotherapy trials** through networked providers. This approach will build on NHS England's approach to Excess Treatment Costs (ETCs) and will allow providers to consider whether to front-load medical physics support, enabling Quality Assurance (QA) of approved trials prior to opening. It is anticipated that this pre-trial QA process could be shared and rolled out across the networked providers to avoid the current duplication of effort and independent approach. These proposed changes, along with other clinical requirements, will provide a framework through which all services will have the opportunity to participate in radiotherapy clinical trials for the common cancers.

43. In order to achieve this, the Expert Advisory Group recommends:

1.	The adoption of a mechanism for partnership working between radiotherapy providers, networked across a geographical population footprint of 3 to 6 million, designed to underpin the full scope of the cancer surgical services and supporting specialist MDT structures. In a very small number of cases, it may be that radiotherapy networks span more than one Cancer Alliance/Vanguard. This will be where there are tertiary flows for clinical oncology and radiotherapy that don't exactly mirror the Alliance/Vanguard footprint. This is reflected in the proposal to develop fourteen networked services, rather than nineteen as with Vanguard/Alliance footprints. It is currently considered that there are greater benefits associated with preserving patient flows, particularly tertiary, and population scale.
2.	That each "networked non-surgical clinical oncology service" configuration would include **at least one** tertiary centre and / or a tertiary centre that closely fulfils the definition of a comprehensive cancer network to lead the new service.
3.	This means that the lead provider should host the full range of specialist MDTs in line with tumour specific Improving Outcomes Guidance including population size and patient numbers for the full range of cancers including rare cancer specialist MDTs (sarcoma, neuro-oncology, paediatric oncology, hepato-biliary and pancreatic cancers etc) and must be a specialist regional provider of radiotherapy, treating a large range of cancer sub-site specialisations.
4.	The approach, described above, would be encapsulated through a **networked non-surgical oncology provider Board**, led by the lead

1.	The adoption of a mechanism for partnership working between radiotherapy providers, networked across a geographical population footprint of 3 to 6 million, designed to underpin the full scope of the cancer surgical services and supporting specialist MDT structures. In a very small number of cases, it may be that radiotherapy networks span more than one Cancer Alliance/Vanguard. This will be where there are tertiary flows for clinical oncology and radiotherapy that don't exactly mirror the Alliance/Vanguard footprint. This is reflected in the proposal to develop fourteen networked services, rather than nineteen as with Vanguard/Alliance footprints. It is currently considered that there are greater benefits associated with preserving patient flows, particularly tertiary, and population scale.
	provider. The Board would agree the structure and configuration of service delivery and underpinned by formal governance and contractual arrangements. The Board will include equal and balanced multi-disciplinary representation and decision making from all providers comprising the networked non-surgical clinical oncology service. In addition, each Board will have whole system representation, in particular senior leader(s) from the relevant Cancer Vanguard or Cancer Alliance, ensuring a link to Clinical Commissioning Groups, and Sustainability and Transformation (STP) groupings.
5.	The models must be underpinned by a single, integrated, multi-professional team that is co-ordinated to provide the designated range of radiotherapy treatments (as determined by the Board) from each of the delivery sites within the networked geography. The working arrangements should not be seen as hierarchical but rather harnessing the expertise that already exists across provider organisations within the "networked" service.
6.	That the process of equipment modernisation must be linked to the implementation of the service and clinical models (over time) to ensure value for money, facilitate efficiency gains and optimise the use of equipment and achieve the ultimate goal of improved patient care standards and outcomes.
7.	That investment is also made in IT infrastructure and electronic links between networked non-surgical oncology providers. This will enable innovative team approaches in treatment planning as well as facilitating regular interdepartmental quality assurance.
8.	A move towards common protocols, integration of a quality assurance framework and common Standing Operating Procedures is adopted across the networked clinical oncology service. This approach will facilitate the broader rollout and access to innovative techniques and treatments, including SABR (over time) across the networked geography. It is envisaged that this should not be unduly disruptive to existing working practice (staff remain in existing locations where appropriate) and that most patients continue to have treatment at the local site.

44. The proposed service model is based on an integrated networked approach

across a number of non-surgical oncology services within a defined geography that is both collegiate and based on partnerships. The longer-term commissioning and contractual arrangements for networked services will fit within the emerging STP and Cancer Vanguard/Cancer Alliance structures.

45. This will require building robust linkages between professional groups and clinical service providers that is underpinned by a governance framework to ensure managerial, research and clinical leadership is embedded to form a sustainable and integrated networked service.

46. The service model will support local care to be 'delivered closer to home' where clinically appropriate and concentration of expertise where this is essential to achieve high-quality, safe and efficient services across England.

47. The creation of a lead provider will drive and co-ordinate the process of innovation in radiotherapy across the network. Innovation could be initiated in any of the centres within the networked service with the appropriate expertise and with plans for rapid dissemination and implementation across the networked providers.

48. The proposed clinical and service models will ensure that we have sustainable services, unaffected by annual leave and staff vacancies, to enable service continuity and resilience to change.

49. Crucially, the models are designed to improve patient outcomes, tackle variation in quality and enable access to the appropriate team of experts able to deliver the full range of cancer specific clinical care, clinical trials and advanced radiotherapy technologies.

5. The Clinical and Service Model

50. Our design principles have been translated into a proposed clinical and service model, enabling stakeholders to better see what these mean for patients and services.

51. The EAG believes that the proposed service model puts radiotherapy providers in a very privileged position, able to create services fit for the future. It will be important to create opportunities to develop networked services that are aligned to robust clinical pathways; underpinned by rigorous quality assurance and peer review processes; and able to build local services that are based on clinical protocols, once established.

52. The networked model requires that radiotherapy is part of a fully integrated non-surgical oncology service that is shaped to support the range of co-located cancer services and MDTs locally. The type of cancer patients able to be treated at each provider site within the network will be dependent on:

    - co-dependency and co-location of some surgical and other support services relevant to and dependent on the complexity of the disease;

- the size and shape of the non-surgical clinical oncology service available locally including; staffing, in-patient facilities, chemotherapy services, out-patient services and the availability of the clinical and medical oncologist team;

- local sub-specialisation of at least two clinical oncologists to manage per cancer type at each provider site delivering the service and subspecialising individually in a maximum of two cancer types;

- integration of all non-surgical oncologists as core members of the associated tumour specific MDTs with opportunities for rationalisation;

- radiotherapy workload, patient throughput, and management responsibility by an individual clinical oncologist - noting that the patient numbers may be considerably higher to include palliative radiotherapy, brachytherapy and chemotherapy activity.

53. The network will be supported by the creation of a single integrated governance framework. This will describe how the networked partnership will operate to safeguard and improve quality and will include arrangements for:

    - the establishment of a Board to oversee the strategic development of radiotherapy and non-surgical clinical oncology services across the geography. This will include decisions on the make-up of the overarching integrated site specific teams, workforce and contingency planning and regular review of capacity to avoid any risks of over or under provision. This is particularly important in the context of the changing nature of clinical practice, more efficient technology solutions and improving access by expanding departmental opening hours;

    - regular network-wide clinical audit and service review meetings to cover as a minimum: (i) performance and quality outcomes; (ii) case-mix review; (iii) audit of treatments; (iv) development and audit of protocols and policies; and (v) critical incidents and near misses. This will include comparative audits of clinical practice between networked partners and, in time, national comparative audits;

    - a single approach to technical quality assurance including both clinical and technical protocols that enables the service to capitalise on the opportunities for efficiencies as a result of investment in equipment and IT;

    - agreement about the range of conditions to be treated by each provider within the networked service. This will be determined by the number of cases of each tumour site treated by each service to ensure a critical mass of patients and staff expertise; this needs regular review of projected versus actual patients treated. Examples using the treatment of gynaecological cancer and head and neck cancer are provided as a separate document.

- a single approach to equipment replacement and upgrades across the networked fleet of linear accelerators will be essential in order to align equipment requirements to the treatment profile of each delivery site, extract value from the procurement process, flexibility to minimise reduced capacity and facilitate a rapid commissioning process

54. Where there are insufficient patient numbers per year for all networked providers to treat a tumour-specific cohort of patients the providers must evidence an agreement in place that clearly defines:

    - the arrangements defining which providers will subspecialise in this clinical area;

    - the role and progression towards an integrated planning team;

    - the cohort and number of patients to be treated at each delivery site. Common cancers and less complex palliative patients should be treated locally; rare cancers should be planned and treated in fewer, larger centres.

55. The identification of delivery sites will be determined by the networked provider board in line with the operating framework requirements, including a broader 'team' approach to treatment planning and quality assurance as well as sufficient cancer site specific supporting infrastructure to ensure highest quality care and patient safety in the local service.

56. In order to harness expertise from the whole networked team, patients with the less common cancers could be treated more locally should the local service be:

    - identified as one of the sites able to deliver that subspecialty service **or**

    - the expertise is harnessed to deliver the treatment as part of a team at another site within the networked geography.

57. The vast majority of late effects following radiotherapy treatment should be managed locally as an integral part of rehabilitation or as part of locally stratified follow-up care pathways which include options for referral to local specialties / services that have expertise to manage complex late effects.

58. In addition to this, it is proposed that NHS England will work with radiotherapy providers during 2017/18 to co-produce an enhanced set of clinical indicators to be incorporated into future service monitoring processes.

59. The EAG has developed a clinical model framework (Table 1) to help illustrate the clinical model. The expectations of radiotherapy workload, patient throughput and management responsibility by an individual clinical oncologist are outlined, and it should be noted that the patient numbers may be considerably higher should palliative radiotherapy, brachytherapy and chemotherapy activity be included.

60. It is acknowledged that the radiotherapy catchment populations are not

necessarily synonymous with the cancer populations served by their host trust(s) which will vary according to the cancer site. This means that both the cancer services population and the radiotherapy catchment population must be considered as part of the service requirements as the radiotherapy catchment population could be either larger or smaller than the broader cancer service provision.

Table 1 Proposed clinical model

Trust Cancer Service Population and supporting MDT Infrastructure	Cancer type and patient throughput	Infrastructure
Up to 500,000 cancer population Common Cancer (4) MDT. Majority of RT patients (65% approx) and majority of RT fractions (65% approx.)	Usually >100 cases/year Per clinical oncologist Per cancer type For common cancers (at least 2 clinical oncologists per cancer type) 1. radical (standard) breast 2. radical prostate/bladder 3. radical rectum 4. lung 5.Palliative RT for Mets (any primary) 6. Palliative RT to primary site for 4 common cancers above	Planning via a single integrated and coordinated team; electronically linked to tertiary centre or lead provider for planning as required and QA; common protocols; Without (satellite) or with a team of at least 5 locally based clinical oncologists. In addition to the 4 common cancers and palliative RT, some other cancers could be (a) planned centrally/delivered locally or (b) planned locally with team coordination/delivered locally. Synchronous chemo-radiotherapy should generally not be delivered in a satellite setting this requires locally based clinical oncologists
Trust Cancer Service Population and supporting MDT Infrastructure	**Cancer type and patient throughput**	**Infrastructure**

Trust Cancer Service Population and supporting MDT Infrastructure	Cancer type and patient throughput	Infrastructure
0.5m -1 million approx. Non-Lead provider Common cancer MDTs as above plus potentially Gynae, Head and neck, Lymphoma, Upper GI, Primary CNS	Common cancers (4); Less common cancers concentrated in a smaller number of RT providers to ensure a minimum of 25-50 cases per year per clinical oncologist (minimum of 2 per cancer type) i.e. at least 1 case per week planned in the department. 5 Head and neck 6 Gynaecological 7 Lymphoma 8 Upper GI (oesophagus; HPB) 9 Primary CNS Scope of RT for less common cancers to be agreed by lead provider and networked team	Planning via a single integrated and coordinated team electronically linked to tertiary centre or lead provider for planning as required and QA; common protocols; with locally based clinical oncologists. Need critical mass of patients, staff expertise and full infrastructure support if uncommon cancers (5-9) to be treated locally within agreed networked provision (a) planned centrally/delivered locally or (b) planned locally with team coordination/delivered locally. (See exemplars and additional information)
Trust Cancer Service Population and supporting MDT Infrastructure	**Cancer type and patient throughput**	**Infrastructure**
At least 1-1.5million Non-lead provider Majority of patients and fractions (90%+)	Common cancers (1-4) and less common cancers (5-9) treated with a minimum of 25-50 cases per year per clinical oncologist (minimum of 2 per cancer type) 5. Head and Neck 6. Gynaecological 7. Lymphoma 8. Upper GI (oesophagus, HPB) 9. Primary CNS (each constitutes approx. 1.5-7.5% total episodes) Scope of RT for less common cancers to be agreed by lead provider and networked team.	Planning via a single integrated and coordinated team; electronically linked to smaller centre(s) and lead provider for planning as required and QA; common protocols; Has critical mass of patients, staff expertise and full infrastructure for treatment of uncommon cancers within agreed networked provision. Full range of integrated diagnostic and planning infrastructure (MRI,PET–CT) Brachytherapy for some indications where agreed. Lung SABR may be concentrated to these sites and lead providers Hostel accommodation for patients travelling >1 hour one way.
Trust Cancer Service Population and supporting MDT Infrastructure	**Cancer type and patient throughput**	**Infrastructure**
Lead Provider of a Networked population of 3-6 million must: Closely fulfil the definition of comprehensive cancer centre; full participation in broad range of cancer MDTs; may participate in specialist MDTs for rare conditions of e.g. paediatric, sarcoma anal, penile cancer, rare head and neck (sinus, NPC)	Common cancers (1-4), less common cancers (5-9) and rare cancers (10-14) treated with a minimum (if possible) of 25-50 cases per year per clinical oncologist. (minimum of 2 per cancer type) 10 Paediatric 11 Sarcoma 12 Anal 13 Penile 14 Rare head and neck (sinus, NPC)	Planning via a single integrated and coordinated team; electronically linked to smaller centre(s) for planning as required and QA; common protocols. Full range of integrated diagnostic and planning infrastructure (MRI; PET-CT) Hostel accommodation for patients travelling >1 hour one way. Will provide RT for rare (less than 1.5% total episodes) cancers and some will provide rare activity (total skin electrons, PBT, comprehensive brachytherapy, TBI, extracranial SABR (for uncommon conditions)

61. The EAG has developed a framework (Table 2) containing Lead Provider criteria. This sets out who will be responsible for hosting a radiotherapy Board, **which will consist of staff group leads from the three key professions from each provider**, whose management contract (Radiography, radiotherapy physics, Clinical Oncology) will be held with the lead provider.

62. It is recognised that dedicated programme management will be required to oversee the transition and development of the new arrangements (i.e. collate activity protocols, audits, standards, meetings) and co-ordinate the Board activities. It is considered that additional checks and balances will be needed in the system and it is recommended that there is commissioner representation on the board to provide support and effective oversight.

Table 2 Summary of criteria for identifying a lead provider

Lead Provider	Requirement
Scope of Services provided	Comprehensive Brachytherapy service Provider of paediatric oncology services or act as a conduit should changes occur to the service configuration Provider of Neuro-oncology and SRS/SRT Host of the full range of supra-specialist cancer MDTs including compliance with IOGs and associated specialist surgical teams and MDTs within same city/town Provide some of complex RT for less common indications to increase throughput and encourage expertise. Full multidisciplinary infrastructure (as described by tumour specific IOGs) to support each site specialist group care including cancer site specialist clinical nurse specialists, dietetics etc Offers radiotherapy treatments to a critical mass of patients and throughput of cases in all cancer disease types Subspecialisation of oncologists for the full range of cancer services including job planned sessional commitments. Specialist enhanced supportive care integration for all services Management and co-ordination of the provision of specialist services for complex late effects that align to specialist surgery and pathways as they arise to prevent / minimise late effects
Leadership	Accountable centre for datasets, comparative audit, protocol development and able to hold other networked RT services to account Informed patient decision making Emphasis on research leadership – embedded in every centre to ensure equitable patient access to radiotherapy clinical trials across the networked providers. Robust sessional clinical oncology commitments are in place Leadership approach balances central control and local ownership from a unified networked team structure
	Required to develop a single integrated and co-ordinated approach to equipment replacement to ensure resilience including allocation, phasing and

Lead Provider	Requirement
Innovation	commissioning of replacement linear accelerators that comply with the service specification Required to provide radiotherapy leadership and organisational management Required to consider and address Hostel and transport issues. Patients must be accommodated properly so ensure that patients have the full infrastructure of supportive care Full range of integrated diagnostic and planning infrastructure such as MRI and PET/CT
Workforce	Innovative approaches to developing teams and utilisation of staff within the teams. Teaching and training – responsibilities Registered training centre

5.1 Delivery Models

63. Patients may be well-served by a "satellite" approach to the provision of radiotherapy where significant access issues exist. This model requires both specialist assessment and planning in the central 'hub', together with local delivery of radiotherapy overseen by visiting clinical oncologists working under a single governance arrangement. The treatment plan, patient management system and patient notes at the satellite all need to be electronically networked with the centre.

64. A move to this arrangement for some existing services providing radiotherapy to populations of below 500,000 should be considered in order address the particular challenges that providing services in geographically 'remote' areas present when balancing patient access with resilience and sustainability of service provision and in accordance with the requirements described in this document.

65. All services should have robust governance arrangements in place that are common to both the linked provider and the satellite service to include;

- common protocols and integrated Quality Assurance system with the lead provider; electronic links for image capture, treatment planning, radiotherapy prescription and patient clinical records; outcomes reported as single service for extended geographical population using common dataset across provider units; common IRMER and incident reporting framework;

- common patient information and consent process; the same research governance, equal access to studies and adequate trial support infrastructure; common training of staff / CPD process; adequate staffing and recruitment;

- a seamless patient pathway as part of a single networked service and to avoid fragmentation of care all colleagues involved in the patient's care should be informed of the care plan;

- a transparent business model; agreed contingency plans to manage service disruption; an integrated equipment replacement programme with machine matching with the lead provider; clear lines of professional leadership (medical, radiographer and physics), responsibility and accountability.

66. Innovative delivery models should be explored to increase efficiency, enhance patient experience and quality of life and optimised staffing models to increase productivity.

67. The scope of treatments delivered using the satellite model would also fall within the framework as described above and as part of the scope of practice of the lead provider. It would still need to comply with the full supportive infrastructure and criteria for specialist patient care and safety.

6. The basis of the proposed changes

68. NHS England has undertaken a literature search and evidence synthesis in partnership with Public Health England, which focussed on the following questions:

- What is the volume outcome relationship for radical or curative radiotherapy or brachytherapy or curable cancer?
- What is the population base for radiotherapy access?
- What organisational structures or configurations might impact on access to radiotherapy and radiotherapy outcomes?

69. The literature search has confirmed that at present, the best evidence to use to inform the responses to these questions is in the form of published NICE or Royal College guidelines relating to specific tumour types, which have informed the EAG recommendations.

70. In the absence of robust published evidence applicable to NHS settings and clinical models of care the search has determined that the revisions to the service specification should be developed through clinical consensus and clinical expert opinion. This is because the evidence synthesis confirmed that there is an absence of compelling published and peer reviewed evidence relating to service configuration and the relationship between volume and outcome for radiotherapy specifically (as opposed to surgery where this relationship is well documented).

71. There is published evidence to suggest, however, that staff competency is greatly enhanced through regularly delivering treatments so that the specialist work becomes “routine” to the team. Higher volumes of activity therefore help achieve a regular weekly throughput of patients. The EAG has used this evidence as a benchmark to inform their recommendations.

72. Furthermore, the Expert Advisory Group has highlighted a number of **potential** problems with low patient throughput and / or single handed oncologist practice, summarised in Table 3.

Table 3 Potential Benefits of Higher Patient Volumes

High patient Volumes	Low patient Volumes
Clinical and planning expertise	Leads to a lack of clinical/planning expertise
Full Multidisciplinary support structure	In adequate throughput affects the available funding to provide the full support structure
At least 2 clinical oncologists subspecialising and treating >50 cases/year. Cross cover available within team	Single handed practice, treating <25 cases/year. This can lead to a lack of cross cover and delays in starting treatment.
No more than 2 broad areas of subspecialisation for clinical oncologists	Oncologists are required to cover more than 2 broad areas of subspecialisation for clinical oncologists
Regular QA/peer review within team	Low numbers can lead to difficulties in achieving a critical mass of cases to regularly quality assure
Prospective data collection; outcomes available for treatment centre	Limited opportunity for prospective data collection; prognostic info for patient based on 'the literature'
Bespoke facilities	"Affordability" challenges of bespoke facilities
Research leadership from team of subspecialties.	Lack of research leadership for each cohort of patients
Service leadership	Potential lack of service leadership
Greater scope for efficiencies	Less scope for efficiencies
Innovative practice more likely	Innovative practice is less likely
Established team makes recruitment easier	Problems recruiting staff to subspecialist areas

6.1 Impact on patients

73. The over-arching objective of our proposals for new clinical and service models is to drive improvements in the way radiotherapy services are delivered for the future.

74. We want to ensure sustainable, high-quality, safe and efficient services. We also want to improve access for patients, enabling them to receive care as close to their homes as possible, where clinically appropriate. The vast majority of patients will be unaffected by our proposals and will continue to receive care for conditions such as breast cancer, prostate cancer, pre-operative rectal cancer, lung cancer, and palliative cancer, in local hospitals.

75. At the same time, we want to make sure that those with more complex, and rarer cancers, have access to the very latest treatments and technologies, as well as to clinical trials, and treated by experienced subspecialist teams which may not be available at their local hospital. This means that some of the more innovative radiotherapy for some types of cancer might only be available in a limited number of centres, where expertise can then be concentrated, offering patients' access to a full range of cancer care, specific to their particular condition.

76. This exercise is not about reducing the number of sites currently delivering radiotherapy. The number of radiotherapy delivery sites will be maintained. Instead, it is about ensuring that patients are able to access the right level of care, in the most appropriate setting. Concentrating sub-specialty clinical expertise in fewer centres supports clinicians and their teams in maintaining clinical competencies, which, in turn, leads to better patient outcomes, and improved patient experience.

77. Our proposals for the development of networked arrangements, supporting the service model described in this document, underpin existing and well established cancer patient pathways. The exact nature and size of those networks will be the subject of discussion during this engagement period.

6.2 Impact on Staff

78. It is recognised that in order to achieve these ambitious proposals, a radically different approach to the way services are organised is needed. The creation of a single, integrated, multi-professional team, arranged to provide radiotherapy treatment at each of the delivery sites within the networked geography, is a major component of the proposals.

79. Furthermore, the creation of a single physics team covering multiple delivery sites would help to address the current crisis of skills shortages in the workforce and provide wider clinical benefits through greater standardisation. It is acknowledged that this would be a significant change.

80. This approach will enable the networked clinical oncology service to harness expertise in all aspects of treatment and care, including sub-speciality clinical practice, in order to create integrated tumour site specific sub-specialist teams. These changes will improve the resilience of the service whilst building on the potential for efficiency through effective implementation and staff development including:

- Integrated workforce modelling aligned to new ways of working
- changing working patterns and skills mix to optimise the use of technologies and automation
- creating a critical mass of physicists with scope for subspecialisation to support;
    - the development and roll-out of innovative practice;
    - increased clinical capacity to engage with innovation and implementation of new radiotherapy technologies;
    - extended roles and site specialisation for radiographers to create opportunities for recruitment and retention of staff;
    - enabling 1-2 sub-specialty interests for clinical oncologists

- reducing variation through the introduction of internal team peer review of contouring, planning, clinical process and audit
- enabling a strategic networked approach to prioritisation and implementation of new radiotherapy technologies;
- enabling service leadership, research leadership;
- achieving excellence through the concentration of patients cohorts aligned with clinical expertise;

81. The framework described within this model will ensure managerial, research and clinical leadership to the full integrated and networked service to ensure that clinical variation is reduced. A summary of evidence and rationale for change is included at Appendix 10.4.

7 Why is NHS England engaging?

82. NHS England is committed to developing its service specifications in an open and transparent way, ensuring that the specifications developed by NHS England are informed by as wide a range of views as possible at an early stage.

83. This is an informal discussion and engagement period, during which we would like to hear from anybody with an interest in radiotherapy services.

84. Your views, during this period, will help to inform the content of any revised service specification for radiotherapy. We will formally consult on this revised specification in the New Year

8 Questions to help guide the discussions

85. For ease of reference, the key sections of text relating to each question is included (in italics).

The proposal is to create networked clinical oncology services in England sufficiently sized to align with the existing cancer pathways, specialist cancer surgery services and the associated specialist MDT arrangements. Current thinking is that a networked service should cover a population of 3-6 million and be aligned with the Cancer Alliance and would be led by a specialist regional provider of radiotherapy. The geographies of the proposed "networked" services are outlined in Appendix 2. This would mean that some cancer treatments would be concentrated into a fewer number of centres to ensure availability and maintenance of clinical expertise.

Question 1a: Do you support the proposal to create networked services? Please explain your answer here

Question 1b: What comments and/or ideas do you have about how networked services could be organised?

Principle 5 states that there must be alignment and national oversight of a programme of radiotherapy equipment replacement and upgrade to deliver the quality requirements. Current thinking is that this would be approached through a networked, non-surgical oncology provider Board that would agree the structure and configuration of service delivery.

Question 2: What comments and/ or ideas do you have about how the proposals could work in practice?

In order to deliver consistent, sustainable services with the best outcomes for patients, we are proposing that a minimum 25-50 tumour specific radical radiotherapy cases are managed per clinician year and that each delivery location must treat 50-100 radical cases per year is the appropriate approach.

Question 3a: Please explain whether you feel that the case numbers presented within the clinical and service model reflect clinical best practice?

Question 3b: Can you think of anything else that should be considered that may impact on the case numbers proposed?

Question 4a: What equality and/or health inequality issues may arise as a result of the proposals, as they currently stand?

Question 4b: What steps could be taken to avoid any equality and/or health inequality issues?

Question 5: Is there anything else that we need to take into account when developing the service specification?

9 Next steps

86. The engagement period, during which we hope to gather views about the content of this discussion document, is open to everyone and will run from 28 October 2016 to 23 December 2016.

87. We hope, during this period, to hold a number of regional and national face-to-face engagement events, to enable as many people as possible to participate in this process to share their views.

88. We also recognise that not everybody will want to travel to an event, and therefore we anticipate organising a number of online webinars, which will enable a larger number of people to get involved in the discussions, in a more informal way.

89. All events during this period will be advertised on the NHS England website (https://www.england.nhs.uk/event-listings/) and we will endeavour to keep in touch with as many registered stakeholders as possible, via our usual links.

90. Anybody who wishes to contribute views regarding the proposed clinical and

service models, or if you have a query about the content of the discussion document, please get in touch with us at England.npoc-cancer@nhs.net

10 Appendices

10.1 Appendix 1: Commissioned Providers

Provider Name
Barking, Havering and Redbridge Hospitals NHS Trust
Barts Health NHS Trust
Brighton and Sussex University Hospitals NHS Trust
Cambridge University Hospitals NHS Foundation Trust
Christie Hospital NHS Trust
Clatterbridge Cancer Centre NHS Foundation Trust
Colchester Hospital University NHS Foundation Trust
Derby Hospitals NHS Foundation Trust
East and North Hertfordshire NHS Trust
Gloucestershire Hospitals NHS Foundation Trust
Guy's and St Thomas' NHS Foundation Trust
Hampshire Hospitals NHS Trust
Hull and East Yorkshire Hospitals NHS Trust
Imperial College Healthcare NHS Trust
Ipswich Hospital NHS Trust
Lancashire Teaching Hospitals NHS Foundation Trust
Leeds Teaching Hospitals NHS Trust
Maidstone and Tunbridge Wells NHS Trust
Newcastle Upon Tyne Hospitals NHS Trust
Norfolk and Norwich University Hospital NHS Trust
North Cumbria University Hospitals NHS Trust
North Middlesex University Hospital NHS Trust
Northampton General Hospital NHS Trust
Nottingham University Hospitals NHS Trust
Oxford Radcliffe Hospitals NHS Trust
Peterborough and Stamford Hospitals NHS Foundation Trust
Plymouth Hospitals NHS Trust
Poole Hospital NHS Foundation Trust
Portsmouth Hospitals NHS Trust
Royal Berkshire NHS Foundation Trust
Royal Cornwall Hospitals NHS Trust
Royal Devon And Exeter NHS Foundation Trust
Royal Free Hampstead NHS Trust
Royal Marsden NHS Foundation Trust
Royal Surrey County NHS Foundation Trust
Royal United Hospital Bath NHS Trust
Royal Wolverhampton Hospitals NHS Trust
Sheffield Teaching Hospitals NHS Foundation Trust
Shrewsbury and Telford Hospital NHS Trust

Provider Name
South Devon Healthcare NHS Foundation Trust
South Tees Hospitals NHS Trust
Southend University Hospital NHS Foundation Trust
Taunton and Somerset NHS Foundation Trust
United Lincolnshire Hospitals NHS Trust
University College London Hospitals NHS Foundation Trust
University Hospital Birmingham NHS Foundation Trust
University Hospital of North Midlands NHS Trust
University Hospitals Bristol NHS Foundation Trust
University Hospitals Coventry and Warwickshire NHS Trust
University Hospitals of Leicester NHS Trust
University Hospitals Southampton NHS Foundation Trust
Worcestershire Acute Hospitals NHS Trust

10.2 Appendix 2 Cancer Alliances / Vanguards and cancer pathway linkages to achieve 3- 6 million populations

Region	Cancer Alliance / Vanguards footprint	STP coverage	Cancer Alliance / Vanguard Population	Possible networked configurations 3-6 m populations (Includes RT population in brackets)
North	North East and Cumbria	Covers 3 STPs: Northumberland, Tyne and Wear West, North and East Cumbria Durham, Darlington, Tees, Hambleton, Richmondshire and Whitby	3 million	Newcastle Upon Tyne Hospitals NHS Trust (1,755,837) North Cumbria Acute Hospitals NHS Trust (300,549) South Tees Hospitals NHS Trust (1,011,710)
	Lancashire and South Cumbria	Covers 1 STP: - Lancashire and South Cumbria	1.6 million	Christie Hospital NHS Trust (3,250,272)

Region	Cancer Alliance / Vanguards footprint	STP coverage	Cancer Alliance / Vanguard Population	Possible networked configurations 3-6 m populations (Includes RT population in brackets)
	National Cancer Vanguard: Greater Manchester	Covers 1 STP: - Greater Manchester	2.8 million	Lancashire Teaching Hospitals NHS Foundation Trust (1,443,305)
	Cheshire and Merseyside	Covers 1 STP: - Cheshire and Merseyside	2.4 million (excluding Wales)	Clatterbridge Cancer Centre NHS Foundation Trust (2,219,372)
	West Yorkshire	Covers 1 STP: - West Yorkshire	2.5 million	Leeds Teaching Hospitals NHS Trust (2,800,766)
	Humber, Coast and Vale	Covers 1 STP: - Humber Coast and Vale	1.4 million	Hull and East Yorkshire Hospitals NHS Trust (1,016,331)
	South Yorkshire and Bassetlaw	Covers 1 STP*: - South Yorkshire and Bassetlaw	1.5 million	Sheffield Teaching Hospitals NHS Foundation Trust (1,759,015)
Midlands and East	West Midlands	Covers 6 STPs: - Shropshire - Staffordshire - West Birmingham & Black Country - Birmingham and Solihull - Coventry & Warwickshire - Herefordshire & Worcestershire	5.7 million	Royal Wolverhampton Hospitals NHS Trust (847,433) Shrewsbury and Telford Hospital NHS Trust (452,790) University Hospital Birmingham NHS Foundation Trust (1,931,339) University Hospital of North Midlands NHS Trust (657,233) University Hospitals Coventry and Warwickshire NHS Trust (1,037,004) Worcestershire Acute Hospitals NHS Trust (New provider)
	East Midlands	Covers 5 STPs: - Lincolnshire - Derbyshire* - Leicestershire - Northamptonshire - Nottinghamshire	4.4 million	Derby Hospitals NHS Foundation Trust (704,817) Northampton General Hospital NHS Trust (715,770) Nottingham University Hospitals NHS Trust (1,101,230) United Lincolnshire Hospitals NHS Trust (564,952) University Hospitals of Leicester NHS Trust (915,820)
	East of England	Covers 6 STPs: - Mid & South Essex - N E Essex & Suffolk - Norfolk	6.3 million	Cambridge University Hospitals NHS Foundation Trust (1,408,835) Colchester Hospital University NHS Foundation Trust (699,489) East and North Hertfordshire NHS Trust (MVCC) (1,937,737)

Region	Cancer Alliance / Vanguards footprint	STP coverage	Cancer Alliance / Vanguard Population	Possible networked configurations 3-6 m populations (Includes RT population in brackets)
		- Cambridgeshire & Peterborough - Milton Keynes, Bedfordshire & Luton - Hertfordshire & West Essex		Ipswich Hospital NHS Trust (352,977) Norfolk and Norwich University Hospital NHS Trust (842,360) Peterborough and Stamford Hospitals NHS Foundation Trust (268,508) Southend University Hospital NHS Foundation Trust (660,285)
London	National Cancer Vanguard: North West and South West London	Covers 2 STPs: - North West London - South West London	3.5 million	Imperial College Healthcare NHS Trust (1,172,283) Royal Marsden NHS Foundation Trust (2,135,001)
South London	Surrey & Sussex	Covers 4 STPs**: - Frimley Health *(Surrey Heath CCG, North East Hampshire and Farnham CCG only)* - Sussex and East Surrey Surrey Heartlands	3 million	Brighton and Sussex University Hospitals NHS Trust (923,398) Royal Surrey County NHS Foundation Trust (1,245,057)
London	National Cancer Vanguard: West Essex, North Central and North East London	Covers 2 STPs: - North Central London - North East London	3.3 million	Barking, Havering and Redbridge Hospitals NHS Trust (586,746) Barts Health NHS Trust (1,078,722) North Middlesex University Hospital NHS Trust (573,653) University College London Hospitals NHS Foundation Trust (868,771) Royal Free Hampstead NHS Trust (384,387)
	South East London	Covers 1 STP: - South East London	1.7 million	Guy's and St Thomas' NHS Foundation Trust (1,695,277)
South	Kent & Medway	Covers 1 STP: - Kent and Medway	1.8 million	Maidstone and Tunbridge Wells NHS Trust (1,776,720)
South	South	Covers 3 STPs**:		

Region	Cancer Alliance / Vanguards footprint	STP coverage	Cancer Alliance / Vanguard Population	Possible networked configurations 3-6 m populations (Includes RT population in brackets)
	Central	- Buckinghamshire, Oxfordshire and Berkshire West - Bath, Swindon and Wiltshire *(Swindon CCG only)* - Frimley Health *(Slough CCG, Windsor, Ascot and Maidenhead CCG and Bracknell and Ascot CCG only)*	2.3 million	Oxford Radcliffe Hospitals NHS Trust (1,334,512) Royal Berkshire NHS Foundation Trust(715,497)
	Wessex	Covers 2 STPs: - Dorset - Hampshire and Isle of Wight	2.5 million	Hampshire Hospitals NHS Trust (144,480) Poole Hospital NHS Foundation Trust (713,802) Portsmouth Hospitals NHS Trust(787,346) University Hospitals Southampton NHS Foundation Trust (1,265,099)
	Somerset, Wiltshire, Avon & Gloucestershire (SWAG)	Covers 4 STPs**:* - Gloucestershire - Somerset - Bath, Swindon and Wiltshire *(minus Swindon CCG)* - Bristol, North Somerset and South Gloucestershire	2.7 million	Gloucestershire Hospitals NHS Foundation Trust (900,655) Taunton and Somerset NHS Trust (384,846) University Hospitals Bristol NHS Foundation Trust (1,069,735) Royal United Hospital Bath NHS Trust (431,841) Plymouth Hospitals NHS Trust (453,046) Royal Cornwall Hospitals NHS Trust (403,014) Royal Devon And Exeter NHS Foundation Trust (572,489) South Devon Healthcare NHS Foundation Trust (243,574)
	Peninsula	Covers 2 STPs: - Devon - Cornwall and the Isles of Scilly	1.7 million	

10.3 Appendix 3 Summary of evidence and rationale for change

Requirements	Rationale

Clinical services must be sustainable and delivered in a consistent way Radiotherapy services are "networked" across a defined and established population of 3-6m. The full networked service will ensure the full provision of service to 3-6m population through a lead provider which will be a specialist regional provider of radiotherapy with a large range of sub-site specialisations	There is evidence of wide variation in clinical practice and quality of treatment and access to advanced radiotherapy as well as an urgent need to replace and upgrade radiotherapy equipment and infrastructure. It is clear that entry into clinical trials is now limited by, amongst other factors, inadequate equipment capability and quality. This is expert opinion based on clinical consensus from the Expert Advisory Group in order to address: • The recruitment of the full range of staff with the appropriate range of experience and expertise • Provide staffing resilience able to be built into the service • The measurement and variation in clinical outcomes • Capitalise on opportunities of non-surgical oncologists to subspecialise in accordance with RCR recommendations • Address the low numbers of some cancers treated at an individual radiotherapy service level • The variable Quality Assurance • The variation in clinical practice and treatment fractionation by department and individual clinician level • The delays and variation in pace of replacing ageing radiotherapy equipment • The Variation in throughput, hours of working and efficiency of services • Variability of rolling out of innovation in treatment
There must be collective population based oversight of individual tumour sites across the networked service by the subspecialist team A networked service covering a population sufficiently sized to align with the existing cancer pathways relating to the full spectrum of specialist cancer surgery services and the associated specialist MDT arrangements. This is envisaged to be 3-6m to ensure access to the full spectrum of radiotherapy treatments and modalities through the creation of cost effective networked models of delivery.	One centre within each "networked service" configuration will include at least one tertiary centre which closely fulfils the definition of a comprehensive cancer network that is a provider of the full range of specialist cancer surgery, paediatric cancer services and hosts the full range of specialist MDTs in line tumour specific Improving Outcomes Guidance including population size and patient numbers for the full range of cancers including rare cancer specialist MDTs (sarcoma, neuro-oncology, paediatric oncology, HPB etc).

There must be collective population based oversight of individual tumour sites across the networked service by the subspecialist team Clinical Oncologists should be employed locally but integrated as a non-surgical oncology team where all are members of specific subspecialty teams for the networked service delivery of RT at a lead provider +/- additional delivery sites as required to meet the demand for each tumour type such that: • The size of the subspecialty team determined by the number of radical radiotherapy cases across the networked geography and the geographical spread of services taking into account affordability and sustainability (cover) • Radical treatments at each delivery site must be 25-50 per tumour site per clinician (or subset of) including SABR for each subspecialist cancer type. • Must be cross-cover arrangements (2 subspecialists per tumour site)	This conforms with existing patient cancer pathways and supports the provision of care. Meets the requirement to be treated in a time efficient manner and an accessible geographical location where appropriate. Provides sufficient workload to maintain staff expertise and tumour specific supportive care infrastructure Builds on Improving Outcomes Guidance and existing cancer pathways and MDTs RCR Recommendations (Guide to job planning in clinical oncology 3rd edition 2015)
There must be a focus on the quality of radiotherapy treatment throughout the whole pathway To generate a minimum 25-50 patients treated per consultant each year and 50-100 cases by each provider of each cancer type treated locally. This level of throughput will assure that the delivery of treatment for each cancer type is 'routine' to promote expertise. The radiotherapy service specification requires stereotactic ablative radiotherapy (SABR) be delivered by centres treating 25-50 cases per year; the proposed service model will facilitate 'roll-out" across networked providers to meet this requirement. The 'Vision for Radiotherapy' document, published in 2013, describes models of concentrating expertise in the delivery of complex treatments. The number of RT providers treating each tumour site will be dependent on: • Total radical caseload • Number of delivery sites to treat the caseload • Subspecialist arrangements • Critical mass and infrastructure – versus actual numbers • Affordability Must have fully functioning MDTs covering the range of treatments	The minimum volume of cases is achievable for populations of 3-6million delivered in a limited number of providers across the networked geography. This approach aligns with other IOG recommendations for other specialist cancer services including Hepatobiliary (HPB) and Upper Gastrointestinal (UGI) Head and Neck, Gynaecological cancers and Sarcoma IOGs. Safety and consistency are improved through regular delivery of radiotherapy for each rarer cancer type by a suitable competent team regularly treating patients. 50 -100 cases is, on average, one or two patients per week which is recommended as a minimum to ensure a constant stream of patients and to maximise expertise. To maintain competency by treating sufficient patient numbers. Patient pathways in place and aligned to specialist MDTs Application of the IOG and National Peer Review requirements for surgical services.

There must be a focus on ensuring improved access to radiotherapy trials. It is expected that a tertiary centre, that fulfils the criteria above, will act as lead provider within the networked service covering 3-6m and in addition will: • Have a significant Radiotherapy R+D role. (Vanguard sites for technical innovation e.g. Advanced technology MRI Linacs / Sim • Academic Radiotherapy appointments largely based in these centres • Deliver 'national' services e.g. SRS/SRT, co-ordination of provision of specialist services for complex late effects • Co-ordinate consistent RT protocol approach within their 'network'/partnership • Co-ordinate RT QA within their partnership. QA payments would need to be contingent upon weekly quality RT meetings (electronic) with the lead centre • coordinate collection and infrastructure for clinical outcomes data collection within their partnership • Provide some of complex RT for less common indications to increase throughput and encourage expertise	To drive innovation and support the rollout and implementation of changes in clinical practice. Developments in clinical practice can occur in any of the networked services but the drive to change should be co-ordinated at a lead provider level. Quality assurance and standards are maintained Lower volume and frequently conditions of high complexity and need for additional infrastructure resources. This will ensure that a concentration of expertise in treating the very rare and complex patients is maintained. Cost efficient and more clinically effective to manage this smaller cohort in a small number of centres in England.
Established, integrated multi-disciplinary clinical teams determine the treatment decisions (surgeons and sub-specialist clinical oncologists) within the broader MDT arrangements	NICE mandatory requirement
Integrated multi-disciplinary teams agree the treatment delivery approaches (surgeons and sub-specialist clinical oncologists with appropriate radiotherapy clinical staff)	NICE requirement and best practice
Integrated sub-specialist oncology teams across the wide geography will work together to ensure that patient referral pathways and processes (pre and post treatment) are established across and between networked radiotherapy services to support patient management during the pre and post treatment phase locally.	Optimal patient care and provides the opportunity to explore all the options for other treatments to ensure appropriate treatment options are considered. Ensure co-ordination of care through referral and follow up.
All service providers will be expected to adhere to NHS England Radiotherapy clinical commissioning policies and protocols and NICE IOG and technology appraisals	Lead provider and MDT mechanism will be in place.
All service providers will be expected to collect and submit monthly data to a central database for analysis. This will include clinical outcomes data.	NICE IOG

10.4 Appendix 4 Glossary

4D Adaptive Radiotherapy	The ability to take account of the tumour shape in the three physical dimensions plus the fourth dimension of change with time
Benign tumour	A non-cancerous growth that lacks the ability to invade neighbouring tissue or to spread to other parts of the body, but, when in the brain, can cause serious harm.
Brachytherapy	The delivery of radiation using sealed sources which are placed close to the site that is to be treated. Isotopes used in brachytherapy can be applied directly to the tumour by surface applicators, inserted into body cavities and tubular organs via specially designed delivery systems (intracavitary and intraluminal therapy) or inserted directly into a tumour (interstitial therapy).
Cancer Alliance	A way of organising local stakeholders, such as commissioners and providers, to lead improvement and key to effecting the transformational change needed to achieve world-class cancer outcomes for their populations
Clinical Reference Groups (CRG)	A group, consisting of clinicians, commissioners and patient/carer members, that provides clinical advice to NHS England for a specific prescribed specialised service.
Co-dependencies	Other services in a hospital which are needed to assist the provision of a specialised service.
Conservative management	Treatment designed to avoid radical medical therapeutic measures or operative procedures.
Comprehensive cancer network	A tertiary centre providing the full range of specialist cancer surgery and hosts the full range of specialist cancer MDTs AND in line with the tumour specific Improving Outcomes Guidance. This includes meeting the population requirements and patient numbers for the full range of cancers including rare cancer specialist MDTs (e.g. sarcoma, neuro-oncology, paediatric oncology etc)
Cancer Network	A geographical area and population size that covers the cancer referral pathways to a single tertiary centre

Elective	Pre-arranged; booked in patient treatment.
Extracranial	Outside of the cranium (skull)
Image Guided Radiotherapy (IGRT)	Imaging at pre-treatment and delivery, the result of which is acted upon, that improves or verifies the accuracy of radiotherapy. IGRT encompasses the whole range of imaging, from simple to more complex imaging, that allows direct visualisation of the tumour and surrounding tissue.
Intensity Modulated Radiotherapy	High precision form of radiotherapy. It moulds (conforms) the shape and dose of the radiation precisely to the volume of tumour tissue that needs to be treated, reducing exposure to healthy surrounding tissue.
Incidence rates	The number of new cases for a population in a given time period.
Innovative radiotherapy	The ability to deliver radiation that is more targeted at a patient's cancer, and causes less damage to the surrounding healthy tissue.
Lesion	An abnormality in the tissue usually caused by disease or trauma.
NHS Commissioning Board	The predecessor organisation to NHS England
Malignant tumour	A cancerous growth involving abnormal cell growth with the potential to invade or spread to other parts of the body.
MDM	A multi-disciplinary meeting involving members of the MDT.
MDT	A multi-disciplinary team involving the key staff delivering the service e.g. neurosurgeon, oncologist, radiologist, physicist.
Molecular Radiotherapy	The treatment of disease with radiopharmaceuticals. As with external beam radiotherapy, MRT offers the advantage of delivering high radiation doses to a specific target and sparing healthy organs from serious side effects
Palliative radiotherapy	Given with intention to relieve/prevent symptoms or prolong life with minimal expectation of cure, usually with fewer fractions than radical treatment together with a sub-radical dose.
Prescribed specialised services	Services provided in relatively few hospitals to catchment populations of more than one million people.
Radical radiotherapy	Given with curative intent either definitively as main / primary treatment or as adjuvant therapy together with surgery (or less often chemotherapy) as supplementary treatment.
Stereotactic Ablative Radiotherapy (SABR)	Refers to the precise irradiation of an image defined extra cranial lesion (not in the brain) and is associated with the use of a high radiation dose delivered in a small number of fractions. The technique requires specialist positioning equipment

	and imaging to confirm correct targeting. It allows sparing of the surrounding healthy normal tissues. SABR is currently supported by a national clinical policy for non-small cell lung cancer. Other indications are being evaluated.
Stereotactic radiosurgery (SRS)	Refers to the precise irradiation of an image defined lesion, similar to SABR, but given as a single fraction. It has become the standard treatment for a number of cranial (in the brain) treatments. National clinical policies are in place for a variety of conditions