



FULL TEAM AHEAD: UNDERSTANDING THE UK NON-SURGICAL CANCER TREATMENTS WORKFORCE

DECEMBER 2017



**CANCER
RESEARCH
UK**

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REFERENCE

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AUTHORS

Katie Burns	2020 Delivery
Mike Meredith	2020 Delivery
Matthew Williams	Institute of Employment Studies
Clare Huxley	Institute of Employment Studies
Camilla Pallesen	Cancer Research UK

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ABOUT CANCER RESEARCH UK

Cancer Research UK is the world's largest independent cancer charity dedicated to saving lives through research. It supports research into all aspects of cancer and this is achieved through the work of over 4,000 scientists, doctors and nurses. In 2016/17, we spent £432 million on research institutes, hospitals and universities across the UK. We receive no funding from the Government for our research and are dependent on fundraising with the public. Cancer Research UK wants to accelerate progress so that three in four people survive their cancer for 10 years or more by 2034.

Cancer Research UK is a registered charity in England and Wales (1089464), Scotland (SC041666) and the Isle of Man (1103)

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EXECUTIVE SUMMARY

More than 360,000 people in the UK are diagnosed with cancer each year¹. By 2022 it is projected that this figure will reach 422,000 people^{2,3}. Yet while more people will develop cancer, survival is improving. Currently half of all cancer patients survive their disease for 10 years or more. Cancer Research UK wants to accelerate progress so that 3 in 4 people survive by 2034. Early diagnosis followed by access to the best, evidence-based treatment is critical to achieve this.


As we strive towards earlier diagnosis of cancer, treatments will change. Increasingly, treatments are tailored to an individual's cancer; combinations of treatment types are being used to target cancers differently and there are more treatment options than ever before. Additionally, an ageing population, often with comorbidities, means the treatment of cancer has become more complex.

As such, ensuring better access to treatments is rightly a priority in the cancer strategies for England⁴, Scotland⁵, and Wales⁶. Northern Ireland does not have an up-to-date cancer strategy at the point of publishing this report. Having the optimal workforce is fundamental to ensuring treatment can be provided to meet the needs of patients.

OUR APPROACH

Cancer Research UK commissioned this research study to investigate the current and future needs, capacity, and skills of the non-surgical oncology workforce to provide optimal treatment to the UK population.

The research combined data analysis of



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TREATMENT DEMANDS**

current workforce data; a survey of the workforce across the UK (> 2500 responses); in-depth interviews with workforce staff; and expert advice from health professionals.

We knew at the start of the research that data on staffing levels is limited across the UK. This makes it difficult for health bodies to make well-informed decisions about workforce planning^{7,8}. For example, in England healthcare providers report staffing requirements based on projected budgets rather than what is needed to deliver best practice care to patients.

Therefore, we have developed a 'best practice treatment model'. This model was developed through extensive clinical consultation, to understand how patients should ideally be treated, and the workforce needed to do that.

This gives us a picture of actual patient need in cancer services, highlighting the difference between the modest vacancy rates in the sector and the widely reported pressures and worsening performance in UK cancer services. Our work was also informed by the workforce planning

framework developed by the Health Foundation⁹.

We consulted people affected by cancer throughout the report (on its scope, methods and recommendations) to ensure that the views of those being treated are represented in this research.

This report presents the findings for the workforce providing systemic anti-cancer therapy (such as chemotherapy and immunotherapy); hormone therapy; stem cell therapy; and radiotherapy. Surgical services for cancer have been explored in a previous report¹⁰.

Teamwork is fundamental to the delivery of these cancer treatments. The non-surgical cancer treatments workforce delivers treatments through shared responsibility and expertise. This report's findings and recommendations are therefore focused on how these teams can continue to deliver excellent treatment and patient care and use each of their skills and expertise to benefit other members of their team.

FINDINGS

CURRENT STAFF SHORTAGES

Based on available data, there were more than 9,000 health professionals working in non-surgical oncology treatments services in 2015. We were unable to develop comprehensive workforce figures in the UK due to the incomplete data sets and lack of systematic collection of these workforce groups, particularly for nurses and pharmacists. This includes inconsistency of job titles and variations between roles, as well as lack of accurately identified work areas, such as

nurses working in cancer care.

The workforce (in absolute terms) has been growing over recent years, although not to the same degree as demand for treatment. Treatment demand has increased due to the growing number of patients diagnosed with cancer (incidence) or living with the disease, and the complexity of the treatments they need. Trend data is available for medical and clinical oncologists and therapeutic radiographers. This shows that staff numbers in these three roles combined have grown by nearly 4% per year on average over the last 3 years. However, cancer incidence (new cancer diagnoses) alone is increasing by 2% per year. The combination of cancer incidence with those already diagnosed and continuing to have cancer treatment would mean that this increase in staff would not meet the patient demand for cancer treatment.

The current vacancy figures seem relatively low. For example, the vacancy levels for clinical and medical oncologists are 3.3% and 5.3% respectively. But our research suggests that these are underestimates of the true workforce gaps, because:

- Many posts have been vacant for up to two years.
- Vacancy rates only reflect current vacancies – services often remove a job advert if they fail to fill the post and redesign the team structure to deliver the service instead.

During our site visits, it was also widely recognised that there are not enough health professionals trained to fill all vacant posts.

Nearly 3 in 4 (73%) of our survey respondents identified staff shortages as a barrier to providing efficient cancer

treatments and excellent patient experience. This results in:

- **Insufficient capacity to undertake clinical research**

Staff do not feel they have capacity to undertake clinical research. This included not having enough staff to deliver the clinical trials as well as lack of time to plan and set up the research.

“Without time to research and develop treatments, it will feel like the early 90s again, when we were really behind the rest of Europe and our techniques were out of date. [In those days] our outcomes were right at the bottom of the table”

Head of Radiotherapy Physics

- **Downgrading of patient experience**

Whilst most staff felt able to deliver cancer treatments in line with standard protocols, 43% of survey respondents did not feel they had enough patient-facing time to deliver best practice care to patients, including providing emotional support or comprehensive information about the treatments.

- **Missed opportunities for service improvement**

Interviews and survey respondents from all workforce groups mentioned that they sacrifice time which should be set aside for service improvement, implementing innovation, and training and development, to deal with increased demand for treatment.

“My job is purely trying to keep the wheel turning. I would love to develop my service which is suffering from a severe lack of research trials and opportunities for patients”

Skin medical oncologist

- **Less frequent sharing of best practice**

with other cancer treatment providers

Neighbouring centres often find themselves competing for scarce staff numbers in the local labour market, and in some cases this means competition is more likely than collaboration.

- **Short- vs. long-term job planning**

Workforce shortages limit the capacity of the services to plan for the future, focusing more on reacting to current issues than long-term planning. Despite treatments becoming more complex and the volume of patients increasing, staffing patterns have therefore rarely adapted to reflect this.

- **Inefficient use of the workforce’s skills and experience**

During our site visits, many health professionals highlighted the problems with lack of administrative staff. In some instances, therapeutic radiographers had been asked to man the reception. This is an ineffective use of highly qualified staff.

- **Decreased staff wellbeing and morale and increased working hours**

All workforce groups reported that they were working more than their contracted hours. 43% of medical oncologists in our survey worked more than 8 additional hours per week.

Discussions with our panel of experts also highlighted concerns that these shortages would be exacerbated in the future due to changes occurring at the moment. Changes to funding for nurses, therapeutic radiographers, and clinical scientists heighten the importance of understanding how changes to training pathways will impact the workforce supply in the future.

The Royal College of Nursing report that nursing applications have decreased by a quarter following the removal of the student bursaries in England. The Institute for Physics and Engineering in Medicine (IPEM) also highlight concerns around lack of uptake of clinical technology posts in England and Wales.

RECOMMENDATIONS

1. Health Education England, and its equivalents in the devolved nations, should use our 'best practice treatment model' to project required workforce numbers based on patient demand, not on affordability.
2. Health Boards and Cancer Alliances should report staff shortages to health workforce bodies, such as Health Education England, based on staff needed to meet patient demand not vacancy figures.
3. Health Education England must address current and future staff shortages by:
 - a. Increasing training places for clinical and medical oncology;
 - b. Reviewing training pipelines for clinical technology with IPEM and the Department of Health;
 - c. Reviewing how the removal of student bursaries for nurses and therapeutic radiographers is affecting workforce projections in 2018/19.
4. NHS Digital, and its equivalents in the devolved nations, should work with relevant professional bodies to develop more standardised role descriptions and codes, particularly in nursing and pharmacy.

PREPARING FOR THE FUTURE

More staff will also be needed to deliver non-surgical cancer treatments in the future. We were not able to account for the impact of shifting diagnosis to an earlier stage, but this should be further examined. With treatment demand increasing and a patient population who will have more complex needs, particular attention needs to be paid to the following changes.

- **Dramatic changes in treatments**

The workforce will need to be equipped for the rapid growth in the use of immunotherapy, and novel combinations such as radiotherapy with immunotherapy.

- **Development of new technologies**

New software will help automate some work. However, some new technology makes the treatment techniques more complex and time-consuming to plan.

- **Changes to treatment delivery**

Some treatments, such as chemotherapy, will be provided closer to the patient's home. This will affect the recruitment practices and ways of working.

RECOMMENDATIONS

5. The UK Radiotherapy Board and the UK Chemotherapy Board should review how future changes to cancer treatments will impact staff numbers and skills required.
6. Further research is needed to understand the impact of early diagnosis initiatives and improvements in technology on when and how patients are treated, and the workforce implications of this.

SKILLS MIX CAN HELP ALLEVIATE PRESSURE

Teamwork is fundamental to the successful delivery of cancer treatment. The non-surgical cancer treatment workforce already share their workload and responsibilities. Teams develop new ways of safely providing these treatments to patients using different team members' skills and experiences.

The importance of implementing innovative ways to better utilise the mix of skills within the team – known as skills mix approaches – was a key finding of this research. Better use of skills mix approaches will require changes to the size and skills of different workforce groups.

We identified 3 key skills mix opportunities:

- Training more advanced clinical practitioners;
- Increasing implementation of non-medical prescribing; and
- Non-medical professionals taking on responsibility for:
 - Treatment review;
 - Radiotherapy treatment planning; and
 - Radiotherapy plan checking.

However, more capacity is needed in the current workforce to adopt these changes. For example, increasing non-medical prescribing will require more training for pharmacists. The knock-on effect of this is that oncologists will need more time to train pharmacists. Pharmacists will also need additional time in their schedule to learn new skills. As a result, the service delivery model needs to adapt to this.

The professions that will benefit most from increased capacity and use of skills

mix approaches are:

- **Pharmacists** – more pharmacists trained in non-medical prescribing would enable prescribing to be shared, freeing up time for oncologists.
- **Therapeutic radiographers** – more therapeutic radiographers would enable more clinical research in radiotherapy and better implementation of complex treatment techniques.
- **Clinical technologists** – more clinical technologists would enable more specialisation in dosimetry and complex planning.

Further changes that would facilitate skills mix include:

- Professional bodies providing more guidance on skills mix approaches.
- Cancer services exploring further implementation of open access, stratified and telephone follow-ups.
- Ensuring future health service contracts for the workforce groups in scope reflect current and increasing future workload.
- Increased professional and senior buy-in at cancer treatment service level, facilitating implementation of skills-mix approaches.

RECOMMENDATIONS

7. NHS England should share the 3 key skills mix opportunities identified in this research with Cancer Alliances to spread innovation and encourage best practice.
8. The UK Radiotherapy Board and UK Chemotherapy Board should work with the Department for Education and equivalent bodies in the devolved nations to understand how apprenticeship standards can be used

to improve skills mix implementation.

9. The UK Radiotherapy Board and UK Chemotherapy Board should agree the standards needed for skills mix approaches and how to implement follow-up and open access approaches.
10. The Department of Health and equivalent bodies in the devolved nations should ensure that contracts for health professionals covered in this research include protected time for Supporting Professional Activities such as service improvement, training, and clinical research.

Cancer services across the UK must address workforce challenges to optimise treatment delivery. This research demonstrates the importance of workforce planning driven by patient demand, not what is affordable according to hospitals' budgets.

Cancer Research UK believes that workforce planning for providing cancer treatment should be based on our 'best practice' treatment model and the Health Foundation's framework. This will enable an improved understanding of true patient demand and the development of comprehensive UK workforce strategies.

1 INTRODUCTION

1.1 BACKGROUND

The UK is facing increased demand for cancer treatments, based on the growing number of cases of cancer diagnosed each year and the fact that people are living for longer with cancer.

Around 360,000 people in the UK were diagnosed with cancer in 2014¹¹, and it has been projected that this figure will rise to around 422,000 by the year 2022^{12,13} – an increase of 17% in the annual number of new diagnoses over 8 years. The variety of efforts to increase the number of people diagnosed at an early stage¹⁴ will also have an impact on the treatment patients need.

Furthermore, half of people diagnosed with cancer will now survive their cancer for at least 10 years¹⁵. Along with increased survival comes the increased complexity of many patients' situations: they are older and more likely to have comorbidities (other health problems) which affect their eligibility for treatments.

In terms of cancer treatments, this means that more people are receiving treatment, their treatment options are more diverse, and that many are receiving treatment for much longer periods than would have been the case 10 years ago.

Improving cancer treatments has been identified as a priority in each of the Cancer Strategies or Plans of England¹⁶, Scotland¹⁷, and Wales¹⁸, in a drive to improve patient outcomes and care. At the point of publication, Northern Ireland does not have an up-to-date Cancer Strategy. In order to achieve these improvements, we must understand the support and training needed for the workforce delivering these treatments.

To inform these strategies and their successful implementation, we commissioned a research study to investigate the whole non-surgical oncology workforce of the UK.

1.2 SCOPE

Cancer Research UK has previously commissioned research to understand cancer surgery services¹⁹ and diagnostic capacity (including imaging²⁰, endoscopy²¹ and pathology²²). This new research focuses on non-surgical oncology treatments. This includes systemic anti-cancer therapy (SACT) such as chemotherapy and immunotherapy; hormone therapy; stem cell therapy; and radiotherapy.

The staff groups covered in this report are those directly involved in the planning and delivery of these treatments. This includes:

- Clinical scientists (radiotherapy physics)
- Clinical technologists (radiotherapy physics)
- Nurses – chemotherapy, clinical nurse specialist (CNS), radiotherapy, stem cell
- Oncologists – clinical, haemato, medical, paediatric

- Pharmacists
- Therapeutic radiographers

Other interventions (such as palliative care and complementary therapies) were not included within the scope of this work. In addition, while the holistic cancer treatments workforce (such as dieticians, physiotherapists and speech and language therapists) are vital for the care and experience of patients, they were also out of scope of this research. Finally, the teams involved in cancer research, such as clinical trials team, have also been excluded from this research. Additional areas out of scope have been outlined in Appendix 1.

1.3 METHODOLOGY

CRUK commissioned 2020 Delivery Ltd and the Institute of Employment Studies to carry out this research with wide support and input from professional bodies and health professionals responsible for non-surgical oncology treatment delivery.

1.3.1 DATA GATHERING AND ANALYSIS

In order to generate the most accurate picture possible on current staff numbers for the selected groups (in terms of headcount and full-time equivalent), we approached a wide number of sources. These included official health service sources, such as NHS Digital, and various professional bodies that are responsible for the staff groups in scope for this research. These are listed in Appendices 2 and 3. We also reviewed previous reports done on this issue, such as Cancer Research UK and NHS England's 'Vision for Radiotherapy'²³ and work done by the National Chemotherapy Advisory Group²⁴ and the National Radiotherapy Advisory Group²⁵.

1.3.2 SITE VISITS

We visited eleven locations across the UK which were known to the clinical expert for their innovative practices (see Figure 1). We also wanted to ensure we had a mix of regions and hospital size as well as different staff ratios and set-ups. The visits included in-depth interviews with frontline staff as well as management teams and HR professionals. They aimed to find out more about specific local issues and solutions. Details on the locations visited and the questions asked can be found in Appendix 4.

1.3.3 UK SURVEY

We also surveyed the workforce groups in scope for this research to understand more about their experiences in the workplace and to support our modelling. The full survey can be found in Appendix 5. The questions asked included 'are there any challenges or barriers to delivering cancer treatment in line with protocol in your day-to-day work?' There were more than 2500 responses to the survey, indicating the widespread interest among sector professionals to express their opinions about their experiences. The response rate by different staff groups is shown below.

FIGURE 1: SITE VISIT LOCATIONS



TABLE 1: SURVEY RESPONSES - COMPARED TO TOTAL WORKFORCE

		England	NI	Scotland	Wales	Total
Chemotherapy nurse*	Responses	106	5	2	3	118
	% of workforce	-	-	-	-	-
Clinical nurse specialist	Responses	213	11	23	15	264
	% of workforce	6.9	19.2	8.7	8.1	7.3
Clinical oncologist	Responses	360	19	58	29	466
	% of workforce	52.1	73.1	90.6	63.0	56.3
Clinical scientist	Responses	216	7	6	8	238
	% of workforce	35.1	17.3	10.4	42.6	32.5
Clinical technologist	Responses	79	3	1	5	88
	% of workforce	21.6	11.6	2.6	22.9	19.5
Haemato-oncologist*	Responses	21	0	1	5	27
	% of workforce	-	-	-	-	-
Medical oncologist	Responses	172	9	13	5	199
	% of workforce	41.2	52.9	35.1	35.7	41.0
Paediatric oncologist	Responses	30	2	0	0	33
	% of workforce	36.6	66.7	0.0	0.0	32.4
Pharmacist	Responses	34	0	0	3	37
	% of workforce	-	-	-	-	-
Radiotherapy nurse*	Responses	0	0	0	0	0
	% of workforce	-	-	-	-	-
Stem cell nurse*	Responses	2	0	1	0	3
	% of workforce	-	-	-	-	-
Therapeutic radiographer	Responses	555	11	26	27	621
	% of workforce	19.8	10.4	8.9	15.1	18.4

Source: RCR; RCP; SCoR; IPEM; UKONS; BOPA; NHS Digital

*It was not possible to define the number of haemato-oncologists, chemo- and radiotherapy nurses, stem cell nurses and oncology pharmacists in the UK – as such it was not possible to conclude what proportion of the workforce had completed the survey.

We used professional bodies to disseminate the survey to members. The membership of the professional bodies is in many cases voluntary (not mandatory) and job titles and descriptions were varied across the workforce groups which meant that response rates from different professional groups varied.

There is also variation in response rates between nations. As this survey was spread using a 'snowball' methodology, we believe that there were strong network effects as to where our respondents came from. For instance, a Head of Radiotherapy in England might send the survey to their peers in other centres, and each of those send the survey on to the therapeutic radiographers in their departments. This was a likely cause of regional spikes for certain groups.

1.3.4 EXPERT ADVICE

The research was guided by a clinical panel of sector experts consisting of members from a wide range of professional bodies: the Royal College of Radiologists (RCR), the Royal College of Physicians (RCP), the Society and College of Radiographers (SCoR), the Association of Cancer Physicians (ACP), the Institute of Physics and Engineering in Medicine (IPEM), the UK Oncology Nursing Society (UKONS), and the British Oncology Pharmacy Association (BOPA). Their contributions have been invaluable for their in-depth knowledge of cancer treatments and experiences of developing standards. They also supported and heavily contributed to the wide uptake of the survey.

We also consulted experts from other organisations: the Royal College of Pathologists (RCPATH), the General Pharmaceutical Council (GPhC), the British Society for Haematology (BSH), the Nursing and Midwifery Council (NMC), the Royal College of Nursing (RCN), the Royal Pharmaceutical Society, the NHS Blood Transfusion Service, the Haematological Malignancy Research Network, the Royal College of Paediatrics and Child Health (RCPCH), the global blood cancer charity DKMS, the Welsh Bone Marrow Donor Registry, and the British Society of Blood and Marrow Transplantation.

When developing the recommendations regarding implementing the skill mix approaches, we also consulted a small group of people affected by cancer to understand how these changes could be best implemented and communicated. A panel of sector experts, patient representatives, and internal stakeholders also steered and informed this report, providing valuable sector knowledge and advice.

2 MODEL FOR TREATMENT WORKFORCE PLANNING

Cancer Research UK believes that workforce planning at a national level should be based on the workforce needed to meet patient demand. This should incorporate the current and future needs of patients, including increasing demand for services, new treatments in the pipeline, and any shifts that will be seen due to early diagnosis interventions and other factors.

Current workforce planning is developed through asking hospitals to report and predict current and future vacant positions to fill roles available. They based their reports and predictions on the number of staff they would be able to afford in their current budgets rather than how many staff members they would ideally need to diagnose and treat all patients. This means that workforce planning is currently based on the size of hospitals' budgets rather than the staff needed to deliver services on time and effectively²⁶.

In order to demonstrate a different way of developing workforce plans, we built a 'best practice model' to estimate how many staff we would need to deliver 'best practice treatments' to patients. This includes ensuring that all staff have time for training and development, service improvement and clinical research and work contracted hours.

The model was built using evidence-based guidelines and extensive clinical consultation to identify the treatment pathway steps that are needed for each patient, and the time required for the treatment team to deliver these to a high standard. This gives us a picture of actual patient need in oncology services, highlighting the difference between the modest vacancy rates and the widely-reported pressures and worsening performance in UK cancer services²⁷. The details of the approach are outlined in Appendix 6.

An overview of the full methodology is demonstrated in Figure 2. We produced these full bottom-up models for the 4 most common cancers (breast, prostate, bowel and lung) as well as head and neck cancer and non-Hodgkin lymphoma (example in Figure 3). This enabled us to account for the complexity and extensive time allocation needed to treat these cancers and the differences implicated by non-solid cancer types. In 2014, these 6 cancer types accounted for 59% of total incidence^{28,29}. By relating assumptions from these cancer types to the next most common 14 types, we covered the resources required for 'best practice treatment' for 93% of cancer diagnoses.

Every cancer service has a different delivery model dependent on their local treatment need and workforce supply. When modelling how many staff we need both now and in the future, we have included ranges to which activities are being carried out by different health professional groups. For example, when estimating the time spent by clinical oncologists outlining proposed target areas in radiotherapy, we assume that they are doing all of this work currently. However, when modelling how many clinical oncologists may be needed in

the future, we assume that they will only be doing between 80% - 100% of this task, as 20% of this would be picked up by a therapeutic radiographer.

FIGURE 2: REPRESENTATION OF MODELLING METHODOLOGY

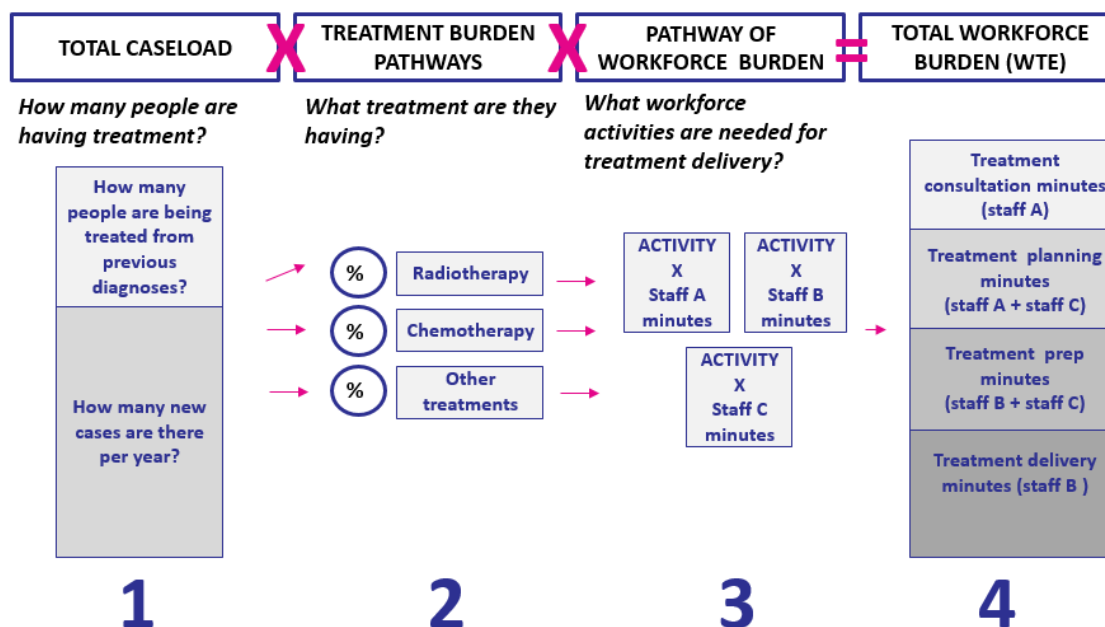
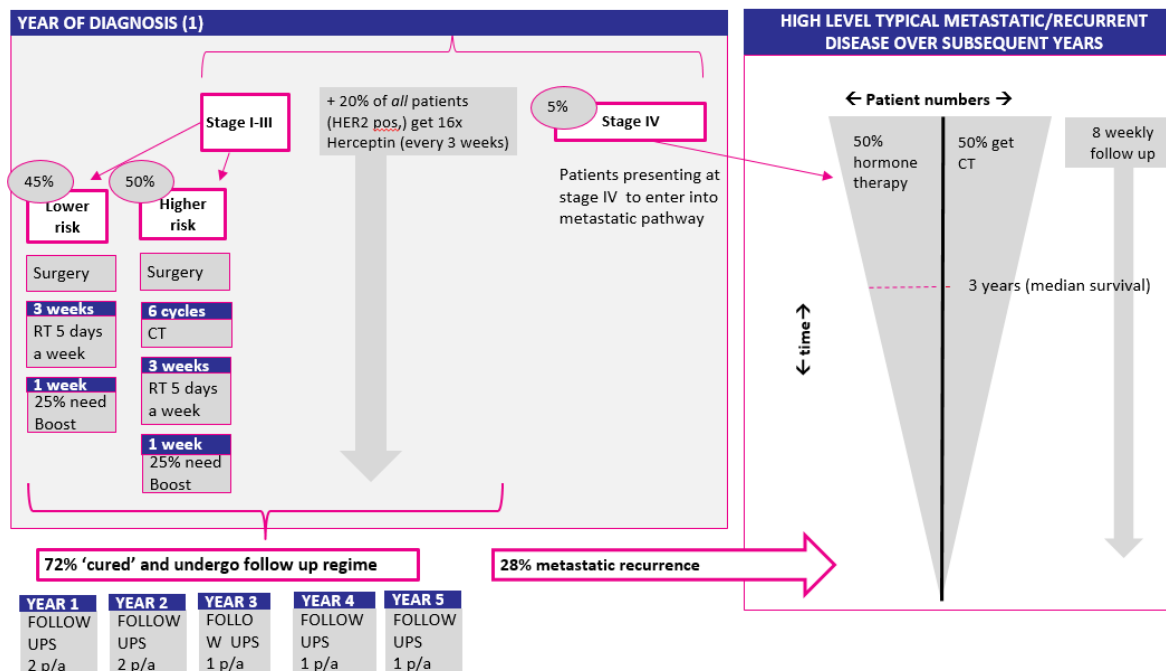


FIGURE 3: BEST PRACTICE MODEL FOR BREAST CANCER



RECOMMENDATIONS

1. Health Education England, and its equivalents in the devolved nations, should use our 'best practice treatment model' to project required workforce numbers based on patient demand, not on affordability.

3 THE CURRENT WORKFORCE

Understanding the current workforce requires a quantitative overview of staff numbers and national variation. Discussion of vacancy rates across the system is also important, although as will be illustrated, vacancy rates only reflect a small proportion of the outstanding need in UK cancer services. It is not possible to compare the non-surgical oncology treatments workforce in the UK to other nations because their workforce groups have different responsibilities. For example, clinical oncologists (often known as radiation oncologists) do not deliver chemotherapy in other countries.

3.1 CURRENT WORKFORCE NUMBERS

Source: RCR; RCP; SCoR; IPEM; UKONS; BOPA; RCPCH; NHS Digital; StatsWales; ISD Scotland;

TABLE 2: SIZE OF UK WORKFORCE, 2015

	Headcount	Full time equivalent	Vacancy rates
	Number	Number	%
Chemotherapy nurse	<i>Data unavailable</i>		
Clinical nurse specialist (2014 data)	4,104	3,595	Not available
Clinical oncologist	827	772	3.3
Clinical scientist	732	662	9
Clinical technologist	452	393	9.2
Haemato-oncologist	<i>Data unavailable</i>		
Medical oncologist	488	459	5.3
Oncology pharmacist	<i>Data unavailable</i>		
Paediatric oncologist	103	102	Not available
Radiotherapy nurse	<i>Data unavailable</i>		
Stem cell nurse	<i>Data unavailable</i>		
Therapeutic radiographer	3,380	3,105	6.4

Department of Health Northern Ireland

We were unable to develop comprehensive workforce figures in the UK due to the incomplete data sets and lack of systematic collection of these workforce groups, particularly for nurses and pharmacists. The data available through NHS sources in England were the most complete. Hospital-level data was compared with information collected during the site visits and discrepancies were identified.

The analysis has relied on the data produced by the professional bodies listed in the introduction, although hospital data has been used in combination with these data sources in some instances to create a picture of the relevant workforce groups. The type of information and the level of detail varies greatly between organisations. Some organisations hold basic details on membership or registrants whereas others carry out annual workforces censuses.

More information about the data collection issues can be found in Appendices 2 and 3.

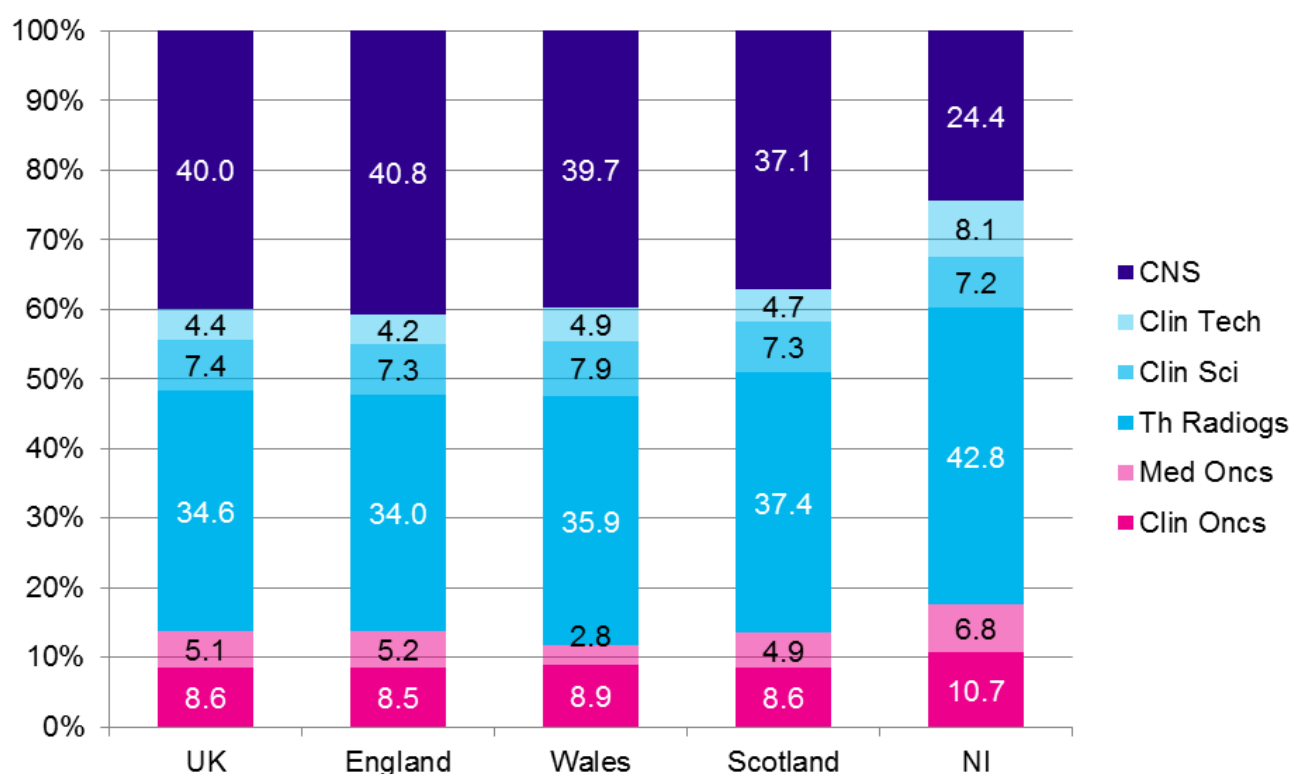
3.1.1 REGIONAL VARIATION

There is variation in the composition of the non-surgical oncology treatment workforce by nation, reflecting differences in the characteristics of the nations such as population size, urban/rural nature, and the number and location of cancer centres.

England accounts for around 85% of the total workforce, with 8% working in Scotland, 5% in Wales, and 2% in Northern Ireland. These proportions are consistent across the different staff groups for the workforce as a whole. Figure 4 shows the variation in the profile of the total oncology workforce by nation.

The profiles are broadly similar in England, Wales, and Scotland. In Northern Ireland, there are relatively more oncologists, therapeutic radiographers, and clinical scientists, but relatively fewer clinical nurse specialists who specialise in the treatment of cancer patients.

FIGURE 4: PROPORTION OF STAFF IN UK NATIONS

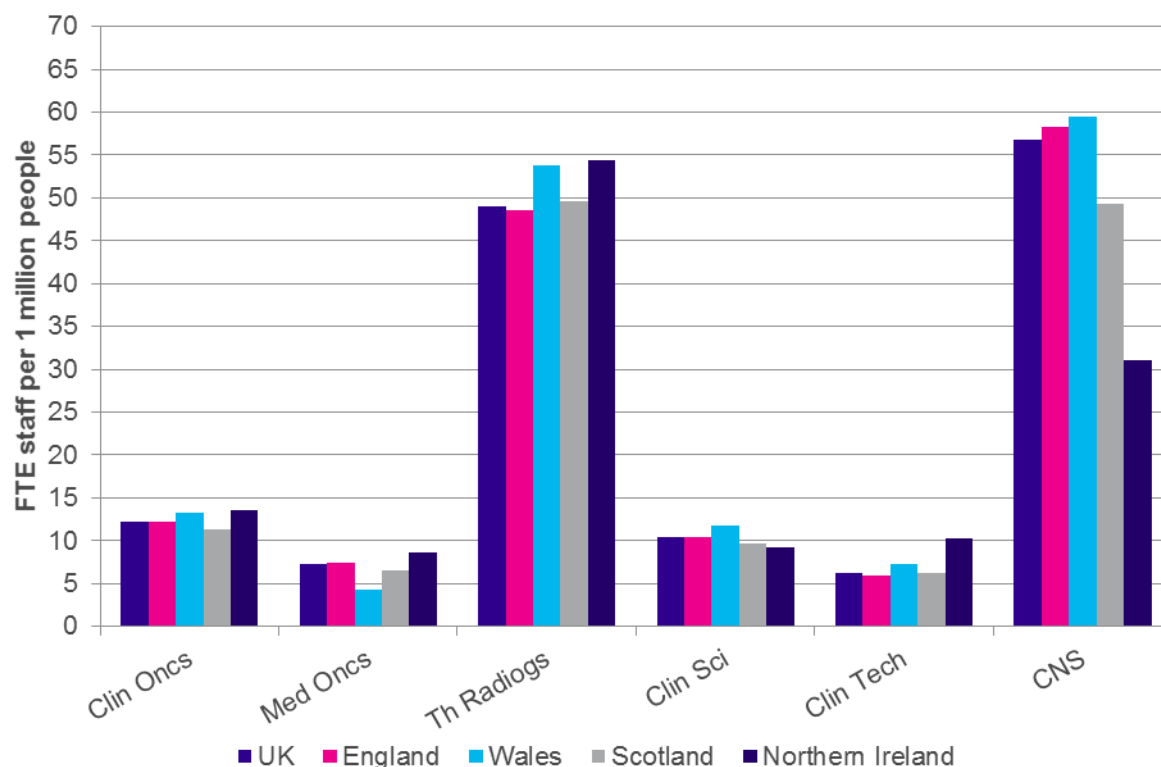


Source: RCR; RCP; SCoR; IPEM; NHS Digital; StatsWales; ISD Scotland; Department of Health Northern Ireland

3.1.2 WORKFORCE PER UK POPULATION

Figure 5 shows the number of each of the staff groups per one million population in each nation. The variation between nations reflects the different characteristics and development of cancer treatment services in each nation, which may influence the potential to spread skill mix practices. For example, certain regions may have staff shortages and therefore may not be able to upskill this workforce to take on more advanced roles.

FIGURE 5: NUMBER OF STAFF PER MILLION PEOPLE



3.1.3. WORKFORCE TRENDS

The workforce (in absolute terms) has been growing over recent years, although not to the same degree as demand for treatment which has increased due to incidence and survival factors as well as the complexity of treatments needed. Trend data are available for medical and clinical oncologists and therapeutic radiographers. These data show that staff numbers in these three roles combined have grown by nearly 4% per year on average over the last 3 years, with the increase greatest among medical oncologists at 8% per year (Figure 6). Cancer incidence has been increasing by 2% per year in the last 3 years. However, cancer incidence (new cancer diagnoses) alone is increasing by 2% per year. The combination of cancer incidence with those already diagnosed and continuing to have cancer treatment would mean that this increase in staff would not meet the patient demand for cancer treatment. Similar trend data for other staff groups was not available so we were not able to provide equivalent analysis.

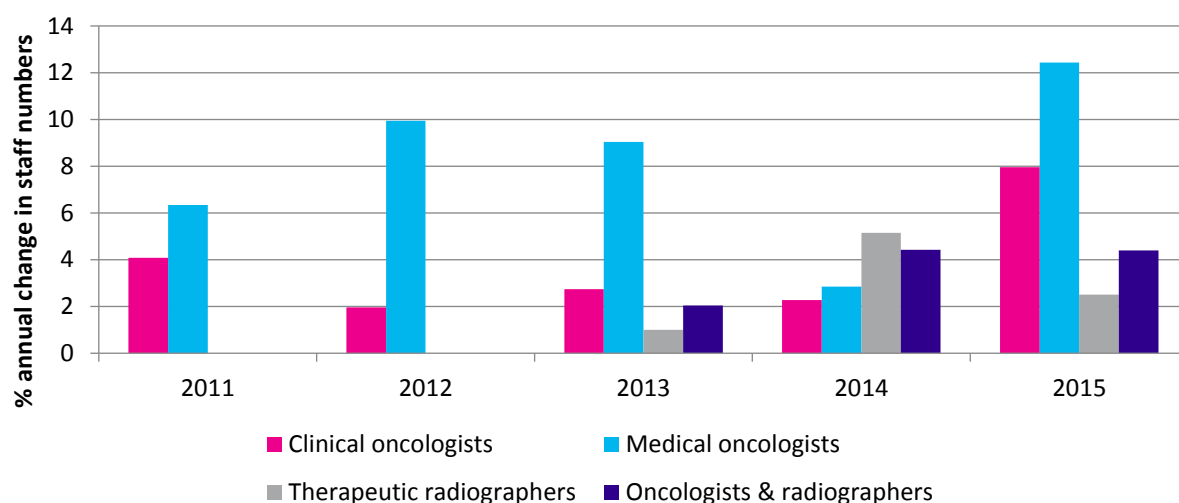
FIGURE 6: ANNUAL UK CHANGE IN NUMBERS

Table 3 shows the trends in the numbers of oncologists and therapeutic radiographers in each nation since 2010. Information at this level for other staff groups was not available. Between 2010 and 2015, the new cancer centre in Northern Ireland was developed, causing the large increase in staff in this nation. Key points to note include:

- The number of clinical oncologists in Scotland has fallen slightly since 2010, while numbers in Northern Ireland increased by more than a third (37%) between 2010-2015.
- The number of medical oncologists in Northern Ireland more than doubled between 2010 and 2015, while in the other nations it increased by at least 40% over this period.
- Northern Ireland also experienced the largest increase in therapeutic radiographers, with an increase of 21% between 2013 and 2015, compared with 12% in Scotland, 10% in Wales, and 7% in England.

TABLE 3: TRENDS IN HEADCOUNT NUMBERS BY NATION

		2010	2013	2014	2015	2013-15	2010-15
						% change	% change
Clinical oncologists	England	562	619	639	691	11.6	23.0
	Wales	39	43	43	46	7.0	17.9
	Scotland	67	65	62	64	-1.5	-4.5
	NI	19	22	22	26	18.2	36.8
	Total	687	749	766	827	10.4	20.4
Medical oncologists	England	287	361	373	420	16.3	46.3
	Wales	10	13	13	14	7.7	40.0
	Scotland	26	35	34	37	5.7	42.3
	NI	8	13	14	17	30.8	112.5
	Total	331	422	434	488	15.6	47.4
Therapeutic radiographers	England	2,423	2,623	2,730	2,802	6.8	15.6
	Wales	-	163	167	179	9.8	-
	Scotland	-	262	276	293	11.8	-
	NI	-	88	125	106	20.5	-
	Total	-	3,136	3,298	3,380	7.8	-

3.2 WORKFORCE SHORTAGES

Nearly 3 in 4 (73%) of our survey respondents identified issues around staff shortages as a barrier to delivering cancer treatments effectively, meaning they did not feel they were able to deliver the treatments to the best of their ability. The remaining answers were largely related to space and resources, such as lack of room for clinics. Lack of time was specifically identified as a factor by 47% of respondents; 26% of respondents identified lack of time together with insufficient scheduled appointments and bottlenecks in the pathway. These answers suggested that **workforce shortages were the key driver of many problems in delivering best practice cancer services in a timely manner.**

We must therefore understand workforce shortages and any evidence to confirm these survey responses. The RCR, RCP, SCoR and IPeM censuses contain information on vacancy figures for their relevant workforce groups³⁰, from which we can calculate vacancy rates (the number of vacancies as a proportion of the current workforce). The 2015 data show vacancy rates of:

- 3.3% for clinical oncologists;
- 5.3% for medical oncologists;
- 6.4% for therapeutic radiographers;
- 9.0% for clinical scientists; and
- 9.2% for clinical technologists.

Whilst some of these vacancy rates may not seem high, we have identified issues which suggest that these are underestimates of the true workforce gaps:

- Our survey and interviews suggest that **many posts have been vacant for up to two years**. Some posts are closed, then reopened at a later point, when they have been unable to fill the position. This indicates a persistent issue and therefore could mean that the current vacancy figures do not indicate true demand for workforce staff.
- **Vacancy rates only disclose the number of unfilled positions.** This reflects hospitals' immediate need-based planning. It cannot be used to indicate how far away we are from the delivery of best practice treatments and the staffing levels required to achieve this.
- **There is great regional variation in vacancy rates.** For example, the site visits showed that rural centres in devolved nations struggle to fill a therapeutic radiographer post, while an urban centre in London could have up to 30 applicants for one position. Hospital-level vacancy data for therapeutic radiographers shows that it is mainly rural hospitals or those in smaller urban areas that have the highest vacancy rates, for example Southend University Hospital (35%), Portsmouth Hospitals (27%), Northampton General Hospital (26%), Royal Berkshire (17%) and Royal Devon and Exeter (16%)³¹.
- **Vacancy posts across the workforce are often hard to fill.** Complete vacancy rates are not available for all professions, but our site visits suggested that this is the case for all workforce groups, especially in nursing and clinical science. Even in a large metropolitan centre, it was reported that a nursing post attracted just 4 applicants and none of the applicants attended their interviews.
- Some centres have been successful at recruiting further staff through dedicated recruitment campaigns. However, this cannot address the long-term problems caused by the **shortage of sufficiently qualified and experienced staff on the job market to fill**

vacant posts. Centres have found success by holding open evenings, but this is more successful for attracting less experienced staff: when trying to recruit consultants, many posts have been gone unfilled for up to two years.

3.3 IMPACT OF WORKFORCE SHORTAGES

Our research found that these workforce shortages have an impact both directly and indirectly on workforce planning, delivery of treatments, and improvements to the service.

3.3.1 PATIENT EXPERIENCE

Whilst most staff felt able to deliver cancer treatments in line with protocols, 43% of survey respondents did not feel they had enough patient-facing time to deliver best practice care to patients, including providing emotional support or comprehensive information about the treatments.

In some centres, this was caused by staff shortages leading to reduced time being allocated to certain types of appointments. For example, guidance from professional bodies recommends a 60-minute initial consultation with an oncologist including time to go through patient records. Survey responses revealed that in some places this has been cut to 30 or 45 minutes, compromising patient care and experience.

“Every patient and every task is completed in line with protocol but that's it – not as much time as we would like to be able to talk to the patients, build a rapport, or ‘go the extra mile’”

Therapeutic radiographer

In addition, whilst in oncology there are very few issues with patients missing appointments, the high demand for consultant time means that clinics are commonly over-booked. In our survey, 60% of oncologists felt that the time allocated in their day-to-day work for appointments or time with patients was insufficient.

Furthermore, 43% of oncologists also felt that a backlog of patients was making it difficult to adequately serve ongoing demand. The need for prompt clinical input on patients with more complex conditions leads to clinics being double-booked at the last minute. With clinical responsibility for these patients, consultants feel compelled to see everyone, resulting in delays and patients sometimes waiting for hours for their appointment.

These concerns are echoed in the 2016 National Cancer Patient Experience Survey³². Only half (52%) of patient respondents said that they found someone on the hospital staff to talk to about their worries and fears during their hospital visit. Although ‘hospital staff’ could include other staff groups than the ones covered in this research, this result suggests that the lack of staffing is impacting the quality of the patient experience.

3.3.2 RESEARCH CAPACITY

In the National Cancer Patient Experience Survey for England, only 29% of patients said that “since their diagnosis, someone had talked to them about whether they would like to take part in cancer research”. Developing better, kinder treatments and improving patient care relies on research, so it’s vital that more patients are offered the opportunity to be involved.

Our research confirmed these concerns, with many centres reporting they had turned down the opportunity to participate in clinical trials as a result of workforce shortages.

Oncologists often lack the time to undertake the extra administrative work and consultation required for clinical trials. Many sites lack the numbers of nurses, therapeutic radiographers, and pharmacists to support the delivery of clinical trials. This severely hinders the potential to discover new and better ways of treating patients, improving outcomes and developing less time-consuming ways to treat.

“Without time to research and develop treatments, it will feel like the early 90s again, when we were really behind the rest of Europe and our techniques were out of date. [In those days] our outcomes were right at the bottom of the table”

Head of radiotherapy physics

3.3.3 WORKFORCE AND JOB PLANNING

Workforce shortages limit the capacity of services to plan for the future: despite seeing current and future workforce issues, planning has been based on affordability and short-term availability³³. Planning also tends to be reactive: it often stems from a staff shortage becoming too much to handle and a business case for additional staff being made as a response. Under these circumstances, the actual systemic staff shortages are hidden. This suggests that the ability of cancer services in the UK to make significant shifts to respond to current and future trends is seriously compromised. These issues were also identified and highlighted in our previous report ‘Improving the effectiveness of multidisciplinary team meetings’³⁴.

“Workforce planning? What workforce planning? We do the best with what we have, but we’re not able to plan ahead for future need”

Co-director of cancer services

Despite treatments becoming more complex and the number of patients having increased greatly, staffing patterns have rarely adapted to reflect this. Both clinical and medical oncologists frequently reported that their job plans do not reflect the reality of the demands of the job. For example, the time periods allocated for radiotherapy planning were highlighted by interviewees as outdated and insufficient. The demand to see patients also means that there are often more clinics than a job plan would define.

“Radiotherapy is becoming more complex, but systems are designed to accommodate an older style of working. One session a week is no longer enough to think about complex IMRT, or stereotactic treatments”

Prostate clinical oncologist,
clinical director

3.3.4 SHARING EXPERTISE AND RESOURCES

Neighbouring centres often find themselves competing for scarce staff numbers in the local labour market, and in some cases this means competition is more likely than collaboration. Collaboration, however, could be cost-effective when many centres are facing similar issues and would benefit from sharing experience of good practice. This was highlighted in the Cancer Strategy for England³⁵ where it was recommended that hospitals should take on the 'lead provider model' in order to share resources across regions rather than focusing on individual hospitals' budgets and needs.

"We can't go to centres to talk about what we're doing, because they're worried we'll steal their staff"

Head of Radiotherapy
Physics

3.3.5 SERVICE DEVELOPMENT AND TRAINING TIME

People from all of the workforce groups said that they sacrifice time which should be set aside for service development and education and training in order to deal with increased demand for treatment. According to job planning standards set by RCR³⁶ and RCP³⁷, oncologists should have protected time for 'Supporting Professional Activities' (SPA) for professional development, research, and training medical students and junior doctors. These are often neglected to provide more capacity to deliver cancer treatments. For example, the guidance from the RCR states that SPA should be protected for at least 15%, and ideally 25% of their working week³⁸. The oncologists responding to the survey said that they only spend an average of 9% of their time on these activities.

Although there are not formalised job planning standards for other workforce groups, they frequently felt that the time they needed to train or learn about new techniques was missing. For example, SCoR has emphasised the need for additional therapeutic radiography resource to carry out specific research in radiotherapy, which is currently not protected in job plans³⁹. People with leadership or service development roles also felt their responsibilities in those areas to be consistently overshadowed by the need to deliver treatments. This hindered their ability to 'take a step back' and make quality or efficiency improvements.

"My job is purely trying to keep the wheel turning. I would love to develop my service which is suffering from a severe lack of research trials and opportunities for patients"

Skin medical oncologist

Given the increasing complexity and fast pace of change in cancer treatments, the time required for all staff levels to develop their skills should not be underestimated – especially if staff are attempting to take on some element of skill mix in a new area.

3.3.6 CONTRACTED HOURS AND STAFF WELLBEING

Previous research suggests that long work hours and insufficient staff are strongly linked to staff not being able to continue with their day-to-day work, either resulting in them taking extended sick leave or leaving the profession all together. One study noted that burnout is up to 15% more likely for every extra 5 hours worked above a 40-hour week job plan⁴⁰. On average, respondents to the workforce survey reported working 5 hours more than their contracted hours, with some people on 40-hour contracts working as many as 80 hours in a typical week. Long-term, this increased workload is likely to increase burnout of this workforce.

“The strain comes through in the number of incidents we have as well as high staff burnout. Number of complaints about waiting is also an indicator”

Chief pharmacist

In the survey, all workforce groups reported that they were working more than their contracted hours. Table 4 outlines the number of additional hours by staff group.

TABLE 4: ADDITIONAL HOURS WORKED BY STAFF

Workforce group	Average hours overtime	% of contracted hours
Chemotherapy nurse	5	16
Clinical nurse specialist	5	15
Clinical oncologist	7	19
Clinical scientist	2	11
Dosemetrist/clinical technologist	2	5
Clinical technologist (physics)	2	7
Haemato-oncologist	8	20
Medical oncologist	9	23
Paediatric oncologist	9	21
Pharmacist	5	14
Therapeutic radiographer	2	7
Average across workforce	5	13

*Survey respondents for stem cell and radiotherapy nurses were too few to be conclusive.

Among those working large numbers of additional hours, 43% of medical oncologists reported working more than 8 additional hours, followed by paediatric oncologists (33%), haemato-oncologists (32%), clinical oncologists (30%), clinical nurse specialists (14%), chemotherapy nurses (12%) and clinical scientists (10%). Furthermore, 14% of medical oncologists reported working more than 16 additional hours, followed by haemato-oncologists (11%), and 6% of clinical oncologists and chemotherapy nurses.

3.3.7 USE OF THE WORKFORCE'S SKILLS AND EXPERIENCE

When there are insufficient staff, people are forced to 'fill the gaps' in a piecemeal way in order to manage the workload on a day-to-day basis. Therapeutic radiographers have been manning reception and some oncologists have reported spending up to half of their clinic time entering data into different systems. Without a well-staffed team, people are spread thinly across many different responsibilities: this is inefficient as the health professionals are unable to make the most of their skills, expertise and training.

"As an oncology registrar, I am pulled in too many directions at once such that I cannot focus and finish the task at hand before being called to another task. This is an enormously inefficient way of working"

Oncology registrar

Survey responses stated that whilst cuts to administrative and support staff had been made on the basis of financial savings, the outcomes had actually been a 'false economy' as more highly paid staff were now taking on the outstanding workload. When we analysed the qualitative survey responses, 20% of respondents said that a reduced administrative burden would contribute to better service delivery. 43% of the survey respondents estimated that they spend around 10% of their time on administrative tasks. Whilst the administration burden cannot be eliminated, some sites suggested that additional admin staff would be a helpful way to make better use of health professionals' time and expertise.

"The size of the pot never gets bigger - we just try to use it in different ways"

Head of radiotherapy

Many centres are also hiring staff that are not qualified for the role with the intention to train them. This was understood as a 'race to the bottom' – centres recruiting people lacking the core skills and training needed. With staff shortages, this seems necessary to treat patients on time, but it also means that similar training programmes may be being repeated on a small scale in lots of different places, leading to unnecessary duplication of education.

"We have to take advantage of any opportunity possible for getting people in – this often means making job offers as early as possible, before people are fully trained"

Head of radiotherapy
physics

3.3.8 USE OF AGENCY AND LOCUM

In discussions during site visits, we asked how staff shortages are being mitigated. Many interviewees said that they use agency and locum staff to fill the gaps. In some cases this provided necessary relief for colleagues, and in others it was seen to have a negative impact on the morale of permanent staff. It was suggested that the high cost of agency and locum staff would be better spent on permanent staff as a retention measure. For example, the RCR census revealed that 64% of locum clinical oncologists are working to fill permanent vacancies⁴¹ as opposed to shorter-term vacancies such as sickness or maternity. This suggests systemic dependence on locums to address persistent shortages rather than temporarily mitigating short-term capacity issues. Because agency and locum workers are not permanent members of staff, they cannot contribute to the training of new staff in a

systematic way and workforce planners are not able to consider their skills and capacities as part of their long-term workforce plans.

RECOMMENDATIONS

2. Health Boards and Cancer Alliances should report staff shortages to health workforce bodies, such as Health Education England, based on staff needed to meet patient demand not vacancy figures.
3. Health Education England must address current and future staff shortages by:
 - a. Increasing training places for clinical and medical oncology;
 - b. Reviewing training pipelines for clinical technology with IPEM and the Department for Health; and
 - c. Reviewing how the removal of student bursaries for nurses and therapeutic radiographers is affecting workforce projections in 2018/19.
4. NHS Digital, and its equivalents in the devolved nations, should work with relevant professional bodies to develop more standardised role descriptions and codes, particularly in nursing and pharmacy.

4 HORIZON SCANNING

Looking five or ten years ahead, the cancer treatments landscape will change dramatically. This is due to the impact of the adoption of new treatments, technological improvements and early diagnostic initiatives. The focus of this research has been on the changes which will significantly change how the workforce will be distributed and the work they will be doing. The developments discussed below were identified through the clinical panel as those which will have the most impact on the workforce needed.

Other changes, such as the impact of early diagnosis initiatives and artificial intelligence and technology, will also affect the treatment demand and workforce. Due to lack of evidence available, we were not able to quantify how and to what extent these changes would impact treatment delivery. However, it would be beneficial to conduct further research to understand how these changes would impact the treatment of patients in the future.

4.1 RADIOTHERAPY

The following changes are likely to affect the resources required to deliver radiotherapy treatment. Cancer Research UK's previous report 'Vision for Radiotherapy' has informed this section. Other changes, such as MRI linacs and hybrid imaging, were not covered in the research.

4.1.1 HYPOFRACTIONATION

Hypofractionated radiotherapy is radiotherapy given over a shorter period of time than standard radiotherapy. Clinical trials have suggested that the way in which breast and prostate cancer are commonly treated can be significantly shortened whilst remaining just as effective. These cancers have therefore been recommended for the hypofractionated approach. The recommendation for breast cancer treatment has changed from 25 fractions per patient to 15⁴² and it is standard practice to deliver this to breast cancer patients. For prostate, the recommended number of fractions per patient is likely to drop from 27 to 20⁴³. It is worth noting that in many centres this is already happening for prostate cancer treatment. In our 'current state' estimates for best practice, we factor in an estimated current roll-out of these changes. Our future model will assume that all treatments are delivered in this way.

4.1.2 INTENSITY MODULATED RADIOTHERAPY TREATMENT (IMRT)

IMRT is a modern type of radiotherapy that precisely targets tumours, making it more effective and producing fewer side effects for patients. Cancer Research UK wants all patients that would benefit to receive IMRT. It is often used to treat head and neck cancers, but the UK Radiotherapy Board projects that it has the potential to be used in many more areas. Treating patients with IMRT will make the planning of the treatments longer. In the short-term, while the workforce becomes familiar with the technique, it could take twice as long for this planning to take place. We assume that in 5 years' time, the benefits of IMRT are likely to be fully established in many areas and take between 20-50% more time to plan than currently.

4.1.3 STEREOTACTIC ABLATIVE RADIOTHERAPY (SABR)

SABR is a 'way of giving radiotherapy to a tumour from many different directions to target the treatment very accurately'⁴⁴ and is often used for smaller areas such as the lung. This is already being used across the UK, but discussions with the clinical experts suggest that the use of SABR would increase by 50% by 2022 for the relatively small number of patients who are eligible for this. This would mean a much longer planning and delivery time for the future cancer service in order to deliver these treatments to eligible patients.

4.1.4 PROTON BEAM THERAPY

Proton beam is a special type of radiotherapy which has minimised effects on surrounding tissue, making it particularly recommended to treat cancer in growing children. There are two high-energy NHS proton beam centres being set up in the UK, due for completion in 2018. One will be in London and one in Manchester, but they will treat patients across the UK. Due to the innovative treatments that will be delivered at these centres, radiotherapy staff in other centres are likely to be interested in working at these new centres.

The centres are due to be completed in 2018, and the workforce required for these centres, and how these will be recruited, are not currently certain. We therefore did not factor in this change in the modelling for all radiotherapy staff. From our engagement with staff working on radiotherapy, many highlighted concerns around how new private (non-publicly funded) proton beam centres would exacerbate staff shortages as experienced radiotherapy staff are being recruited to deliver these advanced radiotherapy treatments.

4.2 SYSTEMIC ANTI-CANCER THERAPY (SACT)

The following changes are likely to affect the resources required to deliver SACT treatment such as chemotherapy. Although chemotherapy delivered closer to home will also have an impact on service delivery, it was not possible to quantify the level to which it would impact workforce structure.

4.2.1 INCREASING NUMBERS OF SACT AGENTS APPROVED

The number of SACT agents approved in the UK has increased greatly. The increased number of agents available will mean a greater variety of treatments and more complex side effects, resulting in more time and complexity in the treatment plans for pharmacists. It should also be noted that in England, the NHS has simplified the majority of chemotherapy delivery and management through a national system of 'dose banding'⁴⁵. It is uncertain how the time required to deliver SACT treatments will be affected by these two major changes. An increasing proportion of SACT agents may be able to be taken orally, although the safety of delivering this outside of cancer centres should be considered further.

"The number of new chemotherapy agents coming to market is unprecedented. This means increasing numbers of cycles, more oncologist time and more pharmacy time too. Patients used to have 6-8 cycles with one drug, but will now have indefinite regime after regime, up until progression"

Chief pharmacist

4.2.2 IMMUNOTHERAPY

Immunotherapy is a relatively new form of treatment that ‘wakes’ a patient’s own immune system so it can fight cancer⁴⁶. Whilst immunotherapy at present does not cure any cancer, durable disease control for many years is being delivered in some patients with solid tumours. Trials being undertaken are likely to report to what extent certain immunotherapies cure patients’ cancers in the next five to ten years. It is administered in a similar way to chemotherapy – typically intravenously or orally – and may be administered on a daily, weekly, or monthly basis.

Immunotherapy treatments create workforce implications for the ongoing and future use of SACT services: regular monitoring of treatment response and side effects is essential, and additional workforce capacity is needed for treatment delivery. Since these treatments are currently only offered in clinical trial settings, we are not able to quantify the workforce needed to deliver these treatments.

4.3 WORKFORCE SUPPLY

In order to project the workforce needed both now and in the future, we must understand how and why staff are leaving and entering the professions. This section therefore gives an overview of the issues and each subsequent chapter will outline the data available for each professional group.

4.3.1 RETIREMENT

Age patterns are important as they affect how long we can expect the workforce to stay in post. A 2015 survey by the Hospital Consultants and Specialists Association⁴⁷ found that 81% of hospital consultants said they had thought about retiring earlier than planned as a direct result of work pressures. Numbers of retirees are calculated for our model on the basis of known ages of the workforce for some groups and an assumption on whether individuals retire at the current planned age of 65.

4.3.2 LEAVERS

Others will leave the workforce due to different reasons. They may leave the UK workforce altogether (through emigrating to continue their medical careers elsewhere) or they may decide to work within the private sector (either wholly or partially). Estimates of leavers for reasons other than retirement are based on the assumption that recent averages are likely to continue into the future.

4.3.3 NEW ENTRANTS

New entrants from the training pipeline will enter the workforce. Different workforce groups have different training periods – for example, oncologists need at least 8 years of specialist training after medical school training, whereas therapeutic radiographers are trained to qualify in an undergraduate degree and continue on additional training while working after that.

4.3.4 FLEXIBLE WORKING

As of 2014, the UK Government introduced the opportunity for staff across different sectors to request flexible working⁴⁸. This means that staff are able to work less than full-time which gives them opportunities to take on other responsibilities, such as research careers and family commitments. The proportion of medical oncologists working less than full-time has increased from 23% in 2010 to 28% in 2015, and the proportion of clinical oncologists working less than full-time has increased from 19% in 2010 to 23% in 2015. This reflects a growing trend for more flexible working. Indeed, the trend towards more flexible careers has been identified as one of the most important factors affecting job choice across sectors⁴⁹. We do not have similar trend data for other workforce groups.

One of the reasons behind this increase in flexible working is the increasing proportion of women in the workforce who are traditionally more likely to work less than full-time due to childcare responsibilities. Research has shown that 75% of female doctors, at some stage of their career, wish to work flexibly⁵⁰. Assuming women will continue to take more flexible working approaches than men, it is likely that the average take-up of full-time posts will decrease from 93.0% to 92.7% in 10 years' time as the proportion of women working in the medical profession increases from 46% to 52%. This would give future workforce requirements that are 0.3% larger than those presented above or an additional one person for every 309 to account for likely changes in this take-up rate.

4.3.5 EXITING THE EUROPEAN UNION

It is uncertain how the exit from the European Union will impact our ability to recruit and retain staff from outside the UK in the non-surgical oncology workforce. The size of the non-UK workforce in each staff group gives an indication of the level of vulnerability to overseas staff leaving (both EU and non-EU nationals) and future difficulties in recruiting from overseas. Data are available for most staff groups for England from NHS Digital and show that the size of the non-UK workforce ranges from 8% of therapeutic radiographers up to 18% of medical oncologists (Table 5).

Although the non-UK numbers are small for the clinical technologist and clinical scientist roles, both these professions are listed on the National Shortage Occupation List reflecting the difficulty to recruit into these roles. IPEM notes that the high volume of staff from the Republic of Ireland, part of the EU workforce, should be considered. Similar data is not available for Northern Ireland, Scotland and Wales, but we assume that the proportions will be similar for those countries. There is no data for the remaining workforce groups on nationality.

TABLE 5: NON-UK NATIONALS IN WORKFORCE, ENGLAND

	Non-UK EU	Non-EU	UK	Unknown	Total
Clinical oncologists	53	57	557	63	730
Medical oncologists	44	30	313	18	405
Therapeutic Radiographers	114	116	2,402	194	2,826
Clinical scientist	42	19	469	52	582
Clinical technologist	28	13	287	33	361

4.3.6 TRAINING PIPELINES

Our qualitative research indicated that there is widespread concern from staff and senior leadership that the current policy changes within training and education of this workforce are likely to impact our supply of health professionals in the future. Key concerns included:

- **Changes to funding mechanisms for nurses and therapeutic radiographers** – Students training for these professions have previously been given bursaries; however, from 2017, these students will be required to take up student loans. There has already been a reduction in the number of people into training since this change was introduced. The Royal College of Nursing reported that nursing applications have decreased by a quarter following the removal of student bursaries⁵¹.
- **Minimal funding for clinical technology posts** – The Welsh Assembly commission places on the Practitioner Training Programme course (see section 7.1 for further detail), which explains the successful training figures in Wales compared to England. In 2015, funding was promised to support English PTP places, but this promise was then withdrawn along with nursing and radiographer bursaries in England.

The extent of the impact of these changes is not yet quantifiable, meaning that they have not been included in our projections. However, the potential impact of these changes on workforce supply should not be underestimated and according to our clinical panel, these factors are likely to further exacerbate staff shortages.

RECOMMENDATIONS

5. The UK Radiotherapy Board and the UK Chemotherapy Board should review how future changes to cancer treatments will impact staff numbers and skills required.
6. Further research is needed to understand the impact of early diagnosis initiatives and improvements in technology on when and how patients are treated, and the workforce implications of this.

5 TEAMWORK AND SKILL MIX

Cancer Research UK believes that cancer patients in the UK should have access to the best, evidence-based treatments. Delivering this is dependent on the effective teamwork of the non-surgical oncology workforce. Our survey, interviews, and site visits demonstrated how important teamwork is for the delivery of these treatments. This includes both traditional team structures where the majority of the clinical responsibility for the patient lies with the clinician, as well as new skill mix approaches where other members of the workforce are trained to take on additional responsibilities. These new approaches revise the traditional allocation of responsibilities within the team to maximise the use of health professionals' skills and training.

The majority of skill mix approaches we observed during our site visits were oriented around training other team members to take on tasks and responsibilities traditionally done by oncologists. The site visits demonstrated the flexibility and innovative approaches taken by staff to implement these changes. Furthermore, 70% of our survey respondents either 'agreed' or 'strongly agreed' that skill mix would be a positive development for their place of work.

"Skill mix can be successful for a very particular scope of practice when it is supported by education and training and a good team environment"

Director of professional policy,
SCoR

However, increasing the implementation of skill mix approaches has also increased demands on more experienced staff's time to train and supervise those undertaking new roles and responsibilities. In this section, we outline existing skill mix approaches and the extent to which they could be rolled out more widely. We have used these interventions in the modelling for each workforce group in subsequent sections.

When using these skill mix approaches for modelling future workforce need, we demonstrate the impact that these approaches could have if they were undertaken to the fullest possible extent. Future workforce projections are then calculated by multiplying the total time needed for different activities by the proportion to which other staff groups might take these tasks on (see tables 6 and 7 below).

For example, if the total annual time requirement for cancer patient consultations is 435 FTE oncologists, and 30% of the consultations could be taken by consultant therapeutic radiographers or other advanced roles, the UK would need 131 fewer oncologists in the future (if this approach was fully implemented across all cancer services). However, as mentioned above, each hospital will need to take a local approach, depending on their local staffing models and requirements. Our projections for future workforce are therefore based on a range of these skill mix approaches being implemented.

Some local examples of the skill mix approaches we explored can be found in Appendix 7.

5.1 ADVANCED CLINICAL PRACTITIONERS

Over many years, the development of advanced nurse practitioners⁵², consultant therapeutic radiographers⁵³ and consultant pharmacists⁵⁴ have enabled skilled nurses, therapeutic radiographers and pharmacists to undertake many tasks traditionally done by oncologists. This includes the ability to manage their own clinics, managing patients over the care pathway and making risk assessments and complex decisions. They also take on leadership roles in developing and improving their service area, participate in clinical research, and contribute to training and education.

The common working model for these positions is to have the advanced clinical practitioner working alongside an oncologist during their regular clinics. Whilst they work independently for the majority of the time, it can be helpful to have a colleague available in case they experience anything unusual or outside of their expertise. Additionally, health professionals in these roles often have site-specific knowledge, but have not undergone the broad medical training of oncologists, so may require peer support in the case of specific or rare comorbidities outside of their field. They are also often not trained to case manage patients independently, which is a common training need when they take on these expanded roles.

These roles are based on the health professionals' many years' experience and are frequently oriented around specific local needs as well as key 'stand-out' individuals who are eager to progress. This means that the sustainability and succession planning for these roles must be considered when the role profile is developed. Our interviews outlined that when the role is developed for a 'stand-out' individual, there is no consideration of what will happen if this person leaves the post. In most cases, the workload is taken back by the oncologist.

"My job plan is 50% clinical and the rest of the time is spent on teaching, research, admin and personal development. I see around 10 new patients a week and have follow ups etc. for the rest of the clinical time"

Consultant therapeutic
radiographer

"An issue with extended roles is sustainability. If the person leaves, or even gets sick, we can be at a loss if we haven't thought about how these increased responsibilities will be covered"

Chief pharmacist

These roles are often implemented through local supervision in areas where the health professionals have identified a need or interest. This would suggest that there would not be one standardised model which would work for all cancer centres. Our site visits highlighted that the transition process takes up to two years with close clinical support and shadowing. Handover of clinical responsibility must be done when both the oncologist and the practitioner are comfortable with independent practice by the latter.

Health Education England, in partnership with NHS Improvement and NHS England, published the Advanced Clinical Practice Framework⁵⁵ in November 2017. This has been welcomed by professional bodies, including SCoR, as it offers an opportunity to align allied health professionals' advanced clinical practice across a wide range of roles and settings.

5.2 NON-MEDICAL PRESCRIBING

In 2006, regulations on ‘independent prescribing’ changed⁵⁶ which meant that some professional groups with relevant training, such as pharmacists, would be able to prescribe autonomously for any condition within their clinical competence without requiring sign-off from a clinician. This also included the opportunity for some other professional groups such as therapeutic radiographers and physiotherapists to prescribe from a limited list of drugs in limited situations approved by their employing organisation. All groups for which this is an option need to belong to a nationally-regulated professional body.

During the site visits, it was evidence that there were more opportunities for independent prescribing in Systemic Anti-Cancer Therapy (SACT) than radiotherapy. This was highlighted in the Carter report where the role of pharmacist-led prescribing was assessed⁵⁷. Non-medical prescribing in SACT treatments is relevant in the assessments for chemotherapy administration which occurs at every cycle of chemotherapy. Prescribing has traditionally been undertaken by an oncologist for the first cycle with other staff, such as pharmacists, supporting in subsequent cycles, usually within their specialty area. However, independent prescribing pharmacists would be able to carry out such appointments during their own clinics. Additional activities might include amending, updating, and initiating SACT prescriptions⁵⁸.

The route to non-medical prescribing in SACT is a 6-month training course. According to BOPA’s membership survey, just under 50% of surveyed oncology pharmacists are non-medical prescribers. Although we are not able to establish the definite figure for oncology pharmacists across the UK, it is likely that this is an underestimate of the total number of non-medical prescribing pharmacists. BOPA advocates for more non-medical prescribing and it is therefore likely that they attract pharmacists interested in developing this skill set. However, 37% of those that are qualified non-medical prescribers in BOPA’s membership are not currently using the qualification at work. This suggests that support is required to establish this practice more widely within cancer services to enable more pharmacists to utilise their training.

Introducing independent prescribing for therapeutic radiographers in radiotherapy can reduce time for patients to receive their medication⁵⁹. Supplementary prescribing which allows non-medical staff to prescribe medicines under particular circumstances has been in place since 2002⁶⁰. The move towards independent prescribers widens these opportunities, meaning that patients don’t have to wait to see multiple practitioners in order to quickly be prescribed the treatments they need. In order to become an independent prescriber, therapeutic radiographers take a six-month independent prescribing course and will be able to prescribe following the completion of this course. They are likely to use this qualification on treatment reviews and follow-ups. There is also a shorter course which enables a supplementary prescriber to become an independent prescriber. SCoR has published in-depth guidance on the delivery of non-medical prescribing in radiotherapy⁶¹.

5.3 TREATMENT REVIEW

On-treatment reviews during SACT cycles can be undertaken by nurses or pharmacists. This is already happening in a number of places. The discussions led by the nurses and pharmacists (frequently advanced clinical practitioners) necessitate high levels of consultation and understanding of the treatments and their side effects. For these positions to be developed successfully, training and supervision by oncologists or advanced clinical practitioners is necessary: this is especially important to understand the site-specific complexities.

On-treatment review in radiotherapy is a legally-mandated weekly opportunity for radiotherapy patients to speak to a member of the radiotherapy workforce about the progress of their treatment and any next steps, as well as the chance to discuss any issues or side effects. In many places, this is undertaken by therapeutic radiographers or radiotherapy nurses working as advanced clinical practitioners. This is a standard identified by the Royal College of Radiologists⁶². There are varied training pathways to undertake on-treatment review. Therapeutic radiographers and nurses developing these skills are often educated at Masters level, but could also learn through a combination of induction, in-house supervision, and external courses. They also receive training in communication, psychological assessment, and awareness of onward referral pathways for more specialist psychological support.

5.4 RADIOTHERAPY TREATMENT PLANNING

Radiotherapy planning involves the outlining of organs at risk from the images provided, outlining the target volume and then planning how treatment will be delivered by a linear-accelerator. The planning is done using computer programming, but needs constant human input in order to check that all of the set criteria are being met. Clinical oncologists also check both the images and the plan. Radiotherapy treatments are becoming increasingly complex, and oncologists in our survey frequently mentioned that time allocated for planning is insufficient. The dependence upon clinical oncologists to develop plans and check images creates bottlenecks in the system and often results in delays in delivering the treatment to patients.

To overcome this, dosimetrists (trained clinical technologists or therapeutic radiographers) are playing a larger role in the imaging-led side of treatment, either outlining target volumes or the organs at risk. Outlining organs at risk is the most common skill mix task for dosimetrists and this often starts in the high-volume and lower complexity areas such as breast or prostate planning. There is no defined assessment criteria which accredits dosimetrists or therapeutic radiographers to deliver planning; however, they undertake training through lectures and hands-on experience. Once they start planning, it will also require varying amounts of ongoing supervision from oncologists and/or clinical scientists. Outlining of target volumes can also be developed, albeit via a more complex and time-consuming training path. In addition, clinical scientists and dosimetrists are already doing more quality assurance of plans.

5.5 RADIOTHERAPY PLAN CHECKING

Radiotherapy planning traditionally involves a clinical oncologist checking and approving after the images are outlined and a further check and approval after the dosimetric plan is signed off. For example, at Newcastle Cancer Centre, the initial image check has been shifted to the end of the process to take place alongside the dosimetric plan. This has been undertaken with dosimetry skill mix meaning that the clinical oncologist's input into radiotherapy has been streamlined and shifted to the end of the process. In turn, this minimises process bottlenecks, whereby physics staff wait for oncologists to do the image outline check.

This model is underpinned by highly skilled and well-practiced dosimetrists being able to work largely independently. It is also easier to implement in tumour sites that are simpler to plan, such as breast cancer, as opposed to more complex sites like head and neck cancer.

TABLE 6: SKILL MIX OPPORTUNITIES IN SYSTEMIC ANTI-CANCER THERAPY

Activity	Minutes per activity per patient	Description	Typical distribution of activity currently	Potential distribution with further skill mix (recommendation)
Consultation in out-patient clinic appointment	60	Review of imaging and histopathology (clinical information). Take final decision about treatment course, with patient present and agreeing (provide information to patients and initiate consent).	Oncologist 99% / consultant nurse 1%	Consultant nurse – up to 50% / oncologist 50%
Prescribing drugs on electronic system	15	Prescribing drugs on electronic system.	Oncologist 95% / advanced clinical practitioner nurse 5%	Nurse 90% / oncologist 10%
Prescribing with assessment for chemotherapy administration	30	Assessment of patients' condition to receive current chemotherapy cycle, including bloods, tumour markers, visible disease and toxicities. Prescribing or alterations.	Oncologist 75% / nurse 22% / pharmacist 3%	Oncologist 40% / nurse 40% / pharmacist 20%
Final review post-treatment	30	End of therapy consultation including special end of treatment follow-up interview where appropriate. Telephone possible for a few cases but final interviews will need to be face-to-face.	Oncologist 100%	Oncologist 30% / nurse 50% / pharmacist 20%

TABLE 7: SKILL MIX OPPORTUNITIES IN RADIOTHERAPY

Activity	Minutes per activity per patient	Description	Typical distribution of activity	Potential distribution with further skill mix
New patient – initial consultation	60	Review of imaging and histopathology (clinical information). Take final decision about treatment course, with patient present and agreeing (provide information to patients and initiate consent).	Oncologist 99% / therapeutic radiographer 1%	Consultant therapeutic radiographer up to 30% / oncologist 70%
Outlining of radiotherapy planning images	20-120 (combination of both procedures)	Outlining of proposed target area. Outlining of organs at risk.	Oncologist 80% / dosimetrist and therapeutic radiographers 20%	Oncologists 30% / dosimetrists and therapeutic radiographers 70%
Checking the dosimetric treatment plan	30	IRMER practitioner approval of generated dosimetric distribution including constraints (complex plans only).	Oncologists 98% / therapeutic radiographers and dosimetrists 2%	Oncologists 50% / therapeutic radiographers and dosimetrists 50%
	60	IRMER operator second confirmatory check of complex plans.	Clinical scientists and dosimetrists 100%	Clinical scientists and dosimetrists 100%
	30 - 60	Machine upload and check of dosimetric and dose data.	Dosimetrists / therapeutic radiographers 100%	Dosimetrists / therapeutic radiographers 100%
On treatment review	15	Once per week during course of radiotherapy treatment.	Oncologist 50% / therapeutic radiographers 50%	Oncologists 5% / therapeutic radiographers 95%
End of therapy	15	End of treatment check to ensure patient has AOS contact details and information on managing side effects and future clinic OPA.	Oncologists 10% / therapeutic radiographers 90%	Therapeutic radiographers 99% / oncologists 1%

5.6 HOW TO IMPLEMENT SKILL MIX APPROACHES

5.6.1 VIEWS FROM PEOPLE AFFECTED BY CANCER

Cancer Research UK consulted a small group of people affected by cancer through a survey to understand their perspectives on how to implement and communicate these skill mix approaches. The themes that came out of this consultation were:

- **“If this will give patients a better experience, let’s do it”** – many respondents were positive about the idea, especially if it meant more time with a health professional, such as a nurse or a pharmacist, to discuss the treatments and potential side effects. Many respondents mentioned that they did not feel that they had adequate time to discuss this during their treatment.
- **“Tell me they’re part of my treatment team from the start”** – most respondents were positive towards the concept of advanced roles having responsibility for their care as long as this was explained during the initial consultation. This would mean that the patients, their carers and families would recognise that this new way of working was part of the standardised protocol rather than an ad hoc procedure. They also felt that this way of working should be communicated both verbally and in written form by the responsible oncologist.
- **“It’s really important that they have adequate training”** – the respondents mentioned that they put trust in oncologists because of their recognised extensive training and experience in their field. There were concerns about whether other health professionals would be able to take on these extended roles due to the lack of experience and training. It is therefore important that any implementation includes reassurance and written communication to patients that health professionals taking on extended roles have been given training to do their roles.
- **“It needs to be clear that the oncologist has ultimate responsibility for the patient”** – some respondents were concerned that it could be seen as the oncologist discharging their overall responsibility of the patient’s treatment plan. It therefore must be communicated clearly, both verbally and in written form, from the start that this is not the case. The respondents also mentioned that it was important that patients, their carers, and families were still able to access the oncologist if they felt it was necessary. If the treatment does not progress as planned or more radical procedures are required, the ultimate responsibility should still lie with the oncologist.
- **“The benefits to the patients must be explicitly explained”** – communications with patients should focus on how this approach will benefit patients, and how it will improve their experience and care management. Any reference to ‘overstretched services’ will not reassure the patient and their carers that this is the best approach for patients. This needs to be reflected in both verbal and written communications.

5.6.2 STAFF RESOURCES AND TRAINING CAPACITY

The first requirement for establishing skill mix practices is having the right staff to fill new posts. For instance, whilst skill mix can help free up time for the oncologist to focus on more complex cases through non-medical pharmacy prescribing, it could be more difficult to develop this in a cancer centre where there are limited pharmacy staff to take up these positions. Skill mix also implicates a training cost, particularly when certificates or Masters

qualifications are necessary. The centres we visited had used existing departmental funding, written business cases, or sourced charitable funding to support these skill mix roles.

In creating advanced roles, it is important to consider how the backfilling of these roles will be done, especially if there are few staff operating at the higher levels. There must be people available to continue to lead departments in the more typical activities. These contingencies must be considered fully in order for skill mix to be sustainable and not negatively impact any other areas of the service.

The understanding of the personal development and extra time that will be necessary for those undertaking new roles is also key for implementation. Training can be completed in a few months in places where the staff have a lot of experience in the area and the new competency range being undertaken is relatively small. By contrast, the creation of advanced roles such as consultant therapeutic radiographers or consultant nurses can take up to two years.

Furthermore, there will be a time implication for the experienced staff that may be involved in delivering training. In a few cancer centres where competencies were being taught to significant numbers of people, a specific full-time training post had been created for the purposes of leading the development programme. In developing advanced roles, there will be certain periods in which the demands upon oncologist time for training and supervision will increase.

5.6.3 CULTURE OF ORGANISATION AND TEAM

Staff and senior leadership must be supportive of skill mix and the change required for these roles. Centres indicated that a culture of openness and mutual appreciation amongst the oncology team as a whole were important for the success of skill mix approaches. During a few of the site visits, health professionals reflected on other staff's resistance or anxiety towards changing roles and the risks that might be implicated.

One good way identified to manage these transitions was to involve staff in the development of competency assessments. The improvements made to the service due to the people in new roles was often what finally convinced staff of skill mix benefits in the early stages. Positively, 70% of the respondents to our survey either 'agreed' or 'strongly agreed' that core skill mix would be a positive development.

"Skill mix needs to be introduced in a really safe way which engages those who had typically done the work in the competency assessments of those going into the post. In that way, you can prove that the people new in post will be just as skilled in doing the work"

Head of radiotherapy

5.6.4 PROTOCOLS AND STANDARDS

Skill mix can be more easily facilitated for more routine activities where there is more standardisation and protocolisation in place. This clarifies the outputs and standards required of staff, and makes competency-based assessment more objective and straightforward. It is for this reason that skill mix has often started in an area with more standardisation such as outlining the organs at risk for breast and prostate cancer.

5.7 FACILITATING BETTER TEAMWORK

When we discussed the implementation of skill mix approaches with the workforce, several additional themes emerged which would increase the efficiency of the team as a whole.

5.7.1 IT SYSTEMS AND DIGITAL WORKING

Delivering treatments closer to home and networked approaches are dependent on IT and digital solutions. Many responses to our survey referenced local attempts to move towards paperless or paper-light systems. The responses highlighted that digital working is beneficial for patient experience and reduces the risk of lost information, but is not necessarily more time-efficient in terms of the core activity of data entry. The multitude of IT systems, each with their own login details, creates a time burden for staff. They cause further issues when treatment plans have to be modified and uploaded between different planning softwares. The radiography systems and software differences also prohibit the sharing of expertise between centres.

Cross-site working is necessary across many small centres, but the travel implications can be an inefficient use of health professionals' time. In terms of paperwork and planning, digital working would offer more flexibility than waiting for the oncologist to be there in person. Oncologists also travel to remote centres in line with the 'care closer to home' agenda to conduct reviews with patients. This need is mediated in some places by telephone follow up in cases where patients would be comfortable with this. However, more extensive digitalisation would improve the possibility of sharing expertise across centres.

5.7.2 ADMINISTRATIVE AND SUPPORT STAFF

Whilst the numbers and activities of the administrative and support staff were not part of the research, their capacity is essential for supporting the oncology workforce. The scope of their roles is locally-defined, with centres with staff shortages often resorting to practitioner- or nurse-led administration. However, most administrative tasks should not be part of skill mix between healthcare-trained staff groups. Where possible, it makes sense to increase administrative support for booking clinics, making arrangements and sorting paperwork to decrease the responsibility placed on the health professionals.

5.7.3 OPEN ACCESS AND STRATIFIED FOLLOW-UP CLINICS

Clinical guidelines on surveillance tend to recommend set follow-up regimes for patients – typically 1-4 times per year for 2-5 years but sometimes longer. However, for many cancers there is little clinical evidence to suggest that regular follow-up regimes contribute to better outcomes⁶³. It should be noted also that whilst some people prefer to not have to come into hospital to see an oncologist, others feel reassured by this.

Due to the lack of evidence in support of follow-up regimes, and the high workload implicated (around 30% of an oncologist's time was spent on follow-ups in our survey), some hospitals are moving towards 'open access' clinics with patient-led future interaction. This was recommended in the Cancer Strategy for England and part of the NHS England Transformation Fund is being used to implement these changes.

Rather than set up a plan for the next few years, members of the non-surgical oncology team will explain to patients that they will not have pre-booked appointments for the future. If they feel the need to come in, they are guaranteed an appointment in the future.

For example, at the Great Western Foundation Trust, breast cancer patients are referred for “end of treatment summary, holistic needs assessment and signposting to living well events and support groups. The patient is given written information listing treatment to date and advice on symptoms that require rapid access back into the healthcare system⁶⁴. In addition, a telephone number is provided to call if required for an urgent appointment in the breast clinic within 2 weeks”. The results of this have included cost savings, more time for doctors and nurses to spend treating patients, and quicker movement through pathways.

An alternative model is to stratify patients onto follow-up regimes of different intensity according to their risk. The London Cancer Alliance has produced helpful information on the implementation of this for a number of cancer sites^{65,66}. The process entails assessing the extent to which a patient is ‘stable’, as well as their holistic needs and confidence to manage or lead their own care. In re-orienting care in a way which empowers patients to lead their own care, changes are needed to the culture and expectations around care. It requires up-front investment in patient education as well as fluid and responsive pathways later down the line. This means that patients will have instant access if it ever becomes necessary.

“I introduce the idea to my patients from session one: I’ll say that all being well, we won’t have to see each other on that regular a basis”

Head and neck clinical oncologist

5.7.4 TELEPHONE FOLLOW-UP

A number of centres are moving more activity to take place over the phone. They highlighted that this has saved time and resources for both staff and patients. This has happened predominantly with follow-ups, sometimes in conjunction with a stratified follow-up regime. They are being led by pharmacists, nurses, therapeutic radiographers, and oncologists in different localities, depending on staff availability.

Any necessary tests such as blood tests can be led by a local GP in advance of the call, and the call will involve a review of the results and a conversation about additional experiences the patient might be having. Research has suggested that patients appreciate this model of care, seeing it as more convenient and personalised. It also fosters good relationships with the leading health professional⁶⁷.

For example, at the Velindre cancer centre the oral chemotherapy drug Vinorelbine is taken by patients at home through telephone facilitation. Rather than coming to the unit to take the drug, patients take it at home on day 8 of their chemotherapy cycle. They speak on the phone with a pharmacy technician who will ask the questions that determine whether the patient should go ahead and take the tablet.

To make this a success, the centre has delivered oral education clinics to patients in preparation for this model, and has put in place measures for situations when the telephone consultation would not be sufficient or appropriate. With the increase in oral chemotherapy drugs, there may be potential to extend this practice, although the safety and management steps must be planned out carefully on a drug-by-drug basis. A move to telephone-led services will need to consider each individual patient's needs.

RECOMMENDATIONS

7. NHS England should share the 3 key skills mix opportunities identified in this research with Cancer Alliances to spread innovation and encourage best practice.
8. The UK Radiotherapy Board and UK Chemotherapy Board should work with the Department for Education and equivalent bodies in the devolved nations to understand how apprenticeship standards can be used to improve skills mix implementation.
9. The UK Radiotherapy Board and UK Chemotherapy Board should agree the standards needed for skills mix approaches and how to implement follow-up and open access approaches.
10. The Department of Health and equivalent bodies in the devolved nations should ensure that contracts for health professionals covered in this research include protected time for Supporting Professional Activities such as service improvement, training, and clinical research.

6 CLINICAL SCIENTISTS

6.1 ROLE AND TRAINING PATHWAYS

There are different clinical scientist roles within healthcare. In this research, the role in scope is specifically that of medical physics specialists working with clinical oncologists and therapeutic radiographers to deliver and develop radiotherapy treatments and services. It should be noted that the term clinical scientists refers to physicists working in radiotherapy and not 'clinician scientists' which is a term used for clinicians undertaking research.

Their responsibilities include managing the change and risk associated with advanced radiotherapy, quality assurance of the radiotherapy machines, refining and developing radiotherapy techniques, and planning radiotherapy treatments for individual patients. They often also take leadership roles in medical physics departments.

There are two main pathways for training to become a clinical scientist (radiotherapy physics). In both pathways, 3 years of specialist clinical scientist training or supervision is required. Pathway 2 requires a further 3 years of experience in the workplace.

1. Individuals who have obtained a BSc in Physics apply for a Modernising Scientific Careers Scientist Training Programme (England, Wales and Northern Ireland) or to the Supernumerary Clinical Scientist trainee programme (Scotland). These are 3 year training programmes leading to an MSc in Clinical Science (Medical Physics) and are assessed by an Objective Structured Final Assessment. STP trainees in England, Wales and Northern Ireland also receive a Certificate of Attainment. Graduates in all nations are then able to register with the Health and Care Professions Council (HCPC) as a clinical scientist.
2. Individuals with sufficient experience and qualifications submit their portfolio to the Association of Clinical Scientists to be assessed for a certificate of attainment (England, Wales and Northern Ireland) or to the Academy for Healthcare Science to be assessed for a certificate of equivalence (Scotland). Applicants are expected to have 6 years of postgraduate experience including at least 3 years in supervised clinical science practice, i.e. as a supervised pre-registrant clinical scientist. For many clinical scientists in radiotherapy physics, the remaining experience comes from studying for an MSc or PhD. Successful applicants are then able to apply to register with HCPC.

6.2 AVAILABLE DATA

The Institute of Physics in Engineering and Medicine collect data on clinical scientists through their census – this includes vacancy data broken down by nation. IPEM are intending to collect more detailed demographic data in the 2017 census due in November, including on nationality, and to develop a detailed picture of staff age, data on which was not previously collected. The variety of routes to entry for this group mean that incoming or training figures do not exist. This means we are not able to model future projections for the workforce.

6.3 CURRENT WORKFORCE

The 2015 workforce data from IPEM show that there were 556 FTE clinical scientists in England, 37 in Wales, 52 in Scotland and 17 in Northern Ireland, a UK total of 662; the headcount total was 732.

The vacancy rate for clinical scientists in their census in 2015 was 9.0%. This indicates that there are staff shortages for this workforce group. This is also likely to increase as advanced radiotherapy techniques become more widely used in the future, requiring more time for treatment planning and delivery.

Furthermore, only 38% of the clinical scientists among our survey's respondents said that they had enough time to complete their workload to a high standard – the lowest proportion of all staff groups.

Many departments use the IPEM staffing algorithm⁶⁸ in order to understand the need for physics staff, which ties the need of clinical scientists not only to patient numbers but also to the number of different types of machinery. For example:

- 0.8 FTE clinical scientists are needed per multi-mode accelerator;
- 0.6 FTE per single-mode accelerator; and
- 0.8 FTE are needed per 1,000 new courses treated by external beam therapy per year.

It was not possible to work through the algorithm with the available data, but IPEM staffing modelling suggests that the staffing shortfall for clinical scientists is around 130 (19.6%) FTE clinical scientists across the UK. This highlights the discrepancy between vacancy figures of 9% and the additional staff needed to fulfil staffing models by professional bodies.

6.4 FUTURE WORKFORCE

It was not possible to model the future clinical scientist workforce needed, however, IPEM staffing modelling suggests we will need more than 450 additional clinical scientists by 2022. This suggests that health services across the UK need to consider how training places and recruitment for this role is increased over the next 5 years.

7 CLINICAL TECHNOLOGISTS

7.1 ROLE AND TRAINING PATHWAYS

The role covered in this research is radiotherapy physics technologist, which we will refer to as clinical technologist. The research did not include engineering technologists due to the lack of available data to map their workload and tasks to patient demand and treatments. However, this workforce group is essential for the safe delivery of radiotherapy treatments to cancer patients.

Clinical technologists specialise in monitoring the quality and dose measurement of radiation from radiotherapy machines. The research also covered the role of dosimetrists. Dosimetrists are employed exclusively to carry out dosimetry/treatment planning.

There are five training pathways to become a clinical technologist:

1. Individuals undertake the Modernising Scientific Careers Practitioner Training Programme (PTP, the only universities accredited are in England and Wales) through applying for a recognised BSc undergraduate degree lasting 3 years with clinical placements in the second and third years. Upon successfully completing the course, individuals can register as a clinical technologist with the Academy for Healthcare Science (AHSC) or the Register of Clinical Technologists (RCT).
2. Individuals employed as trainees in an accredited training centre can participate in an IPEM Technologist Training Scheme. On successful completion of the Scheme, trainees are awarded the IPEM Diploma in Clinical Technology and are entitled to register with the Register of Clinical Technologists.
3. Individuals employed in a trainee technologist position (for example a high apprenticeship scheme) in a relevant medical physics area of healthcare science may participate in a distance learning course enabling them qualify with a BSc Healthcare Science and apply to register with AHSC or RCT. This is a new scheme with the first recruits starting in September 2017.
4. In Scotland, individuals are employed with NHS Scotland in a trainee Pre-Registered Practitioner (PRP) role and participate in the two-year PRP training programme. Upon successful completion, individuals are then able to register with the Voluntary Register of Clinical Technologists.
5. Individuals undertake a two-year postgraduate Diploma which involves both clinical training as part of the cancer service and university education. Applicants require an undergraduate degree in physics.

Dosimetrists are employed exclusively to carry out dosimetry and treatment planning. They may term themselves dosimetrists and these roles may be advertised as such. However, there is no separate training programme for a dosimetrist role. Neither the Register of Clinical Technologists nor the Academy of Healthcare Science recognise 'dosimetry' as a scope of practice. Individuals may enter a dosimetrist role from a therapeutic radiographer or clinical technologist pathway.

7.2 AVAILABLE DATA

The Institute of Physics in Engineering and Medicine collect data on clinical technologists through their census – this includes vacancy data broken down by nation. IPEM are intending to collect more detailed demographic data in the 2017 census due in November, including on nationality, and to develop a detailed picture of staff age, data on which was not previously collected. Given their job focus on the planning of treatment, we have been able to estimate a ‘best practice’ activity-based model according to the outlining, planning, and quality assurance needed to serve the increasingly complex radiotherapy planning need of cancer patients.

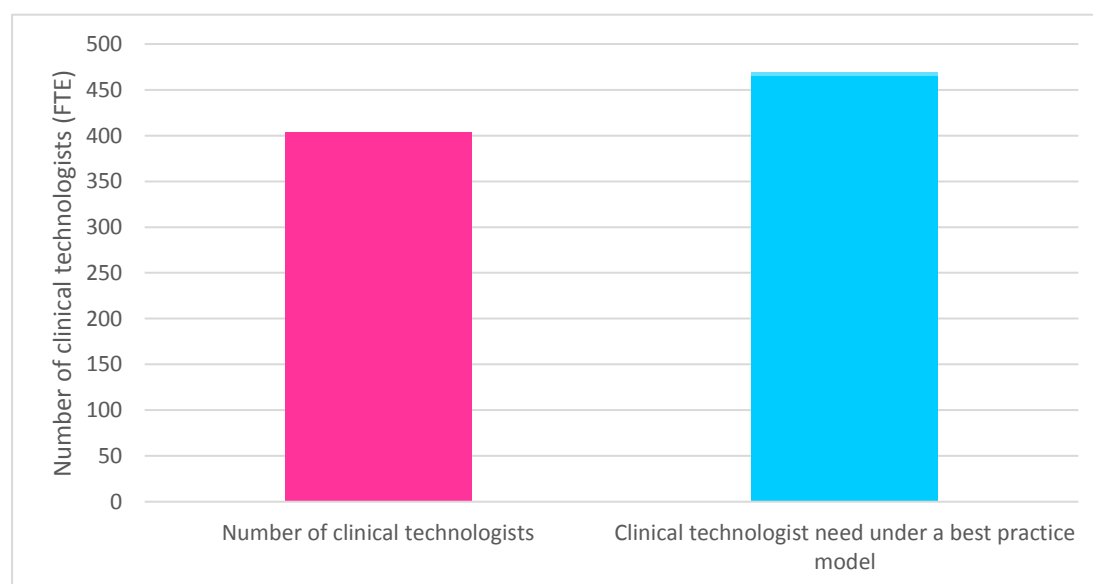
Due to the lack of clear data distinguishing between clinical technologists and dosimetrists, we were unable to identify the number of dosimetrists across the UK. Compared to the figures obtained during the site visits, the NHS data had relatively few individuals recorded with the job title ‘dosimetrist’. For example, the role of ‘dosimetrist’ is also not recorded separately in workforce censuses carried out by relevant professional bodies such as IPEM and SCoR.

7.3 CURRENT WORKFORCE

In 2015, IPEM recorded 403.4 FTE Clinical Technologist (Practitioner) roles in radiotherapy physics. IPEM vacancy data recorded a vacancy rate of 9.2% in 2015. Our ‘best practice’ model suggests that a shortage of around 16% or 80 FTE staff in 2015 (see Figure 7).

The model was based on a 3% vacancy rate due to the available data at the time of the modelling, however, due to the higher vacancy rate available (9.2%), additional clinical technologists would be needed to fill those vacancies.

FIGURE 7: CLINICAL TECHNOLOGISTS COMPARED TO BEST PRACTICE MODEL



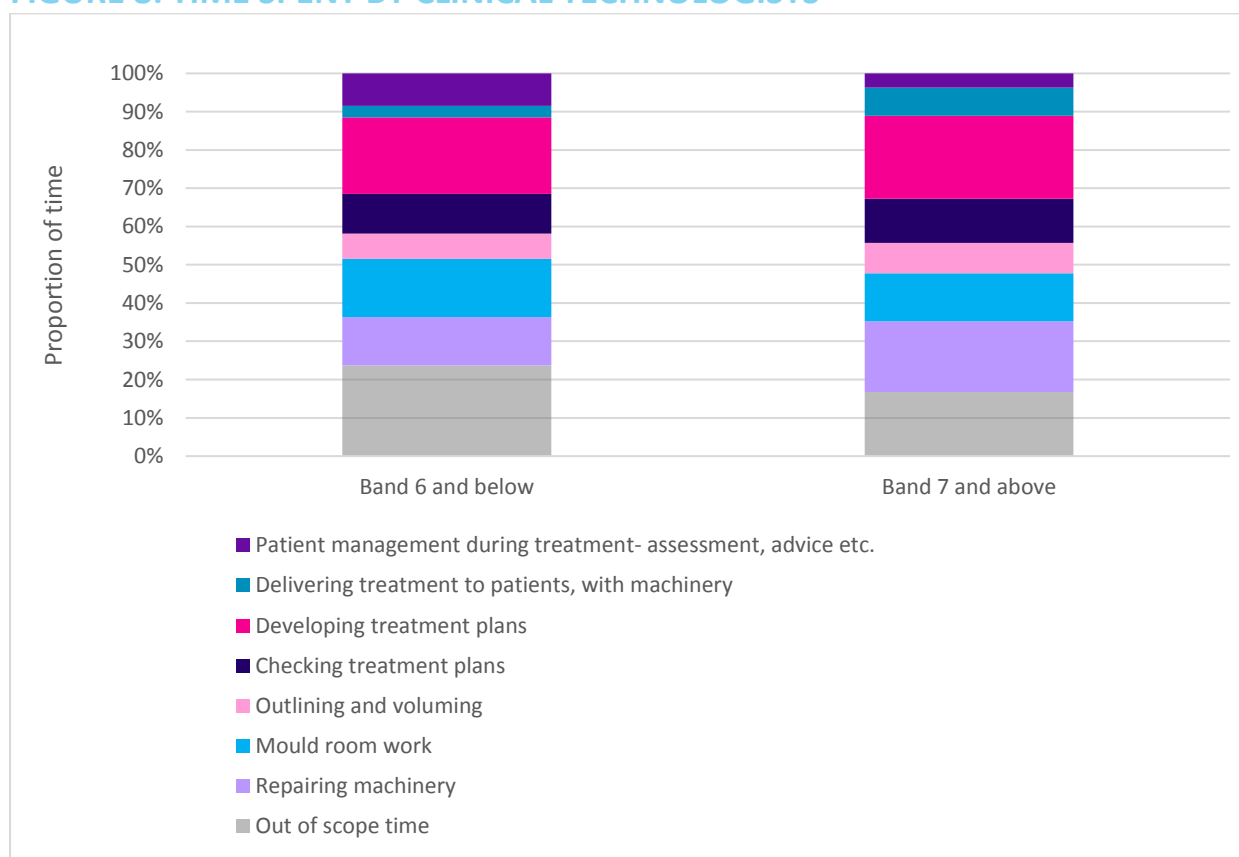
Discussions with the clinical panel and survey findings suggest that clinical technologists spend 50% of their time planning therapies, outlining, undertaking quality assurance, and doing mould room activities (see Figure 8). Mould room activities include making masks for patients having radiotherapy for treating head and neck cancers.

When we examine how the clinical technologists in our survey spend their time, they spent just 15-20% of their time on non-treatment activities such as training, education, management, or admin. Compared to other workforce groups, the survey suggests that clinical technologists spend more time on delivery of treatments to keep up with demand and comparatively less time on other Supporting Professional Activities, such as additional training and research activities.

For Band 5 and 6 level staff who are newly qualified, a large part of this was training into the role. It is important to remember that as techniques advance, and skill mix increases, training will need to be protected in job plans and contracts for clinical technologists.

Furthermore, IPEM highlighted that the Welsh Assembly commission places on the PTP course in Wales, which explains the success of that course compared to others in England. In 2015 funding was proposed to support English PTP places, but this proposal was withdrawn along with nursing and radiographer bursaries. This will have an impact on the number of clinical technologists who are trained and able to take on additional responsibilities.

FIGURE 8: TIME SPENT BY CLINICAL TECHNOLOGISTS



From our survey, 47% of clinical technologists reported that they don't have enough time to carry out their workload to the highest quality. Clinical technologists' time is not related to patient appointments in the same way as other staff groups, but the way in which they work can easily be held up by issues or bottlenecks elsewhere in the pathway. In particular, the problem of waiting for plan checks and approvals from oncologists delays their work.

"We could do more contouring for the clinicians to help ease their workload - we are generally quicker at using the contouring software as we use it all day everyday"

Clinical technologist

Moreover, the complexity of the treatment plans they create is increasing. As one of the latest stages in the pathway, people working in radiotherapy planning often have to deliver large quantities of work in short timescales to ensure that a patient can commence their treatment in a timely fashion.

There was a key issue for clinical technologists about the 'double-edged sword' of advancing technology in the physics field. On one hand, as software can create 'atlases' of previous plans and help to automate some work and reduce time needed from clinical technologists. On the other hand, it takes time to get used to the different types of new therapies, some of which might take 3 times as long to plan, such as 4D adaptive therapies. The very advanced techniques have not yet made their way into standard best practice in some centres, but these changes will have an effect in the near future.

However, many of the clinical technologists that responded to our survey suggested that they could do more to help ease the oncologist's workload by taking on more outlining and plan-checking duties. Developing these capabilities is within the skill set and knowledge of this workforce, but significant capacity for training and practice by clinicians is required to implement these skill mix approaches.

There was an appetite for clinical technologists to be able to take more leadership in the field, learning more about new techniques and improving service delivery. Without protected time to do this, clinical technologists tend to spend the majority of their time on treatment delivery itself.

"Dosimetrists need to be able to take ownership of their profession, be able to lead research, and play a more active role in the development of clinical protocols. This would be good for recruitment and retention, as well as be better for service quality"

Clinical technologist

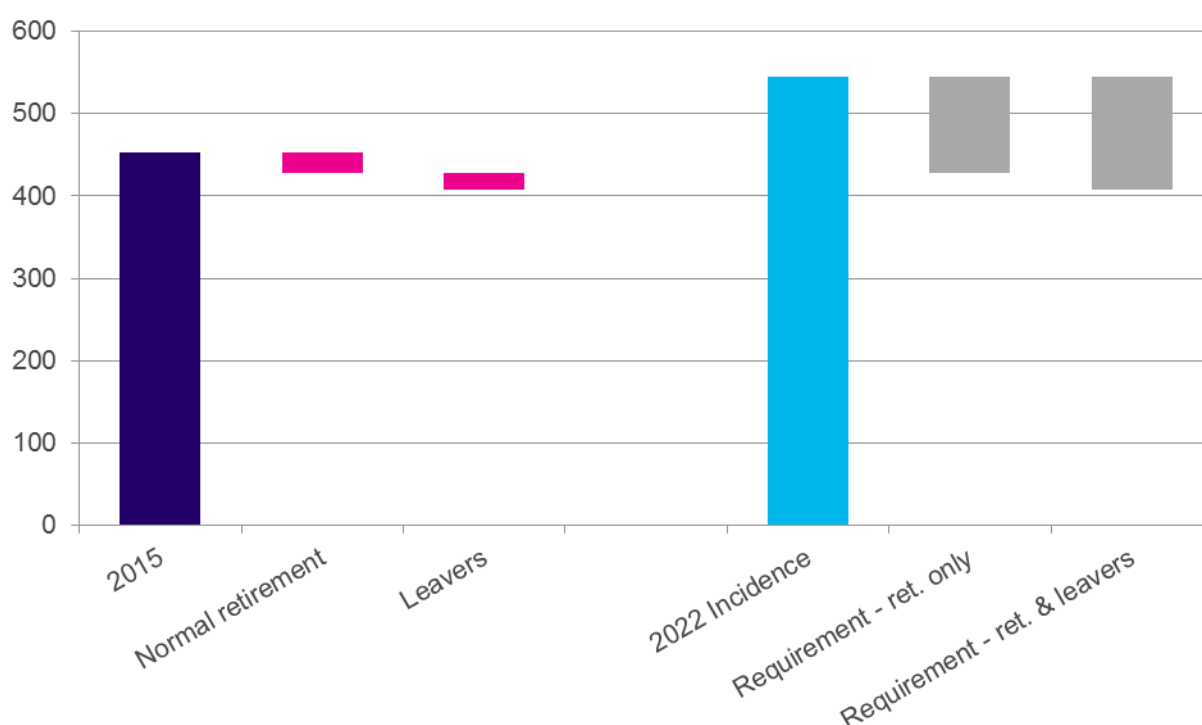
Whilst this is good for getting the work done, a theme of some survey responses was that clinical technologists feel under-utilised and are looking for greater opportunities; moreover, the skills and experience they have could significantly help to both improve services and help alleviate pressures for other workforce groups, such as clinical oncologists.

7.4 FUTURE WORKFORCE

The routes to becoming a clinical technologist are varied, making an accurate estimate for future workforce numbers difficult. The Institute of Physics and Engineering in Medicine have noted that the training routes are currently struggling with uptake as the PTP undergraduate degrees have only managed to produce a maximum of 3 qualified individuals per year.

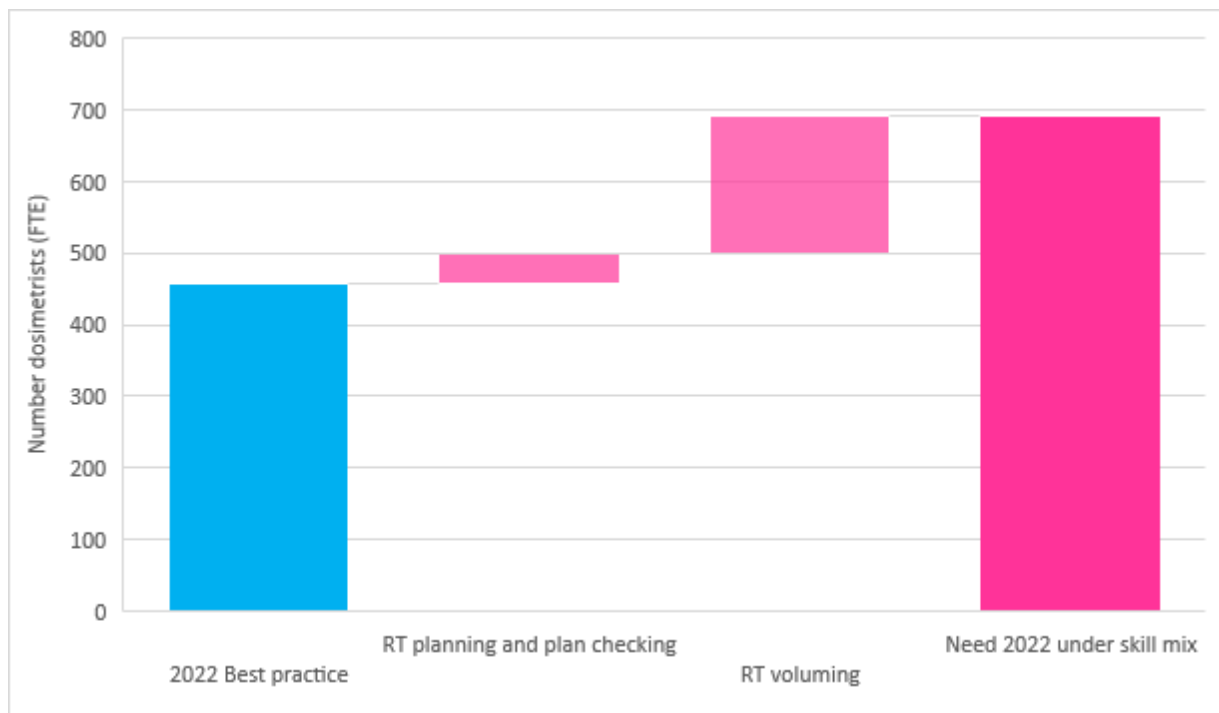
The baseline workforce figure of 452 current clinical technologists is likely to increase to 544 in 2022 based on the projected increase in cancer incidence (including 15 staff required for the NHS Proton Beam Service and assuming a vacancy rate of 3%), while there are likely to be 25 retirees between now and 2022, therefore the expansion demand of 92 plus the replacement demand of 25 will lead to a total additional requirement of 117 (or 26% of the current workforce) to be met through new entrants. If there is attrition from the workforce at a similar rate to that estimated for clinical oncologists, then there will be need for an additional 19 staff to replace leavers, and a total additional requirement of 136 staff, or 30% of the current workforce.

FIGURE 9: FUTURE WORKFORCE PROJECTIONS FOR CLINICAL TECHNOLOGISTS



However, if we wanted to implement skill mix changes with clinical technologists, we would need more than 200 additional clinical technologists on top of this baseline figure, taking the total increase needed to more than 300. This change comes from clinical technologists taking on up to 80% of outlining and 25% of the plan checking that oncologists currently do. However, this change represents the biggest proportional change to a staff group for the purposes of skill mix, meaning that extra training and incentives are likely to be need in order for this level to be reached.

FIGURE 10: SKILL MIX IMPACT FOR DEMAND OF CLINICAL TECHNOLOGISTS



8 NURSES

8.1 ROLE AND TRAINING PATHWAYS

4 nursing roles have been included in the analysis of the non-surgical oncology workforce.

- **Chemotherapy nurse:** nurse specialising in the care and monitoring of patients receiving SACT treatment. They will often be delivering SACT which the other nursing roles are not involved with. In some cases, this may be a clinical nurse specialist role involving proactive case management.
- **Radiotherapy nurse:** nurse specialising in the care and monitoring of patients receiving radiotherapy treatment. In some cases, this may be a clinical nurse specialist role involving proactive case management.
- **Clinical nurse specialist (CNS):** nurse specialising in care for patients with cancer. Typically, they specialise by tumour site, patient type, type of care, or treatment type and undertake proactive case management.
- **Stem cell nurse:** nurse specialising in the collection and transplant of stem cells through intravenous delivery, or the filtering and care of patients receiving this treatment.

In order to register as a nurse with the Nurse and Midwifery Council (NMC), individuals must complete a nursing course which has been approved by the NMC. Undergraduate courses are 3 or 4 years but individuals with relevant previous experience or qualifications can study a two-year accelerated degree. For this initial training, individuals must choose the main area of nursing they wish to work in, so for oncology, this could be adult nursing or paediatric nursing.

Once this training is completed, registered nurses can specialise further in specific areas and roles such as chemotherapy nurse, radiotherapy nurse, or stem cell nurse through on-the-job training, relevant experience, and courses. To become a CNS or equivalent role in oncology requires several years of experience (at least 5 years for a Macmillan Cancer Support CNS role) including sufficient time working in the relevant specialist area such as radiotherapy, and sufficient skills and experience to fulfil the requirements for this senior role proactively managing cases.

8.2 AVAILABLE DATA

Workforce data for nursing roles can be found in health service data, but there is considerable variation in the job titles given to nurses performing the same or similar roles. Their role might have been allocated to another department although they undertake work to treat cancer patients. Relevant professional bodies do not collect workforce data, but there have been several workforce censuses regarding specialist adult cancer nurses undertaken by Macmillan Cancer Support, National Cancer Action Team (NCAT) England, and cancer network nurse directors and colleagues in England, Northern Ireland, and Wales.

- **Chemotherapy nurse:** the categorisations used in the health service data make it difficult to identify which nurses are working specifically on the delivery of chemotherapy. We

would need to know who is trained in chemotherapy in order to understand how many nurses exist and would be needed in the future; however, this data is not available.

- **Clinical nurse specialist:** Macmillan Cancer Support collected data on numbers of CNSs and their specialties in 2014.
- **Radiotherapy nurse:** like chemotherapy nurses, it is not possible to identify the number of radiotherapy nurses working in cancer services across the UK. Their numbers will be conflated with chemotherapy nurses and other nurses working in the cancer support, clinical oncology or medical oncology work areas. In some areas, therapeutic radiographers take on this role. We also had very limited response from this group in our survey.
- **Stem cell nurse:** NHS Digital data identifies only 6 nurses with 'stem cell' in their job title in England. NHS Digital state that they do not believe that this represents all nurses involved in this type of work. Given the low numbers identified in NHS Digital data for England we did not pursue estimates for Scotland, Wales and Northern Ireland. Anecdotal data from the hospitals visits suggests that there are a much greater number of nurses working in a specialist role of stem cell nurses. We also had very limited response from this workforce group in our survey.

Whilst we recognise these groups as key sections of the non-surgical oncology treatment workforce, due to the limitations of data it has not been possible to cover their position and state comprehensively and they feature significantly less in this report than their colleagues.

8.3 CURRENT WORKFORCE

8.3.1 CHEMOTHERAPY NURSES

The way in which chemotherapy nurses work is varied, and can be related to ward safety staffing levels as opposed to specific treatment steps. There is no consensus on how much time a chemotherapy nurse should ideally have with patients, or how many chemotherapy nurses are needed to safely staff a unit. The lack of understanding around this is a likely contributing factor to the widely-cited lack of trained chemotherapy nurses on the ground.

This has made a 'best practice' estimate unfeasible within the context of this work, but our other data suggests that better understanding of nursing in chemotherapy units should be a priority. Survey responses from both nursing and oncology groups called for more nurses qualified to work in chemotherapy. Units are working under establishment, or using non-chemotherapy nurses to 'plug gaps' in an ad hoc way.

"Difficulty in recruitment in our geographical location has left key posts vacant, therefore I have been covering the practice educator role. Our unit has been running with 40% vacancy. I also have no admin support due to cost savings in administration staff"

Lead chemotherapy nurse

The survey respondents themselves talked about how their role is poorly understood and that the time they should have to spend with patients is rarely considered. Indeed, the survey revealed that only 15% of chemotherapy nurses' time is actually spent supporting patients undergoing chemotherapy – they spend almost the same amount of time doing the admin and other support activities related to chemotherapy.

“The role I am currently in is not the one I was employed for. The shortage of staff has resulted in me working in chemotherapy”

Nurse

FIGURE 11: TIME SPENT BY SURVEYED CHEMOTHERAPY NURSES



8.3.2 CLINICAL NURSE SPECIALISTS

CNSs are crucial to good patient experience⁶⁹. However, the role of the CNS is highly varied and the job title and expectations can be inconsistent⁷⁰. They often take the role of ‘key worker’, a role for which key intervention points have been identified at diagnosis, treatment delivery and palliative care⁷¹. The Cancer Strategy in England suggests that all patients should be given a named CNS contact.

The variety of tasks attributed to the role makes it impossible to create a typical bottom-up calculation of CNS need. However, a number of metrics suggest that there is a significant CNS shortage if best practice guidelines are to be followed (England-only):

- **Percentage of patients given a named CNS contact:** Whilst NICE guidelines suggest that all patients should be given a named CNS to contact, only 90% of patients were given a CNS contact in 2015⁷².
- **CNS or designate present at 'breaking of bad news'**⁷³. Despite being an ambition for all patients, just 37% of patients had a CNS present at the breaking of bad news.
- **80% of lung cancer patients should see a lung CNS:** In 2015, 78% of patients saw a lung CNS at diagnosis. However, it should be noted that over a third of centres did not meet this target⁷⁴.
- **Holistic needs assessment and psychological needs:** Research in prostate cancer CNSs revealed that over half of CNS felt that they didn't have the time to attend to the holistic needs and psychosocial assessment requirements of their roles⁷⁵.

The vast number and range of responsibilities and activities assigned to CNSs mean that it is difficult to develop standardised job plans. They often fulfil the service gaps in their local centres, meaning that they work in very different and ad hoc ways. The survey revealed the extent to which their roles are very diverse and multi-faceted (Figure 12).

All of this suggests that CNSs are stretched very thinly across the multitude of responsibilities that they have, and that the key-worker, holistic and supportive roles they should be playing are often not completed. They spend around a third of their time on consultations and follow-ups combined – some of which will be their own typical appointments, and some of which will be skill-mixed clinician appointments.

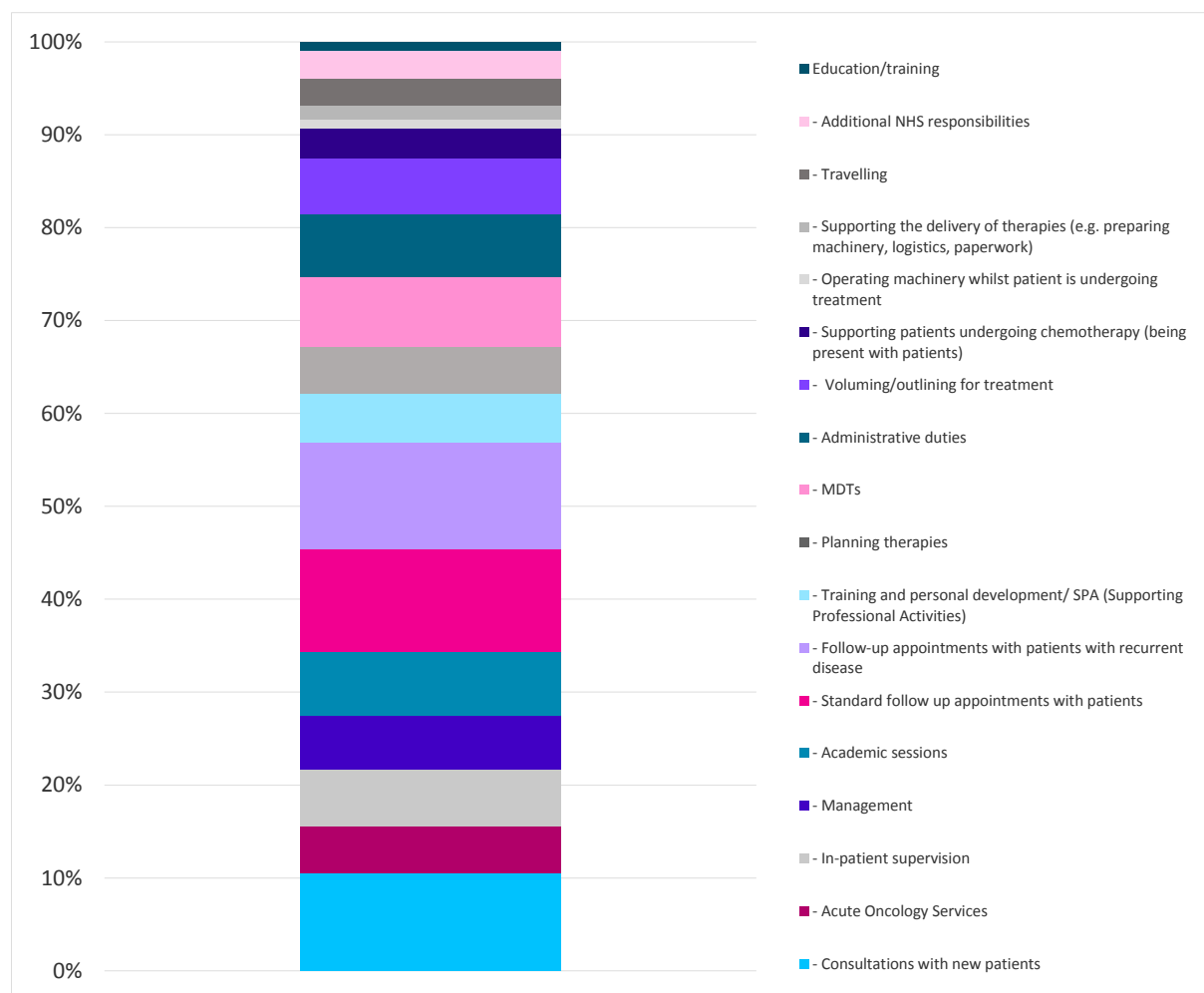
A 2010 report commissioned by the Department for Health revealed that in order to fulfil the key worker role alone, we would need over 1000 additional CNSs⁷⁶. Censuses of the specialist adult cancer nursing workforce in England conducted in 2010⁷⁷ and 2014⁷⁸ show a 10% rise during this period from 2,771.1 FTE to 3,088.2 FTE. This is under a third (317.1 FTE) of the suggested target of 1,000 extra CNS. This also doesn't account for the leadership and skill mix that are increasingly expected of the profession.

"Our CNSs spend most of their time in consultant clinics and nurse led clinics doing 'patient review' i.e. delivering all of the follow up care after cancer treatment... I feel there is a real need for nursing supportive care such as managing symptoms more effectively, psychological and social support and delivering the recovery package, which we don't have the time to do"

Clinical nurse specialist

50% of CNSs in our survey responded that they did not feel they have enough patient-facing time, and they are consistently working an average of 5 additional hours each week, an average of 15% of their working hours. Best practice for CNS would start with a clear expectation of how their many assigned responsibilities should fit together and be prioritised.

FIGURE 12: TIME SPENT BY SURVEYED CLINICAL NURSE SPECIALISTS



8.4 FUTURE WORKFORCE

Due to the lacking data, we were not able to model the future workforce.

9 ONCOLOGISTS

9.1 ROLE AND TRAINING PATHWAYS

Four oncologist roles have been included in this research:

- **Clinical oncologist:** specialist doctor trained in the care of malignant diseases in adults and in some teenage and young adult, childhood and haematological malignancies. They are trained in the delivery of radiotherapy and systemic therapies. They are the only group trained to deliver radiotherapy. Clinical oncologists delivering paediatric radiotherapy will be covered in this workforce group.
- **Haemato-oncologist:** specialist doctor trained in the laboratory diagnosis and clinical care of both malignant and non-malignant haematological conditions. Typically, patients with cancers originating with cells of the blood, bone marrow or lymph nodes are investigated and managed by haemato-oncologists.
- **Medical oncologist:** specialist doctor trained in the care of malignant diseases in adults and in some teenage and young adult, childhood and haematological malignancies. They are trained in the delivery of systemic therapies.
- **Paediatric oncologist:** specialist doctor with expertise in managing children with cancer. They are often trained paediatricians who have undertaken specialist higher training in paediatric oncology. Most cover a wide range or even all cancer sites/types occurring in children. Paediatric radiotherapy is carried out by specifically trained clinical oncologists.

The length of time needed to train an oncologist varies depending on their specialty, course type and format, but all oncologists follow similar models of training. In order to model future workforce and the time needed to respond to changing recruitment demand, it is necessary to take into account training pathways for oncologists.

After completing general medical training, which comprises completing a degree in medicine (4-6 years) followed by 2 years of Foundation Training, individuals are then able to start specialising in adult medicine or paediatrics.

In adult medicine, entry into all oncology specialties occurs after Core Medical Training (CMT, 2 years) or Acute Care Common Stem (ACCS, 2 years), following award of MRCP. Higher specialty training then occurs: clinical oncology (5 years), medical oncology (4 years), haematology with an oncology sub-specialism (5 years).

Core paediatric training occurs immediately after Foundation Training. For paediatrics with an oncology sub-specialism, 5 years paediatrics of general paediatrics with a 2-3 years sub-specialism is required.

Therefore, training any type of oncologist requires 6-8 years of specialist training after completing foundation training in medicine. In practice, specialist training may be longer as individuals take time away from training to do clinical research, go on maternity leave etc.

9.2 AVAILABLE DATA

Workforce data for the oncologist roles are available through the relevant professional organisations who undertake workforce census surveys on a regular basis, and can also be found in health service data, albeit with some limitations concerning accuracy. Data availability and limitations for individual oncologist roles are described below.

Clinical oncologist: the highest quality workforce data is available for this group with the ability to provide information on demographic detail of members as well as training numbers. For this reason, they feature more prominently in the research here, as we are able to analyse them with more detail and make more accurate projections for the future.

Haemato-oncologist: Among the workforce data collected by professional bodies, none of the data sources we consulted were able to give a complete picture specific to this role. The workforce census from the Royal College of Physicians (RCP) includes the specialism 'haematology' but does not break this group down any further to identify those in this group that specialise in haematological oncology. The Royal College of Pathology (RCPath) collects information about haematologists and histo-pathologists as part of their workforce census but does not break these groups down any further to identify those who specialise in haematological oncology. Finally, the British Society for Haematology (BSH) does not collect workforce data and so did not hold this information. The RCR Census collects information on clinical oncologists who have 'haematological malignancy' as a site specialty, and these are included in the clinical oncology numbers, but this describes only one part of the haemato-oncologist workforce.

Medical oncologist: these have amongst the highest quality workforce data with the ability to provide information on demographic detail of members as well as training numbers. For this reason, they feature more prominently in the research here as we are able to analyse them with more detail and make better projections for the future.

Paediatric oncologist: As with haemato-oncologists, there is crossover in this role between professional bodies with two organisations covering and collecting information about paediatric oncologists. The Royal College of Radiologists (RCR) collects information on clinical oncologists who specialise in 'paediatric' and 'teen and young adult' in their workforce census but this describes only one part of the paediatric oncological workforce. The Royal College of Paediatrics and Child Health (RCPCH) collect information about paediatricians who specialise in 'oncology' in their workforce census. After consulting with both organisations, it is our understanding that there is little to no overlap between these two samples and that combining these two data sources should provide a relatively complete picture of the paediatric-oncologist workforce. NHS Digital data have paediatric oncology as a tertiary work area, but given the concerns about the accuracy of health service data we have not pursued this.

9.3 CURRENT WORKFORCE

Medical and clinical oncologists

Due to the cross-over of activity implicated by the UK model of clinical and medical oncology, the following charts represent oncology need as a whole including medical oncologists and clinical oncologists. Key limitations are that:

- the UK model, in which clinical oncologists are involved with chemotherapy, means that it has not been appropriate to disaggregate the need for clinical and medical oncologists: rather the below figures indicate the need for skilled consultants in both areas combined;
- the model includes workforce estimates for haematological malignancies, which will sometimes be treated by haemato-oncologists, but can also be treated by medical and clinical oncologists. Due to the unreliable haemato-oncology data, however, the number of haemato-oncologists has not been factored into our 'current numbers'.

A "full-time equivalents" has been calculated based on the assumption of a job plan which contains 10 "planned activities" (PAs) per week in total. A 10 PA job plan is a typical 40 hour job plan, consisting of ten sessions of PAs including both direct clinical care and other responsibilities. The activities in scope for this modelling are consultations with new patients, treatment reviews, follow ups, and radiotherapy planning where applicable.

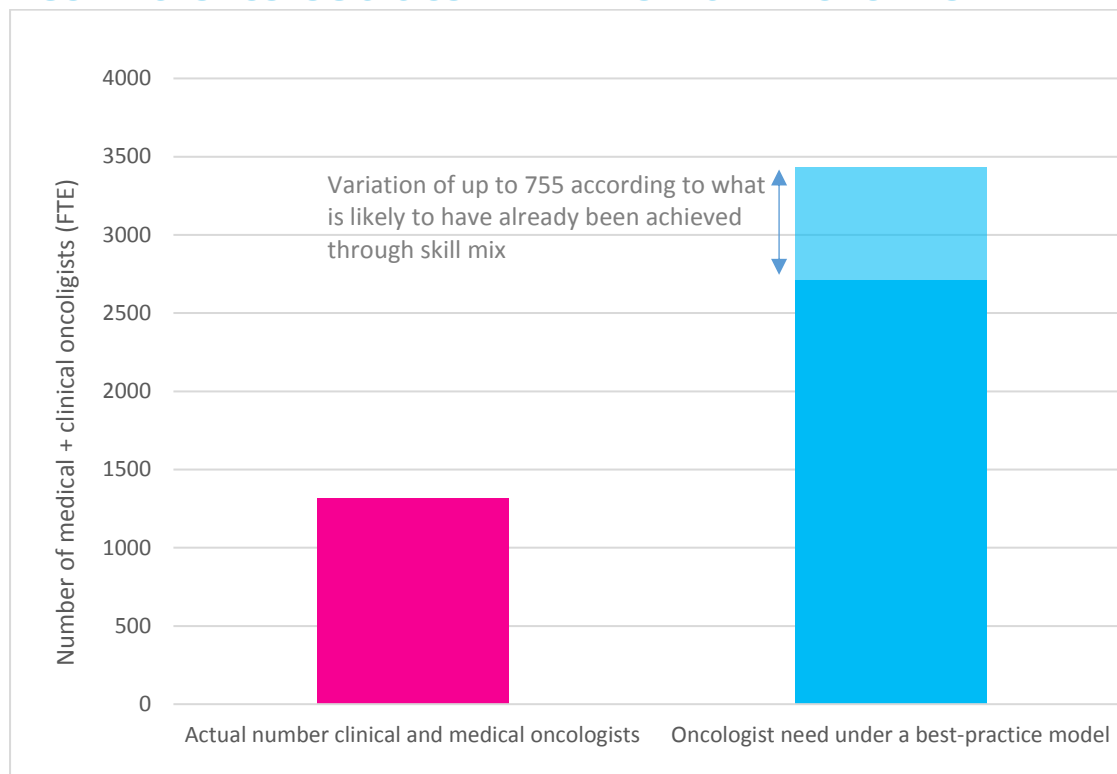
On average, these should be 5.5 PAs per week worked by oncologists. This is in line with the sample job plans produced by the RCR⁷⁹ and the RCP⁸⁰, noting a total of at least 4.5 PAs per week going towards a combination of clinical trials (1), other Supporting Professional Activities (1.5), MDTs (0.5-1), and acute oncology (0-1.5).

In order to understand how many oncologists we would need, we used the best practice model described in chapter 2. This is an oncologist-heavy model due to the uncertainty in the amount of skills mix happening across the UK, and following clinical guidelines more than current practice. The best practice model incorporates best practice for treatment and ensures that the health professionals would have adequate time to train and develop themselves and others, improve the service, and deliver clinical research.

In 2015, there were 1,315 clinical and medical oncologists. By considering what might be needed using this model, our model suggests a need for up to 170% more oncologists than the 2015 levels (approximately a further 2,000), or potentially nearer 100%, given the skill mix happening already and the implications this has had on oncologist need (see Figure 13). In terms of FTE, this indicates a need of at least 1,500 more oncologists if best practice is to be served.

This suggests that there is a need for oncologists both now and in the future to ensure that oncologists are able to deliver best practice treatment, but also have capacity to undertake Supporting Professional Activities such as Continuing Professional Development training, clinical research, and development of new staff and roles.

FIGURE 13: ONCOLOGISTS COMPARED TO BEST PRACTICE MODEL



Haemato-oncologists

Whilst the data limitations for haemato oncologists have prevented us from establishing an adequate baseline, survey responses indicate that this profession is struggling with workload to a similar extent as clinical and medical oncologists. Respondents reported working an 8 additional hours on average, which was typically 20% of their contracted hours.

Haematological malignancies are more frequently treated with SACT than radiotherapy. When they need radiotherapy, the radiotherapy is very specialised as it is mostly young people being treated for these cancers. However, the nature of these cancers mean that chemotherapy - and increasingly immunotherapy - are used extensively, with complex regimes that cause complex side-effects.

There is also a huge variety of genetic and other factors which affect patient pathways as treatments become more advanced. Moreover, the relatively high recurrence risk for some haematological malignancies means that follow-up regimes often last more than 20 years.

Paediatric oncologists

The ratio of staff to patients is much higher in paediatric oncology than it is in adult cancer services. Whilst the data do not enable us to capture the full extent of the paediatric oncology workforce, the minimum numbers we could find for the year 2013⁸¹ meant that there were 60 new diagnoses⁸² per paediatric oncologist. In adult oncology in 2014, the number was 305 new diagnoses per oncologist (clinical or medical). This is because child cancers are highly complex, and require clinician-led consultation not only with patients, but

also with the parents and families.

Moreover, follow-up is ongoing until adulthood, as childrens' cancers can affect development. Two thirds (67%) of paediatric oncologists said they have enough patient facing time. Having said that, the paediatric oncologists that responded to the survey were working an average of 21% (approximately 8 hours in any given week for a full-time paediatric oncologist) over their contracted hours.

Similarly to other oncologists, those with insufficient time felt stretched over many different activities that could be shared between other staff groups. They were also sacrificing Supporting Professional Activity Time, only 5% of their time (assuming 2 hours per week for someone fulltime) was spent on this despite having similar guidelines to clinical and medical oncologists.

9.4 FUTURE WORKFORCE

Clinical oncologists

The clinical oncologist workforce is likely to increase from the 2015 figure of 827, to 1,004 in 2022, if oncologists retire on average at 64 over this time period. This is based on a retirement projection of 117 retirees, plus 35 staff (5 per annum, average from RCR censuses 2011-2015) leaving for other reasons, while there are likely to be 329 new entrants (47 p.a.) from the current training pipeline. This figure of 1,004 is lower than the trend in clinical oncology workforce observed over the last few years (which would generate a figure of 1,162) – the shortfall here is around 12%, or 158 clinical oncology consultants.

However, if clinical oncologists retire earlier, with an average retirement age of 60 rather than 64 (the RCR uses 64 and 60 in their presentation of retirement data from their Census), then the shortfalls are much larger. Under this assumption the 2022 workforce figure is projected to be 917, which gives a shortfall of 6% (61 staff) against the incidence only projection, and a 19% shortfall (245 staff) against the trend-based projection.

TABLE 8: WORKFORCE PROJECTIONS FOR CLINICAL ONCOLOGISTS

	Normal retirement (65)	Early retirement (60)
2015 workforce	827	827
Retirees	117	204
Leavers	35	35
Joiners	329	329
2022 workforce forecast	1,004	917
2022 projection based on incidence	978	978
2022 projection based on past trends	1,162	1,162

Medical oncologists

The number of medical oncologists is projected to increase from 488 in 2015, to 706 in 2022, based on an average retirement age of 65. There are projected to be 46 oncologists retiring, and a further 21 leaving for other reasons (based on the same attrition rate as for clinical oncologists), while 285 new entrants from training are projected to join. Using an earlier retirement age of 62 (used by RCP as the average intended retirement age for the specialty in their census dashboard), the workforce in 2022 is projected to be 685, but 23% lower than the projected requirement based on the continuation of past trends.

TABLE 9: WORKFORCE PROJECTIONS FOR MEDICAL ONCOLOGISTS

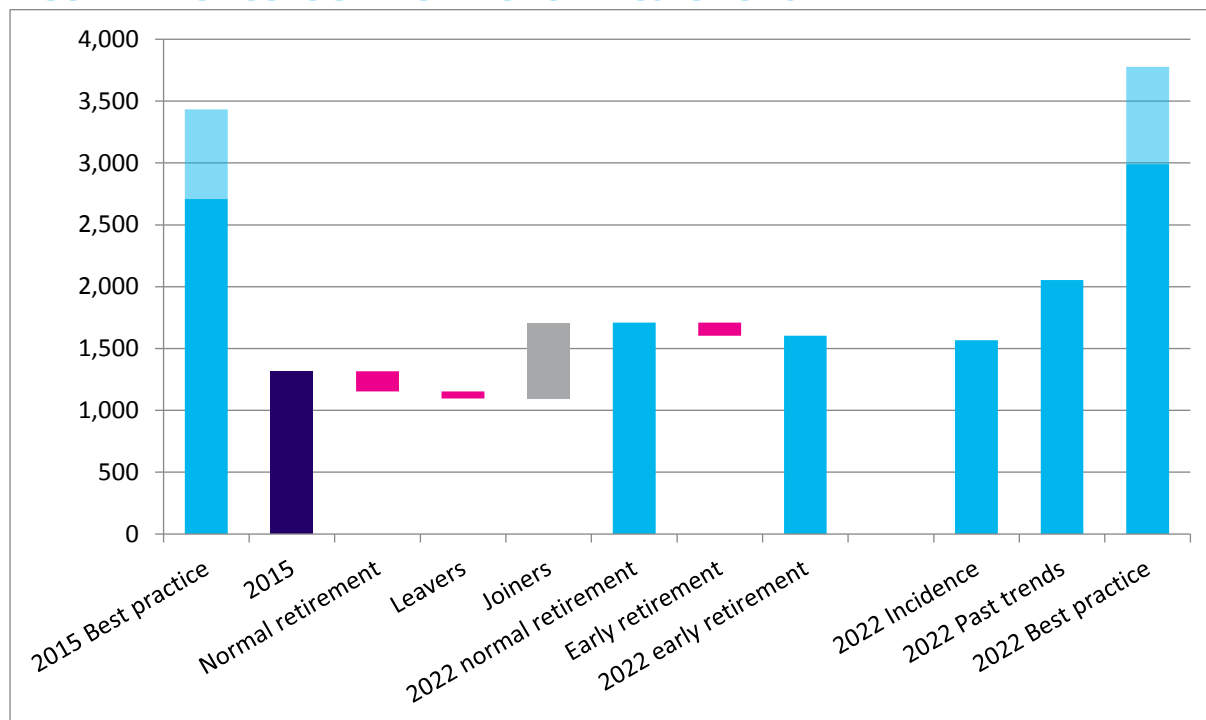
	Normal retirement (65)	Early retirement (62)
2015 workforce	488	488
Retirees	46	67
Leavers	21	21
Joiners	285	285
2022 workforce forecast	706	685
2022 projection based on incidence	589	589
2022 projection based on past trends	892	892

Combined oncology workforce

Figure 19 shows the projections for the combined oncology workforce, including the estimates of the size of the required workforce based on the bottom-up best practice modelling. The current (2015) oncology workforce of 1,315 is between 39-49% of the required workforce according to the best practice calculations, of 2,676-3,369, or a shortfall of 1,361-2,054 oncology consultants.

Projecting forwards, based on normal retirement ages, there are likely to be 1,710 oncologists in 2022 who would represent 46-60% of the required workforce to deliver best practice treatments to all patients, giving a shortfall of between 1,281 and 2,067 consultant oncologists. If oncologists retire early, then the projected 2022 workforce will be roughly half of what would be required to deliver best practice treatment; the workforce of 1,602 would be only 43-56% of the likely best practice requirement, and the shortfall would be between 1,389 and 2,175 consultant oncologist.

FIGURE 14: ONCOLOGY WORKFORCE PROJECTIONS

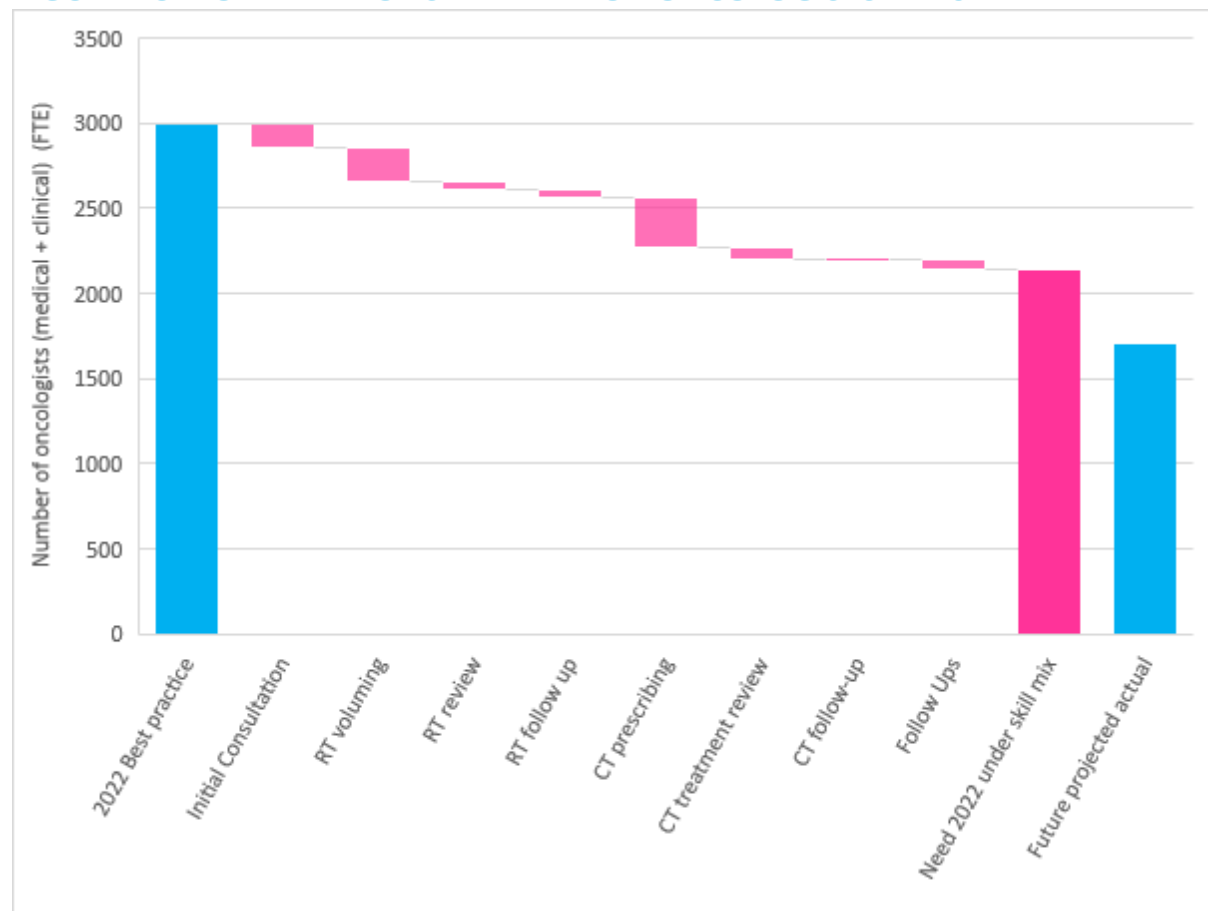


Skills mix for oncologists

As indicated, oncologists appear to be suffering from the most severe shortages. To meet current need under a best practice model, we could need twice as many as we currently have. This is why skill mix in so many places has centred on alleviating the workload of the oncologists. If we assume that the maximum estimate of skill mix is already having, and assume later retirement ages, it looks as though skill mix could reduce the oncologist shortage to 22% (Figure 15).

The biggest opportunities lay within consultations, outlining, and non-medical SACT prescribing. Having said that, it would clearly require a sustained skill mix approach across many areas to make a large difference.

FIGURE 15: POTENTIAL OF SKILL MIX FOR ONCOLOGISTS IN 2022



10 PHARMACISTS

10.1 ROLE AND TRAINING PATHWAYS

Oncology pharmacists specialise in the care of patients with cancer including chemotherapy dose preparation and safety checks, and educating patients about side effects.

To become an oncology pharmacist, students undertake an undergraduate and Master's degree in pharmacy (MPharm) and then undertake a 12-month pre-registration training period in a relevant pharmacy setting. The MPharm course is typically 4 years but there are also 5 year courses which include the pre-registration period as a sandwich year. On successful completion of an MPharm, individuals can register with the General Pharmaceutical Council (GPhC) through passing the GPhC registration exam. Once registered, a pharmacist can then specialise in oncology by undertaking work-based training to achieve the relevant accreditations such as delivering SACT. Some pharmacists may work in a specific oncology pharmacist role while employed in a cancer service whereas other pharmacists may be in a more general clinical pharmacist role where oncological pharmacy is one part of their work.

10.2 AVAILABLE DATA

Some data on numbers of staff are collected by British Oncology Pharmacy Association, but it is based on voluntary membership, so this is not representative of the full workforce. For example, one treatment centre with more than 20 pharmacists reported that only 5 were known to be members. Furthermore, BOPA do not collect information on whether members are currently active in the UK workforce so it is unclear what proportion of the BOPA membership belong to the oncology pharmacist workforce. BOPA also highlighted the issue that pharmacists may provide oncology pharmacy services as part of their role but may not identify or be recorded as an oncology pharmacist.

The relevant professional bodies do not collect workforce data. The General Pharmaceutical Council holds data on numbers of registered pharmacists but does not hold information on whether individuals are currently practicing in the workforce or whether they specialise in oncology.

NHS data do not record specialties or specialisms for pharmacists, and a search for pharmacists in the work areas of cancer support, clinical and oncology and medical oncology in England identified only 15 pharmacists or pharmacy technicians working in these 3 areas which compares with BOPA number of 751 members in England.

10.3 CURRENT WORKFORCE

While the current data do not enable us to reliably represent the shape and size of the oncology pharmacy workforce, the emerging theme from this research was that pressures are an issue and changing the decision and organisation of labour could help best practice to be both understood and realised.

Half (50%) of the pharmacy respondents to our survey said they didn't have enough time to deliver a best practice service to patients. A number of them mentioned the safety and usability of prescribing systems as a barrier to this. With the increasing complexity of drugs and the move towards non-medical prescribing, the traditional role of pharmacists is changing, and little has been put in place to guide how this should take place.

"We need to consider using the concept of "job-planning" in much the same way as medical staff, so that sufficient time is allocated to each of the various roles and responsibilities, as well as officially planning for study time/training..."

Pharmacist

As is the case with many other staff groups, the lack of job-planning means that the volume of patients prevents pharmacists from being able to spend time training or taking on more work. BOPA's recent membership survey revealed that 38% of pharmacists qualified in non-medical prescribing, for instance, do not currently use the skill at their place of work. There was also a need for more pharmacy technicians to take on more routine work, whilst pharmacists enter into new areas.

10.4 FUTURE WORKFORCE

As described, it is not possible to very reliably determine the number of pharmacists currently working in oncology – therefore, it is not possible to achieve a reliable future projection. The pharmacy profession as a whole is set to grow with increasing numbers of people taking their exams and becoming registered pharmacists⁸³.

11 THERAPEUTIC RADIOGRAPHERS

11.1 ROLE AND TRAINING PATHWAYS

Therapeutic radiographers are allied health professionals (AHP) trained solely in cancer and they are responsible for planning and managing the radiotherapy patient pathway. They are extensively involved at all stages of the patient's radiotherapy journey. Therapeutic radiographers are not only responsible for the planning and delivery of accurate radiotherapy treatments using a wide range of sophisticated and technical equipment, they have unique expertise and skills required to care for patients before, during and after radiotherapy. They also sometimes undertake work associated with clinical technologists.

There are two main training pathways to become a therapeutic radiographer. The first is to complete a recognised undergraduate degree in radiotherapy (3-4 years). Alternately, if an individual has a relevant first degree they can complete a recognised pre-registration programme in radiotherapy (2 years). On completion of an approved radiotherapy course⁸⁴, an individual can then apply to the Health and Care Professions Council (HCPC) to register as a therapeutic radiographer. Therefore, training a therapeutic radiographer requires 2-4 years of specialist training to meet practitioner level.

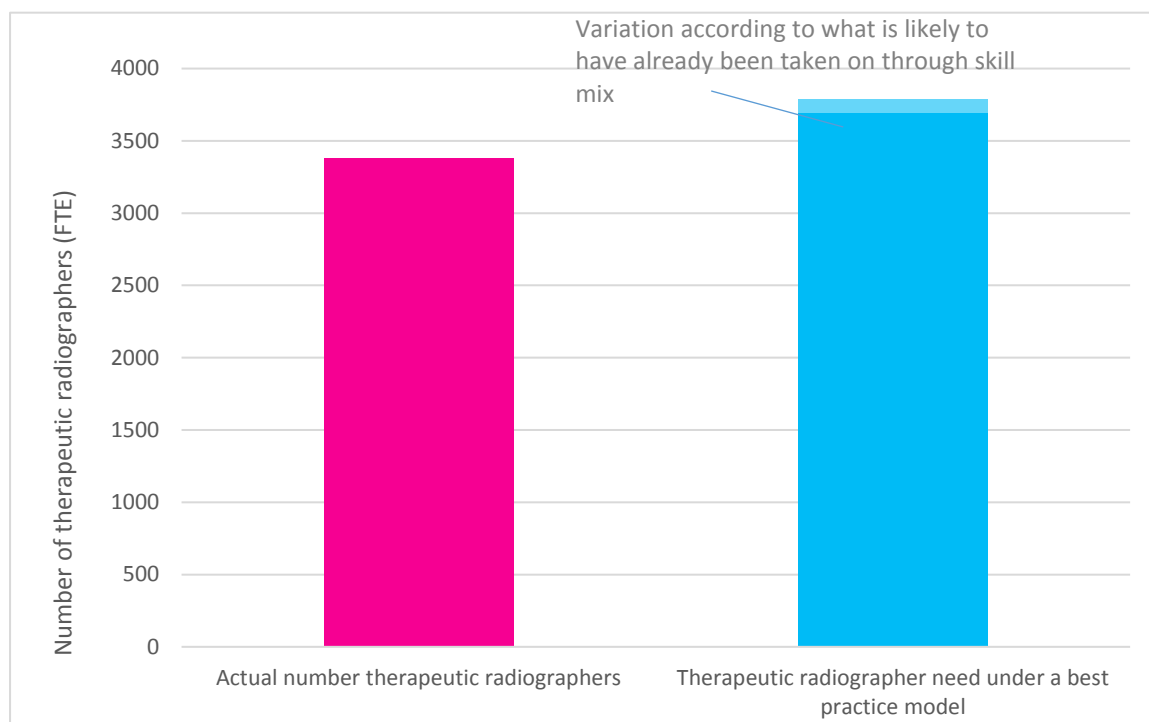
11.2 AVAILABLE DATA

Data on the therapeutic radiographer workforce are provided by SCoR and are also available via NHS sources although with limitations regarding the accuracy of the data. This group has amongst the highest quality workforce data, with the ability to provide information on demographic detail of members as well as training numbers. For this reason, they feature more prominently in the research here, as we are able to analyse them with more detail and make better projections for the future.

11.3 CURRENT WORKFORCE

Therapeutic radiographers' time is closely linked to the amount of episodes of treatment patients receive. We were therefore able to develop an understanding of the current and future workforce using the 'best practice' model. Furthermore, given the amount of time that therapeutic radiographers spend with patients, they are critical in determining a good patient experience and, as such, appropriate time has to be given to sensitive patient engagement as well as the technical delivery of episodes of treatments of radiotherapy.

FIGURE 16: THERAPEUTIC RADIOGRAPHERS COMPARED TO BEST PRACTICE



When we assume that therapeutic radiographers spend around half of their time consulting and reviewing patients, preparing for delivering radiotherapy (e.g. uploading information), and delivering radiotherapy with machinery, our model suggests a shortfall of around 10% within the current numbers of therapeutic radiographers. This would equate to around 400 additional FTE (see Figure 16).

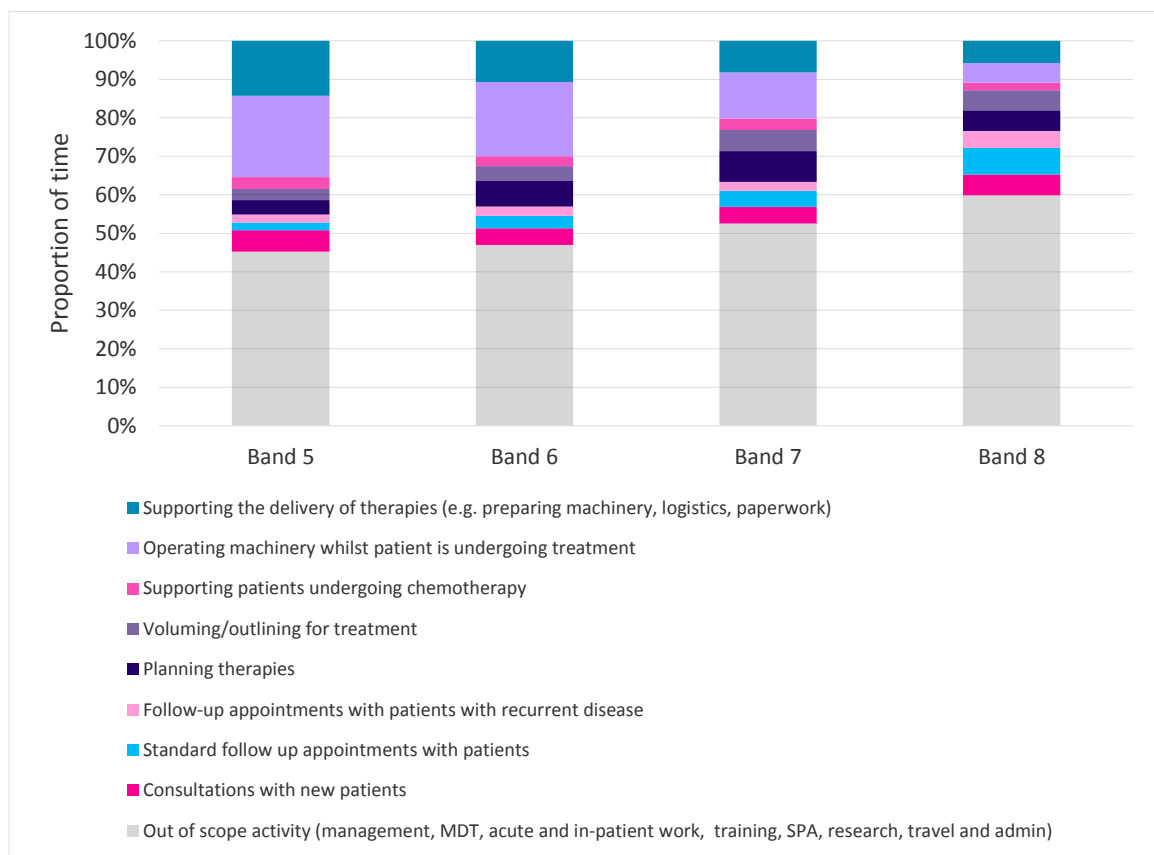
The therapeutic radiographers in our survey estimated that they spent around 64% of their time on direct clinical care or patient/treatment related activities, although some of this was acute, in-patient or multi-disciplinary team settings, meaning that they had on average 48% of their time for the delivery of the treatments that are in scope for this project (see Figure 16). Their remaining time was spent on other essential activities such as training, management, and travel.

This varies between bands, with those in band 8 (often advanced clinical practitioners) doing more leadership and management and having just 40% of their time for treatment delivery and care. Moreover, whilst it was expected that radiographers' core activities would be the delivery of therapies with a linear accelerator and the work directly associated with that such as providing information and uploading information, the survey revealed that their activities are much more varied: they spend significant amounts of time doing radiotherapy physics work such as outlining and planning treatments.

Unlike oncologists, clear recommended job planning guidelines for how therapeutic radiographers should spend their time are less common (although, these are being developed by SCOR)⁸⁵. This makes it difficult to advise what proportion of time *should* be

spent on different activities in an ideal model. Moreover, this may help to explain why our model suggests a smaller gap than might be expected given the qualitative findings.

FIGURE 17: TIME SPENT BY SURVEYED THERAPEUTIC RADIOGRAPHERS



42% of therapeutic radiographers that responded to the survey said that they didn't have enough time with patients. In their qualitative responses, they felt rushed and unable to give patients the time and information they would have liked. Similar to oncologists, appointments are being shortened and double booked in order to treat patients in time with limited resources.

An additional trend in cancer centres is extended hours of working. Whilst this aligns with national priorities and helps to provide more treatment, it should be noted that this was sometimes being serviced by simply working current staff for longer as opposed to hiring more people. In therapeutic radiography, the shortage is not as severe as in oncology, but increasing demand and complexity is putting pressure on their capacity, as is the increasing range of responsibilities they have to undertake.

"Treatments are getting more complex, which requires more time both for the planning and treatment delivery. Extra time would allow patients to feel they can spend more time with us on questions. I think they are very conscious of the pressures, and worry about holding us up"

Therapeutic radiographer

11.4 FUTURE WORKFORCE

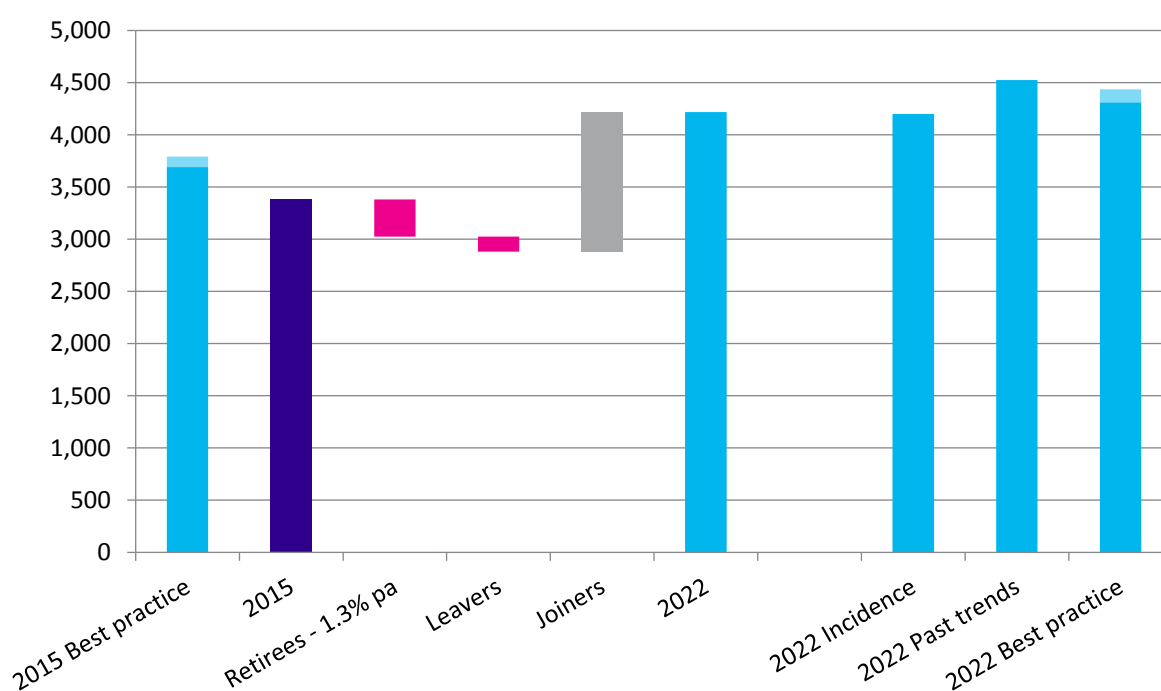
The therapeutic radiography workforce is projected to increase from 3,380 in 2015 to 4,218 in 2022. This is based on an average 1.5% of the workforce retiring each year (based on average expected retirements from 2015 to 2018 in the SCoR Census) and a further 20 staff leaving each year on average for other reasons (using clinical oncology attrition rate), and an average of 191 new joiners per year (based on total completions from therapeutic radiography degree courses and an estimate of 60% entering the NHS from HEE total workforce data).

This workforce projection is lower than the requirement based on continuation of recent growth trends of 4,524 with a 6.8% shortfall representing 306 therapeutic radiographers (both these future requirements contain a need for an additional 80 therapeutic radiographers for the introduction of the NHS Proton Beam service).

The future workforce is likely to be slightly lower than that needed to deliver best practice oncology services (including staff working at advanced practitioner level to support the medical workforce) to future patients in 2022 (see Figure 18).

Moreover, skill mix will implicate therapeutic radiographers working at advanced and consultant levels of practice, in turn adding a significant need for training time.

FIGURE 18: THERAPEUTIC RADIOGRAPHY WORKFORCE PROJECTIONS

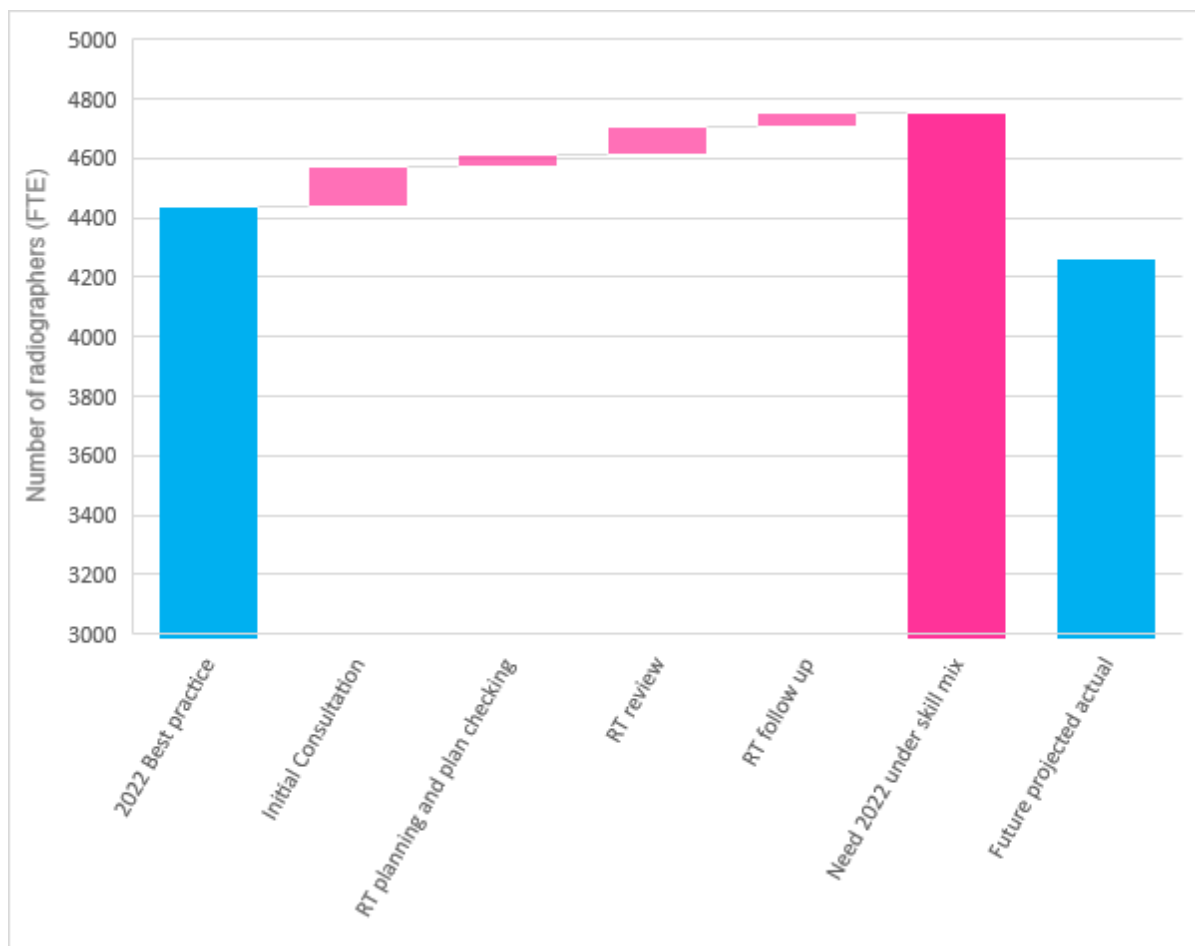


Skills mix for therapeutic radiographers

Therapeutic radiographers will take on additional responsibilities in the next 5 years, both through more consultant therapeutic radiographers leading the management of pathways of care with support from the radiotherapy MDT and therapeutic radiographers taking on a proportion of planning and voluming, conducting on-treatment and post-treatment review. This means an increased workload for the workforce as a whole and a full skill mix scenario would mean that future workforce numbers would remain with around a 10% shortage of the greatest level of need (Figure 19).

This would result from Consultant Radiographers taking on 30% of consultations from oncologists, almost all on-treatment review and radiotherapy end-of-treatment follow-ups (that they're not doing already), and 25% of plan checking (a responsibility shared with dosimetrists).

FIGURE 19: SKILL MIX IMPACT FOR THERAPEUTIC RADIOGRAPHERS



12 CONCLUSIONS

Cancer Research UK commissioned this research to understand the current and future needs, capacity and skills of the non-surgical oncology workforce. The research findings highlight the importance of workforce planning driven by patient demand, not what is affordable according to hospitals' budgets.

There are shortages across the workforce. Although some workforce groups have modest vacancy figures, our research indicates that these are likely to be underestimates of the true workforce gaps as many posts have been vacant for up to two years and vacancy rates only reflect current vacancies. Cancer services remove their job adverts if they cannot fill the post and instead redesign the team structure to deliver the service.

These workforce shortages are having both direct and indirect implications for the workforce and the treatments they are able to deliver. The lack of time to do research came up as a theme across all the workforce groups. Staff shortages are also affecting services' ability to successfully provide high quality patient experience, long-term workforce planning and professional training and development amongst many others.

The research also showed that workforce planning needs to consider how changes to treatments, improvements of technology and early diagnosis initiatives will impact the demands on the workforce. For example, implementation of modern technology will help automate some work. However, some new technology makes the treatment techniques more complex and therefore will take more time to plan.

The survey, interviews and site visits demonstrated how important teamwork is for the delivery of the non-surgical oncology treatments. This includes both traditional team structures where the majority of the responsibility for the patient lies with the oncologist, as well as new skills mix approaches where other members of the workforce are trained to take on additional responsibilities. These new approaches revise the traditional allocation of responsibilities of the team to maximise the use of health professionals' skills and training.

However, the lack of staff is acting as a barrier to the skills mix interventions being implemented. More staff is needed to be upskilled, training these expanded responsibilities and to backfill the roles. Currently the shortages of oncologists are having an impact on our ability to deliver best practice and improve the service.

In the future, we are likely to have shortages in most of the workforce. In order to implement the skills mix approaches more widely, national workforce planning bodies should look at how the UK can increase the number of pharmacists, therapeutic radiographers and clinical technologists. Alongside this, there is a need for a continued increase in training places for oncologists to take on the most specialised treatment techniques.

APPENDICES

1. AREAS OUT OF SCOPE

The list below outlines areas and workforce groups out of scope, as well as the reasons for why they were not included in the research:

- **Acute oncology services** – bed numbers and safe staffing levels necessitate a different approach to modelling and understanding the standard pathway for a patient.
- **Clinical trials** – although essential to improving patient outcomes, clinical trials do not have a standardised pathway for patients.
- **Treatment support workforce** – the focus of this research has been the workforce directly involved in service delivery of treatment. For that reason, we have excluded the cancer support workforce, such as dieticians and speech and language therapists. These workforce groups play an integral part to patients' care and must be considered in any workforce modelling for cancer care.
- **Physical resource constraint** – the focus on this work has been exclusively on the size and shape of the workforce required to deliver the best services possible for patients. There are clear implications for physical resource too (such as chemotherapy delivery units and linear accelerators), but the prediction of what physical resource might be required is out of scope for this report

2. DATA COLLECTION ISSUES

Issues with data collection impacted our ability to understand the workforce demand and supply both now and in the future. The most common issues were:

- **Identification of accurate job titles/roles** – in some cases, there has been difficulty identifying individuals with specific job titles or roles within the hospital data. For example, only 15 oncological pharmacists were identified in the NHS Digital data for England, but recent British Oncology Pharmacy Association membership in the UK at the start of 2016 was 900 individuals.
- **Identification of relevant work areas** - analysis of hospital data found that for some roles there were no individuals identified in work areas where one would expect to find that role. Similarly, some roles were identified as working in areas where one would not expect to find that role. For example, according to the NHS Digital data, there are no clinical scientists working in cancer support, clinical oncology or medical oncology at Guy's and St Thomas' NHS Foundation Trust, which has 19 clinical oncologists and 89 therapeutic radiographers. Clinical scientists in radiotherapy physics have been coded to a different area of work. One possible explanation for this could be if clinical scientists have been coded to the department where the individual is based rather than by the work activities undertaken for that role. For example, a clinical scientist could be located in a non-oncology department but work in the area of radiotherapy physics.
- **Inconsistent use of job titles or variation within roles** – among certain roles there was great variation in job titles used to describe an activity or role, or large differences between what activities would be undertaken by individuals with the same job title at different NHS organisations. This was not attributable to error or inconsistencies during

data collection but was an underlying issue which resulted in NHS data that was difficult to interpret and use.

All of the above issues can lead to discrepancies between numbers reported in the health service data and numbers collected through a census approach by professional bodies coordinating directly with department heads or those leading cancer centres.

During data collection, discrepancies were identified in some instances between health service data and data collected by professional bodies, and also between health service data and observations during case studies.

3. AVAILABLE DATA FROM PROFESSIONAL BODIES AND CHARITIES

Several professional bodies collect information on groups or roles and this information has been incorporated into the workforce analysis where possible. The type of information and the level of detail varies greatly between organisations. Some organisations hold basic details on membership or registrants whereas others carry out annual workforces censuses. There is also great variation as to whether details about role, job title, specialism, working status and personal characteristics are collected. Furthermore, for some roles membership of the relevant professional body is required whereas for other roles membership of such bodies is voluntary. This section gives an overview of the sources consulted as part of this research outlining what data they contain and how they are collected.

Association of Cancer Physicians (ACP)

ACP do not collect information about medical oncologists but have contributed to the Royal College of Physicians (RCP) annual census. In December 2016, ACP launched a new membership database which will collect a range of information including job plans, retirement, sub-speciality interest, and time spent supervising and prescribing systematic cancer therapies. This resource would be useful for future workforce planning.

British Oncology Pharmacy Association (BOPA)

BOPA do not hold data on the oncological pharmacist workforce but they do collect some information on their membership (just under 1,000 members) such as numbers and address at registration. However, membership of BOPA is voluntary so does not include all individuals in the UK who specialise in oncological pharmacy. Furthermore, BOPA do not collect information on whether members are currently active in the UK workforce so it is unclear what proportion of the BOPA membership belong to the oncological pharmacist workforce. BOPA also highlighted the issue that pharmacists may work in oncology as part of their role but may not identify or be recorded as an oncology pharmacist.

General Pharmaceutical Council (GPhC)

GPhC hold information on the number of prescribing pharmacists, non-prescribing pharmacists, pharmacy technicians and trainees registered in the UK. This information was provided by country and by region. However, individuals registered with GPhC may not

necessarily be active in the workforce. GPhC do not hold information on whether an individual specialises in oncology pharmacy.

Royal College of Paediatrics and Child Health (RCPCH)

RCPCH collect information about paediatric oncologists as part of their biennial workforce census. The most recent census collected data on staff in post on 30 September 2013. Paediatric clinical directors or leads in 197 service providers were invited to participate in the census. The average response rate across all sections of the census survey was 89.7%. The data is collected mostly as headcount with some full-time equivalent (FTE). The census collects information regarding service providers, child health services, safeguarding and workforce. Relevant information collected includes nation, hospital, gender and nationality.

Institute of Physics and Engineering in Medicine (IPEM)

IPEM collect workforce data through their Radiotherapy Physics Workforce Census. The most recent data was collected in November 2015 and 92% of UK Radiotherapy Centres responded. Data are provided for the following relevant categories: clinical scientist (radiotherapy physics), clinical technologist (practitioner) physics, and clinical technologist (practitioner) engineering. This information regarding number expressed as FTE and headcount for those aged 55 years or older. The information does not include job title or role such as 'dosimetrist'.

Macmillan Cancer Support

In 2014, Macmillan Cancer Support commissioned Mouchel Management Consulting supported by the Centre for Workforce Intelligence to conduct a census of specialist adult cancer nurses in England, Northern Ireland, Scotland and Wales. Previously, this census had been conducted by the cancer network nurse director and colleagues in 2007 and 2008, and then the National Cancer Action Team (NCAT) and Mouchel Management Consulting in 2010 and 2011. The census collects FTE numbers for each UK nation and information on gender, age, bands, cancer network or hospital, area of practice (e.g. breast), and job title. Data are also reported for Clinical nurse specialists (CNS) as a subgroup, but this group is identified in the data by job title and discussions with experts have highlighted that other nurses in the census will be performing similar roles involving proactive case management but do not have the job title 'Clinical nurse specialist'. Further information includes Macmillan nurses, vacancies, and covering other posts.

Royal College of Physicians (RCP)

RCP collect data on the consultant medical oncological workforce and haematological workforce through their annual census of the consultant and higher specialty trainee (HST) physician workforce of the UK. However, it is not possible in this census data to identify haemato-oncologists as a group separate from other haematologists or paediatric oncologists separate from paediatricians. For each nation, the census collects information on age, gender, specialty (e.g. medical oncology), contract type. For HSTs, the census also collects information by Commissioning Groups, Local Education and Training Boards and their General and Internal Medicine commitment. The data are presented as headcount.

The census of consultant physicians has run for more than 20 years and the census of HSTs

has run for 8 years. The most recent data is the 2015-16 dataset. This census was coordinated by the Medical Workforce Unit of the RCP on behalf of the Federation of the Royal Colleges of Physicians. Census forms were sent to all UK consultants who were in post on 30 September 2015. The RCP verified consultant numbers by checking with each specialty representative and then telephoning each hospital to ensure the headcount was accurate. HST data were obtained from an electronic census that was sent to all registrars on the Joint Royal Colleges of Physicians Training Board database.

Royal College of Radiologists (RCR)

RCR collects information about the clinical oncology workforce in its annual UK clinical oncology workforce census. The 2015 census achieved a 100% response rate from Heads of Service with all 62 UK cancer centres submitting information. The census collects information on the number of consultant clinical oncologists and trainees by headcount and FTE, UK nation, region, programmed activities, working pattern (e.g. full-time), type of post (e.g. academic), age, gender, hospital, tumour site specialism, supporting professional activities, cross-site working patterns, locum working, unfilled clinical oncology posts and reasons for leaving a post. Additional information is collected on cancer centre opening hours and weekend opening.

Society and College of Radiographers (SCoR)

SCoR conduct an annual census of the radiotherapy radiographic workforce in the UK. Information is collected on the UK radiotherapy radiographic workforce in both the national cancer services and private/independent healthcare sector. Data collection was performed in December 2015. The SCoR contacted radiotherapy centres asking radiotherapy service managers to complete the survey to record the workforce in their department as of the census date on 1st November 2015.

The response rate was 100% with all 68 NHS centres that provide radiotherapy services in the UK submitting data to the SCoR census. Data was collected on the total numbers of therapeutic radiographers, assistant practitioners and trainee assistant practitioners. SCoR's analysis assumes that numbers reported in the Agenda for Change band 5 and above refer to therapeutic radiographers and numbers reported in AfC band 4 and below refer to the associated assistant practitioners and trainee assistant practitioners. Information collected includes numbers of posts and FTE, UK nation, vacancies, Agenda for Change banding, anticipated retirement, reasons for absence, job titles, reasons for leaving a post, use of agency staff, reasons for using agency staff. Headcount numbers were collected for dosimetrists in working in radiotherapy centres – this is only part of the dosimetry workforce.

Other organisations

The following organisations were contacted but did not hold or collect workforce data: British Society for Haematology, Nursing and Midwifery Council, Royal College of Nursing, Royal Pharmaceutical Society, UK Oncology Nursing Society, Anthony Nolan, Delete Blood Cancer, and British Society of Blood and Marrow Transplantation.

The following organisations were contacted but either did not hold information to the level of detail needed or were only able to provide information on part of the workforce group required: NHS Blood Transfusion Service, Welsh Bone Marrow Donor Registry, and Royal College of Pathology.

4. SITE VISITS

Site visits were conducted in the following hospitals:

- Mount Vernon Cancer Centre, Greater London - radiotherapy department
- Royal Marsden Hospital, London - radiotherapy department, HR
- Churchill Hospital, Oxford - oncologists, nurses, pharmacists
- Bristol Hospital Cancer Care Centre, Bristol - radiotherapy department, oncologists
- Christie NHS Foundation Trust, Manchester - oncologists, physics department, HR
- Velindre Cancer Centre, Cardiff - pharmacists
- Northern Centre for Cancer Care, Newcastle - oncologists, physics department
- Northern Ireland Cancer Centre, Belfast - HR, pharmacists, radiotherapy department, oncologists
- Airedale Hospital NHS Foundation Trust, Keighley - HR, oncologists
- Yorkshire Cancer Centre, Leeds - radiotherapy department, nurses, physics department, oncologists
- Perth Royal Infirmary, Perth - radiotherapy service managers from Aberdeen, Edinburgh, Inverness, Glasgow, Perth

Research topics included:

- How are you dealing with increasing patient demand?
- How do you go about planning oncology workforce?
- Is there anything on the horizon that you think will seriously change the requirements of the oncology workforce?
- Can you tell me about any retention/recruitment strategies?
- What, if any, are your experiences of skill mix?
- To what extent is attrition a problem in your hospital, and what are the drivers?
- What pressures are you facing?
- What skill mix has been tried, and why?
- What was the process and preparation leading up to you taking up this role?
- What jobs do you now take on, and when do you need to draw upon others?
- How, if at all, do you see things changing over the next few years?
- In your view, how can skill mix improve the cancer service we deliver to patients?
- Do you think your current set up is likely to work for other hospitals - why, why not?

5. FULL SURVEY

Introduction

Many thanks for clicking through to this survey - it should take just 10-12 minutes to complete. Cancer Research UK is working to publish a piece of research on the oncology treatment workforce, explaining what it might look like in 2022 and how the gap between

staff numbers and patient demand in 2022 might be mitigated. In order to both understand the current situation on the ground and to propose solutions that will work for staff, we have created this survey to learn more about how you work and any barriers you might come up against. Your input here will be invaluable for creating an honest and robust research report.

The survey will be used for a report being published this year with all responses being confidential.

SECTION 1: PROFILE

About You

1. Which of the following titles best describes your role?

- a) Clinical oncologist
- b) Medical oncologist
- c) Therapeutic radiographer
- d) Clinical scientist
- e) Clinical technologist - physics
- f) Clinical technologist - engineering
- g) Dosimetrist
- h) Clinical nurse specialist/specialist cancer nurse
- i) Pharmacist
- j) Stem-cell nurse
- k) Radiotherapy nurse
- l) Chemotherapy nurse
- m) Haemato-oncologist
- n) Paediatric oncologist
- o) Other: please specify

2. What is your grade?

- Consultant
- Trainee
- Speciality doctor
- Don't know
- Other (please specify)
 - Band 8c or above
 - Band 8b
 - Band 8a
 - Band 7
 - Band 6
 - Band 5
 - Band 4 or below
 - Don't know
 - Other: please specify

3. Please tell us which provider type the majority of your work is for?

- NHS provider
- Independent sector provider

- NHS provider – in which country?
 - England
 - Northern Ireland
 - Scotland
 - Wales
- England – list the 155 NHS acute trust
- Northern Ireland – 5 NHS Health and Social Care Trust
- Scotland – 12 NHS Health Boards
- Wales – 7 Local Health Boards
- Independent sector provider – list of regions

4. Which, if any, of the following do you specialise in? If you have multiple, please select 'primary specialism' for the area where you spend the biggest proportion of your time.

SELECT: Primary specialism [select one]; Additional specialism

- Acute oncology
- Breast
- Central nervous system
- Colo-rectal
- Genito-urinary
- Gynaecology
- Haematological malignancy
- Head and neck
- Lung
- Sarcomas
- Paediatric
- Skin
- Thyroid
- Teen and young adult
- Upper gastro-intestinal
- Other: please specify
- N/A - no specialism

5. Which, if any, of the following types of cancer treatment are you involved in prescribing, planning, voluming, or delivering?

- Radiotherapy
- Brachytherapy
- Chemotherapy
- Biological therapy/immunotherapy
- Hormone therapy
- Stem cell therapy
- None of the above

6. How many hours per week are you contracted to work? [ENTER]

7. Please use the sliders to give a rough idea of how you currently spend your time at work - the total will need to add up to 100%.

- Consultations with new patients
- Standard follow up appointments with patients
- Follow-up appointments with patients with recurrent disease
- Training and personal development/Supporting Professional Activities
- Planning therapies
- Administrative duties
- Supporting patients undergoing chemotherapy (being present with patients)
- Operating machinery whilst patient is undergoing treatment
- Supporting the delivery of therapies (e.g. preparing machinery, logistics, paperwork)
- Travelling
- Other: please specify

(Physics staff, therapeutic radiographers)

- Repairing and managing machinery/equipment
- Research and development
- Training others
- My own training/personal development
- Outlining and voluming
- Checking treatment plans
- Developing treatment plans
- Delivering treatment to patients, with machinery
- Patient management during treatment- assessment, advice etc.
- Patient follow up after treatment
- Other: please specify

SECTION 2: BEST PRACTICE

For the purposes of this survey, we will be referring to ‘treatment protocols’ in terms of the medical advice in clinical guidelines that state what type/length of treatment patients should receive. When talking about delivering these in a ‘timely fashion’, we mean not only within the 31 and 62 day wait targets, but also in terms of a day-to-day service which runs on time.

8. To what extent do you agree with the following statements, where 1 is ‘strongly disagree’ and 5 is ‘strongly agree’?

- There are sufficient physical resources (e.g. rooms, beds, machinery) in the cancer centre (or equivalent) of my hospital to deliver a service that follows treatment protocols in a timely fashion.
- We always treat cancer patients in line with the existing published treatment protocols.
- In addition to delivering treatment in line with protocol, we have time to spend on additional patient needs such as providing information and support.
- There are sufficient staff in the cancer centre (or equivalent) of my hospital to deliver a service that follows treatment protocols in a timely fashion.

- N/A option for all
- 9. Are there any challenges or barriers to delivering cancer treatment in line with protocol in your day-to-day work? If so, please explain. OPEN END**
- 10. Do you believe that you personally have enough patient-facing or patient-related time in order to deliver a best practice service to all of the cancer patients you are involved with? This may be interacting with a patient directly or, for example, preparing paperwork or planning treatment in relation to patients.**
- Yes
 - No
- 11. How much more patient-facing or patient-related time would you personally need in order to be able to deliver best practice service to all of the cancer patients you are involved with?**
- 12. Do you believe that you personally have enough time within your contracted working week to complete to the highest quality the cancer treatment related workload that you are presented with?**
- 13. How much more time per week do you believe you would need in order to complete to the highest quality the cancer treatment related workload you are presented with?**

SECTION 3: PROBLEMS

This section aims to learn a little bit more about your daily experiences and the working circumstances of your own place of work. Please answer in relation to your primary place of work rather than in relation to the health sector or NHS as a whole.

- 14. To what extent do you agree with the following statements, where 1 is 'strongly disagree' and 5 is 'strongly agree'?**
- The time allocated in my day-to-day work for appointments, sessions, or time with patients is sufficient
 - My current place of work is sufficiently staffed
 - I often work more hours than I am contracted to work
 - In my day-to-day work, a backlog of patients is making it difficult to adequately serve ongoing demand.
 - A lack of machinery or facilities inhibits me from carrying out my workload in a timely fashion
 - A lack of support staff inhibits me from carrying out my workload in a timely fashion
 - N/A for all options

SECTION 4: SOLUTIONS

- 15. To what extent do you agree with the following statements, where 1 is 'strongly disagree' and 5 is 'strongly agree'?**
- My place of work makes the best use of my skills with its job planning and staff deployment

- I think that using more 'skill mix' - using alternative grades/roles of staff to take on elements of the jobs of other grades/staff that are in severe shortage - would be a positive thing for cancer services in my place of work
 - I think that cancer services in my place of work will be sufficiently resourced to meet patient demand in 5 years' time
 - I think that there is an opportunity for the workforce to deliver more 'best practice' care to patients through efficiency improvements.
 - I think that my area of work would benefit from more standardisation and protocolisation
- 16. Hospitals across the country define the exact roles and remits of their staff in different ways. There are differences between how staff are expected to spend their time and the activities or responsibilities which they are/are not permitted to undertake. What, if any, changes to your job plan or the remit of your role would help your team to deliver the best service to patients? Please answer with reference to the specific activities or protocols within your role.**
- 17. What, if any, efficiency improvements do you think would improve the delivery of cancer services to patients in your place of work? Please describe your examples.**
- 18. What, if anything, has your current place of work done to try and mitigate any shortage of cancer workforce? Please explain the measures and their outcomes.**
- 19. We may wish to follow up with some respondents based on their answers. If you are happy to be contacted for a further conversation about your own experiences within the cancer workforce, please leave an email address here. Your data will not be passed on to any party outside of the immediate project team.**

6. BEST PRACTICE MODELLING METHODOLOGY

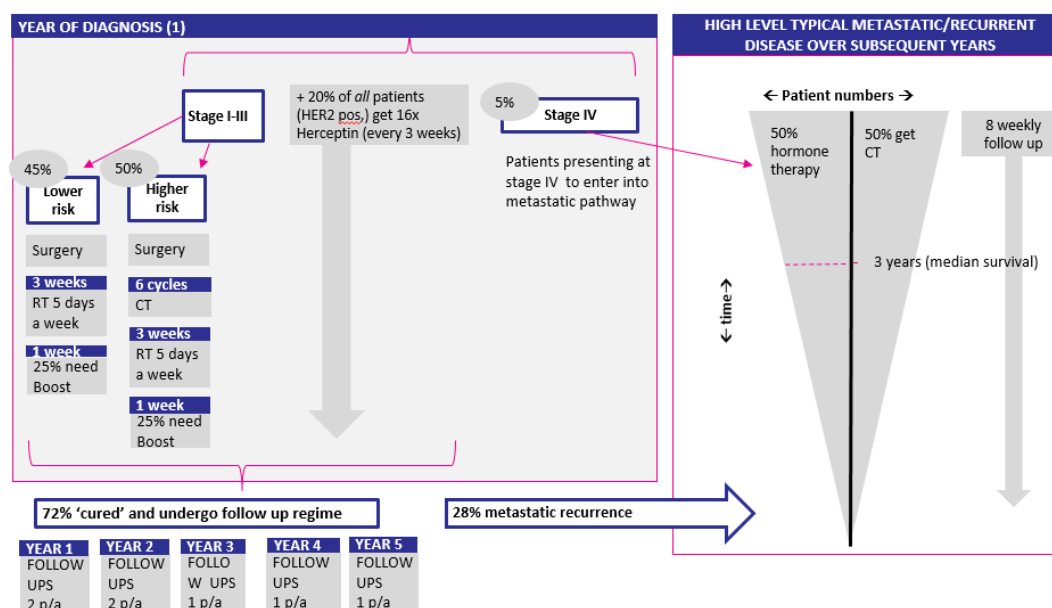
Step 1: Calculating caseload

To calculate the caseload (i.e. the number of patients undergoing relevant treatment or follow up regimes) in a given year, we used figures on incidence by cancer site^{86,87} and incidence by stage data for the modelled tumour sites. To consider the patients still receiving treatment in the years after diagnosis, we had to include both follow up regimes (modelled up to 5 years after diagnosis) as well as people who experience disease recurrence. For the former, we followed best practice follow-up regime guidance and limited the horizon to 5 years, although in rare cases circumstances may necessitate a follow-up of 20 years or more. We mediated the number of patients expected to be having these with the 5-year survival data available. For recurrence figures, we used indications from studies and journals. As these patients tend to have more advanced disease and poorer outcomes, we mediated their ongoing care with advanced disease survival estimates as far as they were available. We also mediated through expert consultation.

Step 2: Defining treatment pathways

To define the steps in any pathway, we consulted the best practice clinical guidelines for treatment (for example NICE and SIGN). Nationally and locally produced treatment pathways outline the treatment options available to patients. Where these guidelines have lacked detail, we have developed them further with our clinical panel and other area experts. For example, Figure 20 shows the agreed best practice pathway for patients with breast cancer. We mapped out different pathways for 6 different cancers, each with their own pathways according to stage and complexity, resulting in 48 bespoke treatment routes. We estimated the proportion of patients going through each pathway using the various cancer audits available supplemented with expert consultation.

FIGURE 20: HIGH-LEVEL BREAST PATHWAY REPRESENTATION



Step 3: Assigning workforce burden to pathways

Whilst clinical guidelines inform us of the type of treatment patients should have in terms of the number of fractions of radiotherapy or cycles of chemotherapy, they do not define how long these activities should take, nor who should be carrying them out. Accordingly, we used treatment delivery models outlined by National Chemotherapy Advisory Group and SCoR and modified them to include indications of how long the activities should take.

We are very aware that the time taken to deliver different steps of the pathway will vary considerably according to complexity, patient need and the practices of the local workforce. In order to provide a comparison to current resourcing levels, however, we have used expert input to estimate typical durations on a tumour site basis. For example, whilst a plan for radiotherapy to the breast could take as little as 20 minutes to produce, it would be difficult to make a head and neck plan in less than two hours. This is because plans need to consider nearby areas which may need to be protected from the radiotherapy beams. Figures 21 and 22 show the assumptions on average time per each step in a radiotherapy and chemotherapy delivery pathway.

FIGURE 21: RADIOTHERAPY DELIVERY PATHWAY

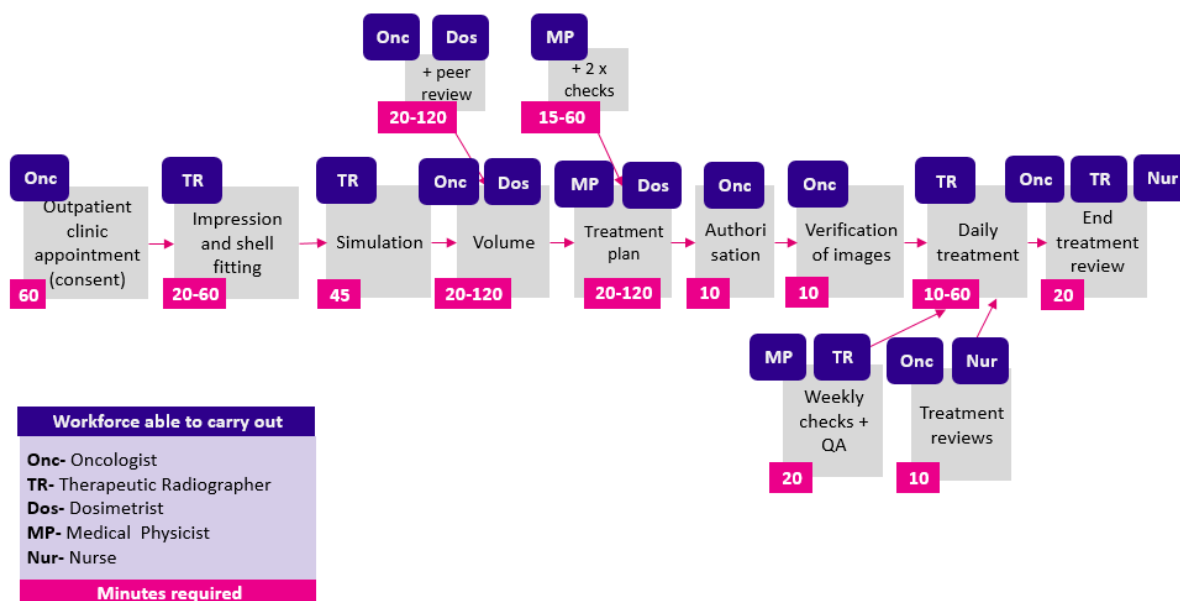
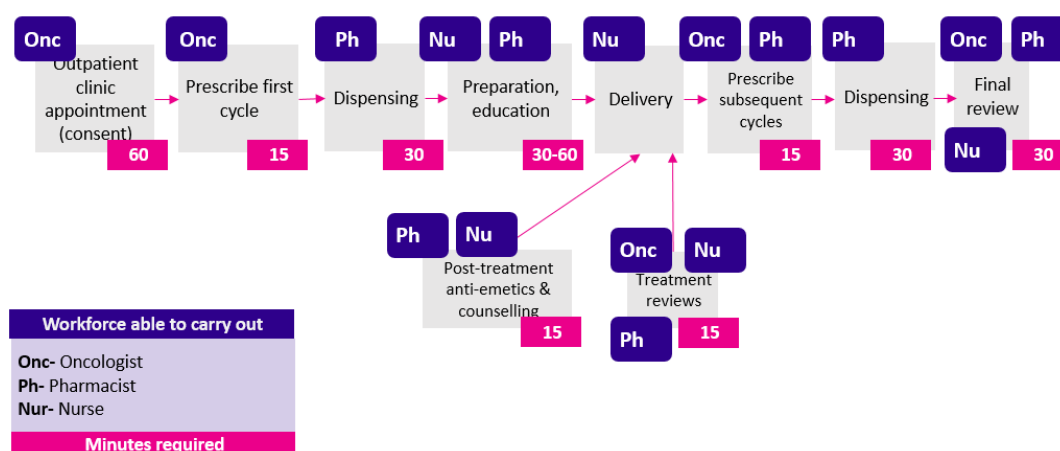


FIGURE 22: CHEMOTHERAPY DELIVERY PATHWAY



Step 4: Making the final calculation

We multiplied the number of patients in each pathway each year by the workforce minutes required for each step to obtain total number of minutes per year required for the delivery of each activity. We then took the total annual minutes needed per staff groups for a given tumour type, and divided by the number of hours an individual could be reasonably expected to spend delivering treatment within their job plan. For instance, a typical therapeutic radiographer with a 38 hour per week contract might be expected to spend just 40-70% of that time delivering treatment; the rest necessarily dedicated to other responsibilities such as training, or 'fixed' activities such as machine maintenance, which aren't directly tied to the number of patients being seen. In addition, we accounted for the

fact that a full-time employee is entitled to 5.6 weeks of annual leave per year. This results in an estimate of the staff numbers required if every patient were to have the recommended time with staff during treatment, and if every staff member had the protected time required (or estimated in the absence of recommendations) for training, education, managerial responsibilities and other responsibilities.

How we aggregate the tumour specific models to create a model across all cancer sites

Our complete bottom-up models were developed for 6 cancer types: breast, prostate, lung, bowel, head and neck, and non-Hodgkin lymphoma. In 2014, cancer diagnoses of these types accounted for 59% of all cancer diagnoses⁸⁸. In order to come to a picture which estimates the “best practice” resource requirements for the remaining 41%, we have taken two further steps:

- We have matched treatment characteristics of the next 14 most common cancer types to one of the original 6 types through using the clinical expertise available as shown in Table 9. For example, cancer of the uterus tends to have a similar profile of radiotherapy use to prostate cancer and so we took the average workforce implication in radiotherapy for a prostate patient and applied this to the number of people with cancer of the uterus. These 14 cancer types account for 34% of cancer diagnoses.
- For all remaining cancer types, which account for only 7%, we have simply used the averages from the 20 most common cancer types.

Our methodology for creating an aggregate picture for all cancers involved clinical expertise to match the workforce implication profiles of the 6 modelled tumour sites to the remaining 14 most common cancers. This methodology enabled us to cover 93% of all cancer incidence. For the remaining 7% of cancers (consisting of rarer cases), we used averages of all the sites to produce need estimates.

TABLE 10: AGGREGATION OF CANCER SITES

Cancer site	Cumulative total incidence	Treatment pathway code	NOTES
1. Breast	15%	1	
2. Prostate	(+13) 28%	2	
3. Lung	(+13) 41%	3	
4. Bowel	(+12) 53%	4	
5. Non-Hodgkin lymphoma	(+4) 57%	5	
6. Head and neck	(+3) 60%	6	
Kidney	(+3) 63%	4	
Melanoma	(+3) 66%	4	
Brain and other CNS/intracranial	(+3) 69%	6	
Bladder	(+3) 72%	6	
Pancreas	(+3) 75%	3	
Leukaemia	(+3) 78%	3	Without radiotherapy resource

Uterus	(+3) 81%	2	
Oesophagus	(+2) 83%	3	
Ovary	(+2) 85%	1	Without radiotherapy resource
Stomach	(+2) 87%	3	
Liver	(+2) 89%	3	
Myeloma	(+2) 91%	5	
Thyroid	(+1) 92%	6	
Cervix	(+1) 93%	6	
Other	AVERAGE OF OTHERS		

Applying the ‘best practice’ activity-based model

The ‘best practice’ activity-based model works best in order to understand the workforce burden of groups whose activities are assigned to patients in a structured way. For instance, a consultation appointment or a fraction of radiotherapy are relatively consistent and we are therefore able to estimate the units of time which can be applied to patients and scaled up with increased patient volume. There is a strong relationship between the number of patients and the workforce time required. Other roles, such as clinical scientists for example, are less directly tied to patient numbers because their workload is also mediated by machinery numbers and complexity. In addition, some roles are so varied and patient dependent, such as the CNS role that a typical workload per patient is extremely difficult to estimate. We have applied the activity-based model where possible to identify the gap between actual staff numbers and what the treatment workload would necessitate.

Those workforce groups which were suitable for ‘bottom-up’ modelling were as follows:

- Clinical oncologists
- Clinical technologists
- Medical oncologists
- Therapeutic radiographers

It was not possible to develop ‘bottom-up’ modelling for the following groups:

- Clinical scientists
- Clinical nurse specialists
- Chemotherapy nurses
- Haemato-oncologists
- Paediatric oncologists
- Radiotherapy nurses
- Stem cell nurses

FIGURE 23: HIGH-LEVEL BREAST CANCER TREATMENT PATHWAY 89 90 91 92 93 94

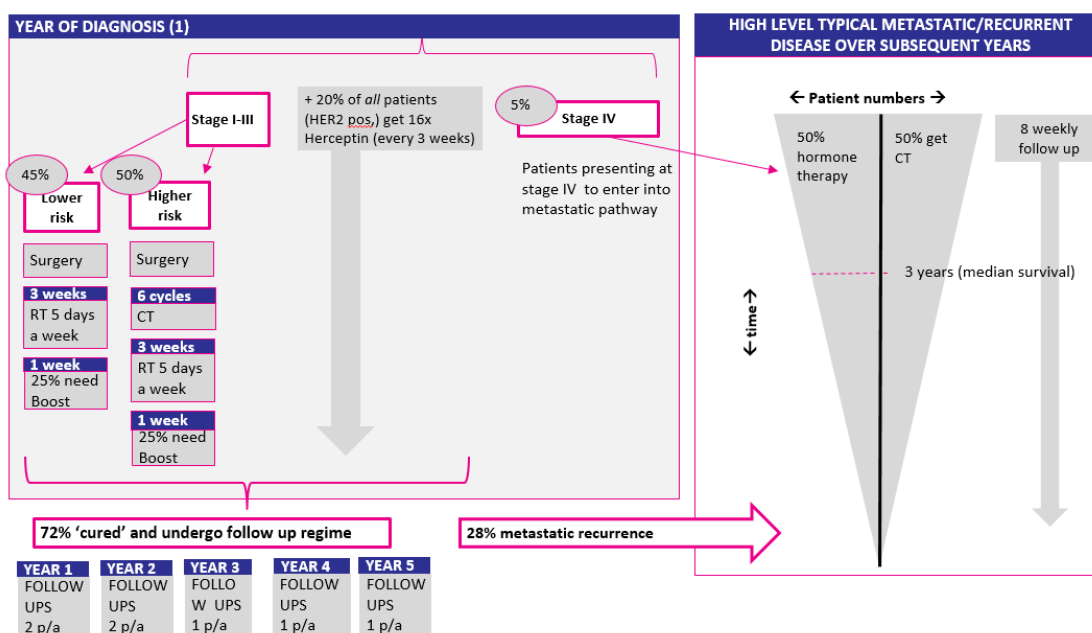


FIGURE 24: HIGH-LEVEL LUNG CANCER TREATMENT PATHWAY 95 96 97 98 99

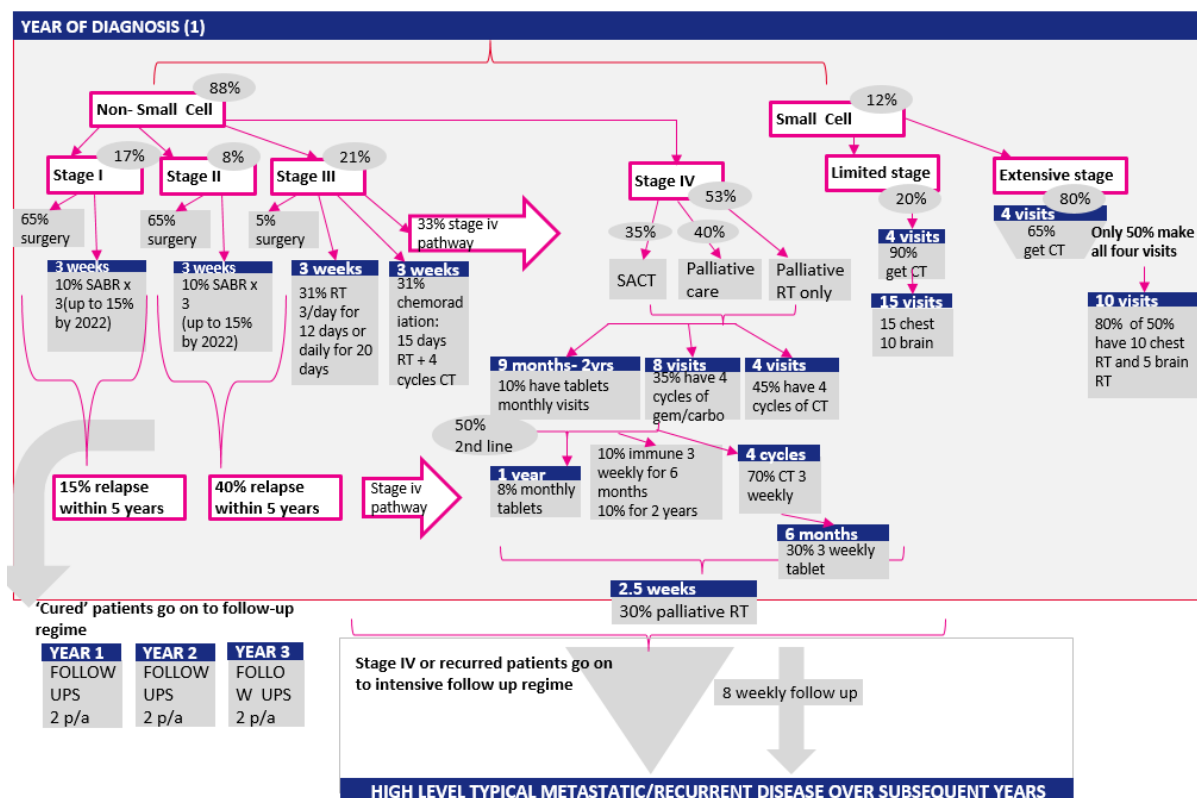


FIGURE 25: HIGH-LEVEL PROSTATE CANCER TREATMENT PATHWAY 100 101 102 103

104

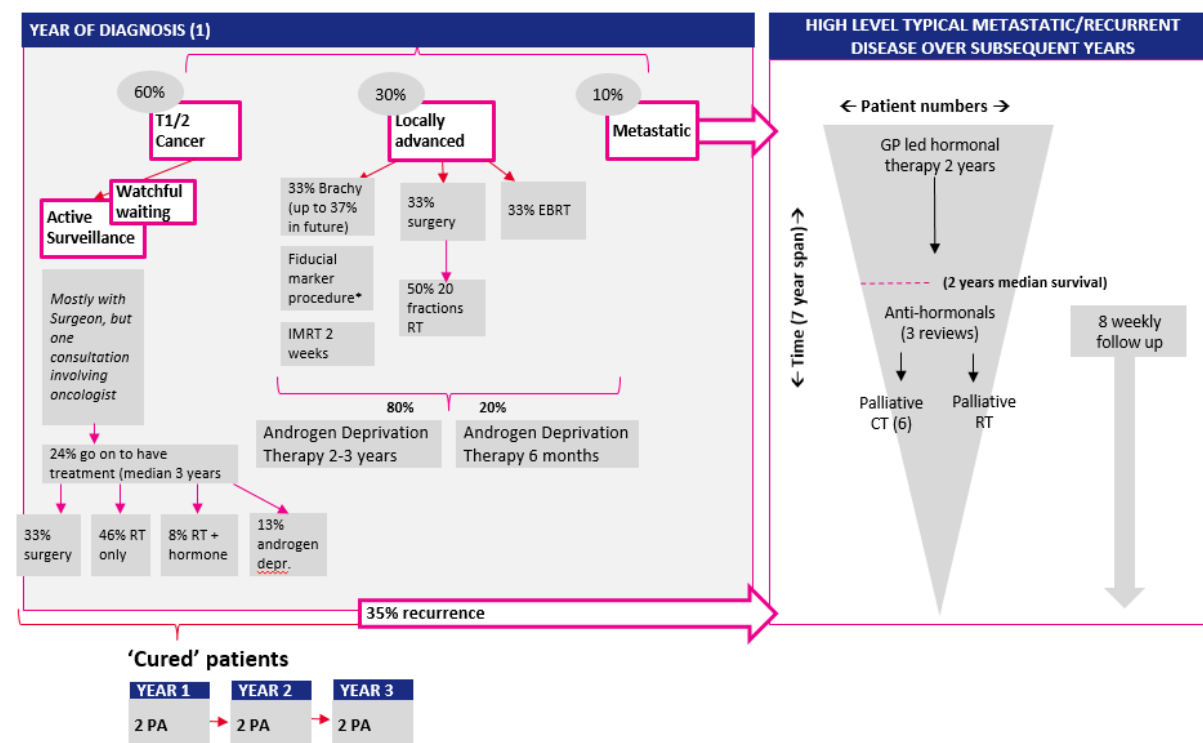


FIGURE 26: HIGH-LEVEL BOWEL CANCER TREATMENT PATHWAY 105 106

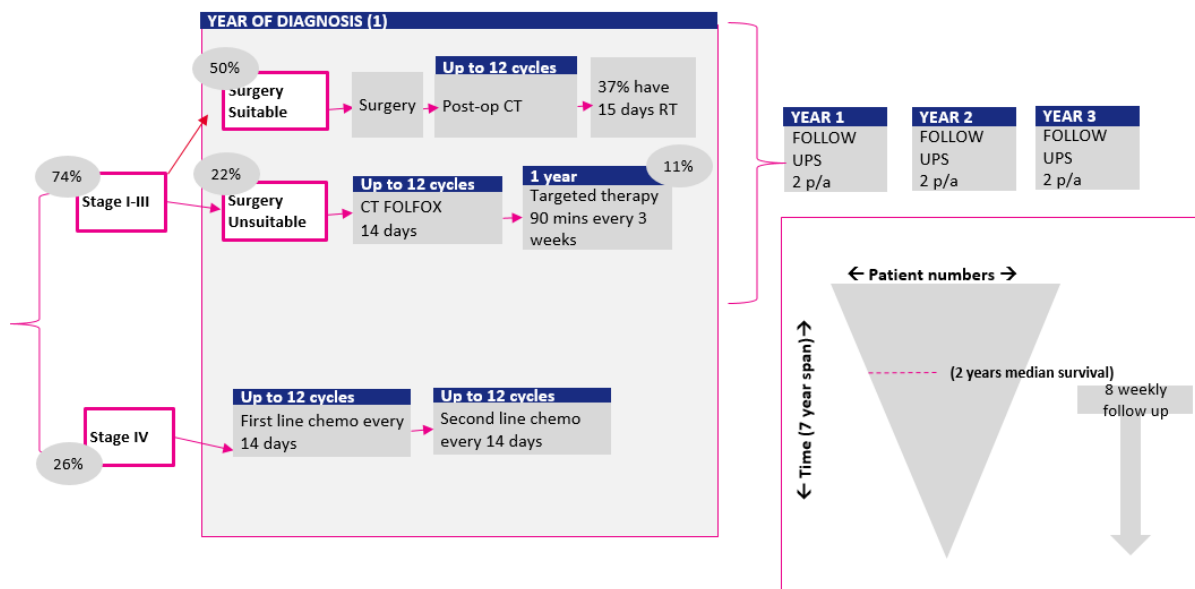


FIGURE 27: HEAD AND NECK CANCER TREATMENT PATHWAY – LOCAL 107

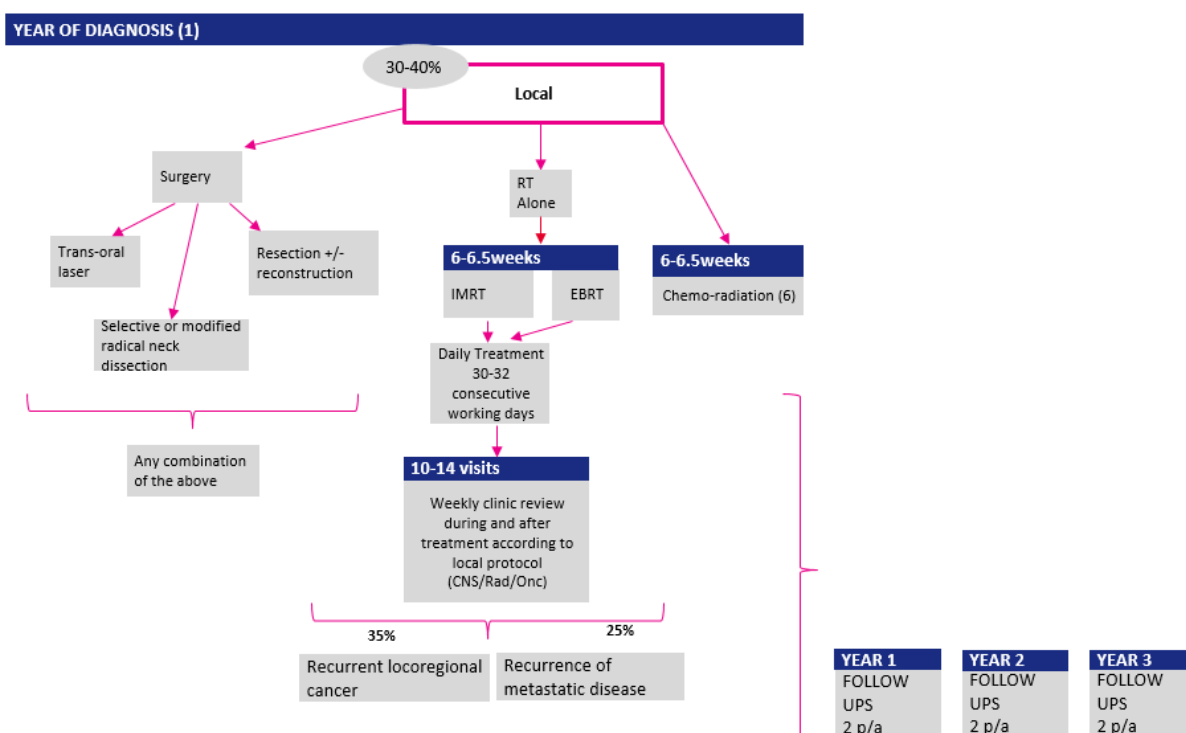


FIGURE 28: HEAD AND NECK CANCER TREATMENT PATHWAY – LOCAL/REGIONAL

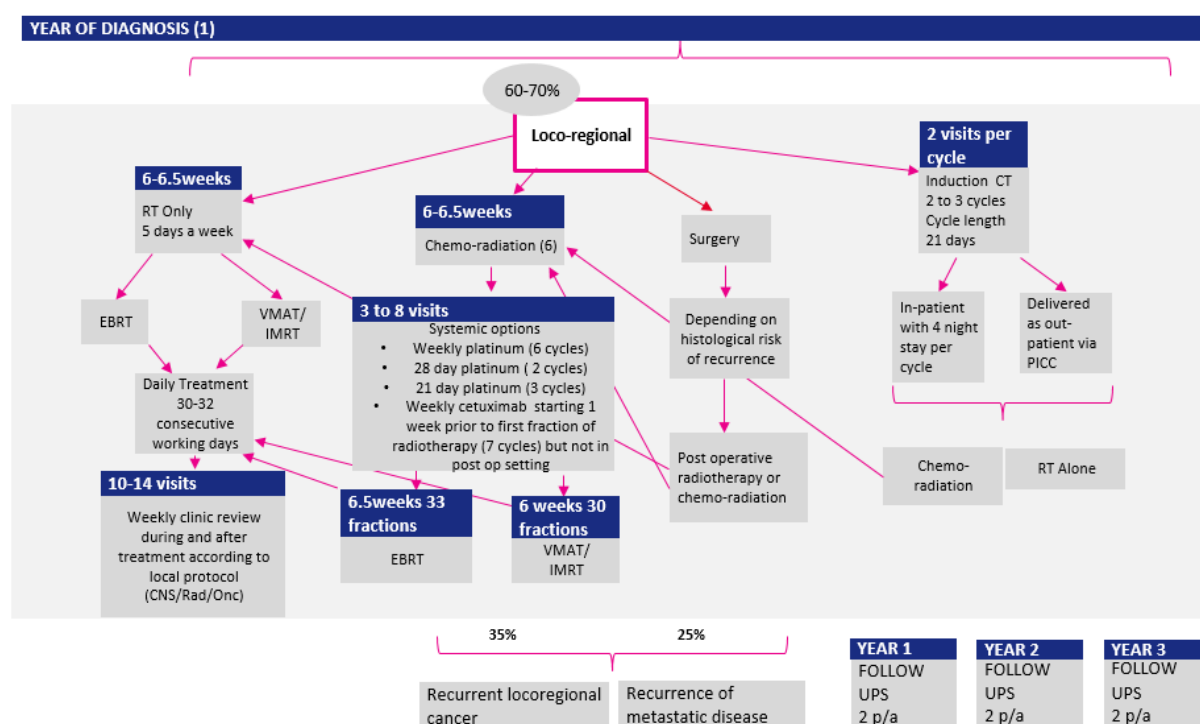


FIGURE 29: HEAD AND NECK CANCER TREATMENT PATHWAY – METASTATIC

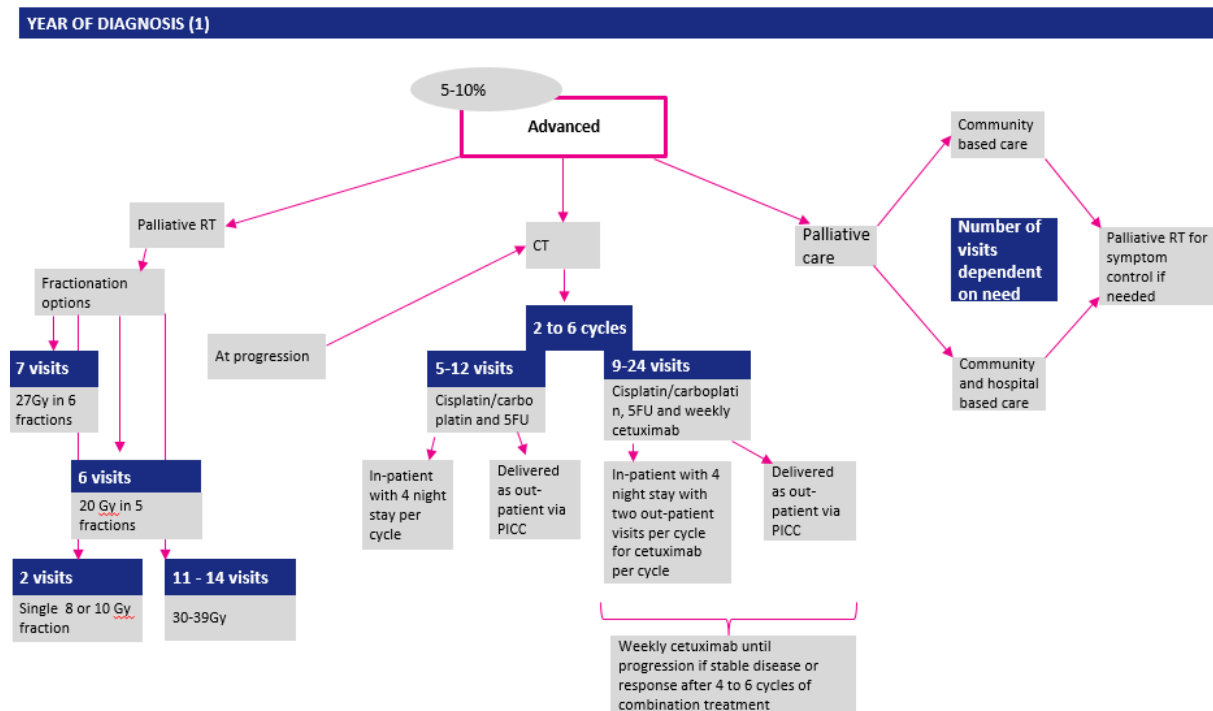
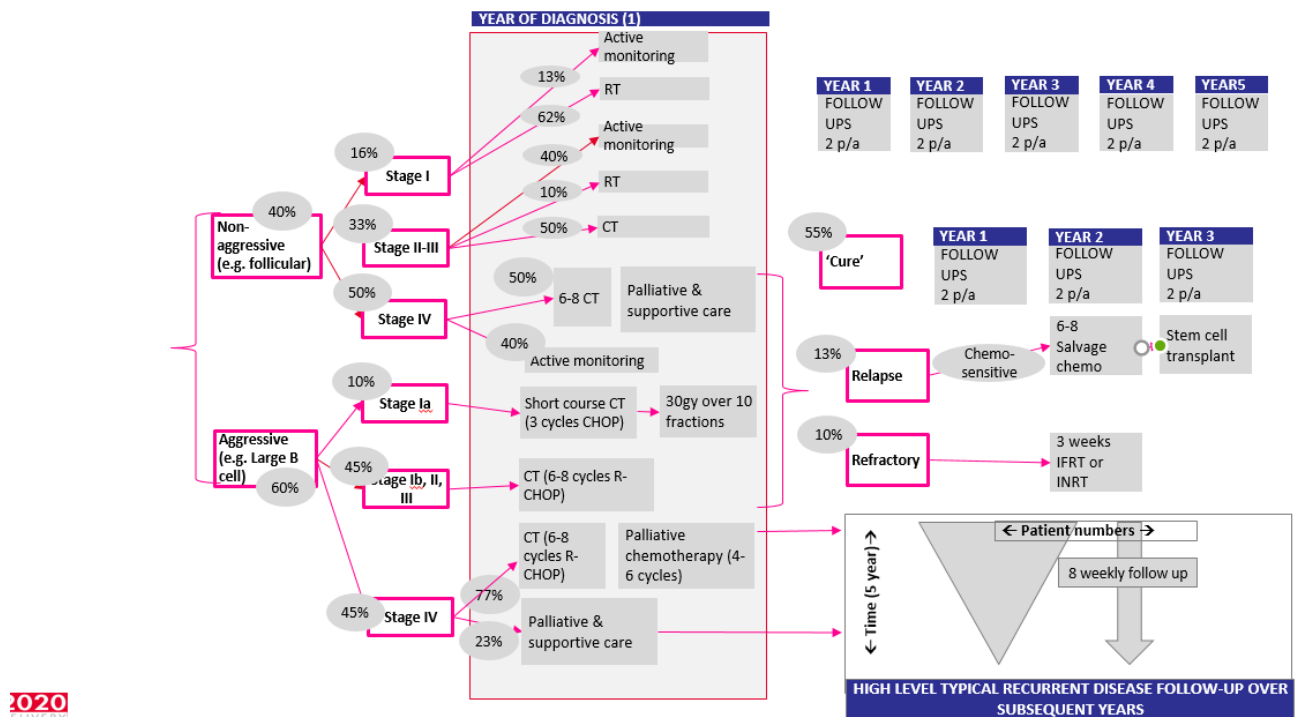


FIGURE 30: NON-HODGKIN LYMPHOMA TREATMENT PATHWAY 108 109 110 111



7. SKILLS MIX CASE STUDIES

Dosimetrist outlining at the Northern Centre for Cancer Care, Newcastle

1. Background

The Northern Centre for Cancer Care (NCCC) based in Newcastle has always embraced the “skill mix” ethos to free up consultant clinical oncologists time for patient facing activities. An advantage of this approach has been seen in career development and job satisfaction for the other radiotherapy professional groups. For this reason, the dosimetry team had already been outlining ‘Organs at Risk’ (OAR) in the planning process for some time. However, the time pressure on oncologists over the years has been further exacerbated by the increasingly complex radiotherapy techniques becoming best practice for patients. This means that the outlining on images, which is necessary for determining how to deliver radiotherapy beams, is taking much longer.

2. Challenge

How can Newcastle use its highly skilled dosimetry team to alleviate some of the time pressures on the limited number of oncologists?

3. Implementation

The dosimetry and clinical team identified disease sites that would be most suitable for a skill mix transition by establishing the scope of practice, training requirements, equipment availability and national guideline/protocols recommendations. For example, in prostate cancer, as well as outlining OAR such as bladder and rectum, trained dosimetrists also define the target volumes for treatment based on fused CT and MRI datasets.

They also approve the final treatment plans for patient radiotherapy delivery, in place of the clinical oncologist, in accordance with locally agreed protocols. Similarly, for breast radiotherapy, dosimetrists are entitled to approve the treatment plans ready for treatment if agreed dosimetric criteria are fulfilled. For rectal and anal cancer, some treatment targets and all OAR definition is undertaken by a dosimetrist following suitable competency based training. All of these role developments have been made possible by excellent multi-disciplinary team working and close collaboration with radiology consultants, clinical oncologists and dosimetrists.

“This is not about de-skilling the clinical oncologists from radiotherapy. Doctors’ skills will always need to be there for the purposes of better practice and the ability to take on or help out with the very complex cases, for example in post-surgery”

Prostate clinical oncologist

“Dosimetrists are highly skilled in defining volumes and are best placed in the planning pathway to perform tasks that would previously have been undertaken by clinical oncologists. This has allowed us to greatly improve patient waiting times and develop a flexible service”

Dosimetrist

This skill mix and dosimetry role extension has required the development of competency-based in-house training delivered by advanced dosimetry staff, radiologists and oncologists. Initially, in 2003, the Radiotherapy Department in Newcastle collaborated with Northumbria University to develop MSc modules in Prostate Volume Definition and Breast Mark-up using CT data. However, the cost and time associated with running these were extensive and so in-house programmes were developed instead. Dosimetrists attended lectures delivered by key members of the oncology team and observed a range of examples of patient target volumes being defined. This training can usually be provided over the course of one day.

Training cases are available for staff to complete under supervision, away from the clinical setting. Once sufficient cases have been completed for initial proficiency to be obtained and the trainee is ready to define volumes without direct supervision they progress to defining volumes on clinical cases. These are reviewed by a disease site-specific oncologists until the assessor is confident that the trainee is competent. The timescale for achieving competency is dependent on the complexity of the voluming required and prior experience of the dosimetrists involved, but can usually be completed in 2-3 months.

50% of the dosimetrist team are now routinely undertaking the responsibilities discussed. The skill mix provides exciting and compelling opportunities for recruits interested in personal development and the chance to extend their skills and a greater variety in the job role can also make it more interesting for staff helping with retention. Finally, by having more dedicated time for these jobs, dosimetrists routinely take less time to complete outlining tasks compared to clinicians who have limited availability in their job plans.

4. Results

The dosimetry team has taken on the outlining workload for almost 1100 annual referrals, vastly alleviating oncologist time. By reducing clinician-led outlining and plan approval, the staff at Newcastle have reduced the planning pathway for some disease sites by 7 days. More efficient use of consultant clinical oncologist time: utilised in the more complex planning cases and the provision of direct patient care.

5. Making it work

Starting small: Skill mix in a limited area paves the way for further development. The model of starting with organs at risk and then moving on to target volumes means that competencies - and a department or centre's comfort with skill mix - are gradually built up over time. This has facilitated the potential to move on to more complex areas of treatment in the future, such as swallowing structures for head and neck cancer or the Brachial Plexus in lung treatment.

Non-medical prescribing at the Velindre Cancer Centre, Cardiff

1. Background

A reduced number of oncologists, in conjunction with greater numbers of cancer patients and a greater number of chemotherapy agents had begun to take its toll on service delivery at the Velindre, with increasing patient waiting times and an unsustainable workload for the

existing staff model. There was also a wider policy context oriented towards cost savings and modernisation, and in 2004, supplementary prescribing had been approved in Wales.

2. Challenge

How can we use pharmacy staff in chemotherapy to alleviate the oncologist demand in an increasingly busy unit at the same time as meeting the cost-saving agenda?

3. Implementation

When deciding on where to start, the chief pharmacist and leading team worked to identify the staff most enthusiastic about development opportunities, the most experienced staff and the areas of greatest need.

As the majority of patients within Velindre's out-patient setting are those attending for assessment prior to their next cycle of chemotherapy, the need was identified to introduce non-medical prescribing in the busiest clinics. It was also to help pharmacists to start taking on the high volume of work related to returning patients: this would free up the time of oncologists to spend more time on new or more complex patients. The key responsibilities to be re-assessed included:

- Assessing response to chemotherapy with by tumour markers and CT scans
- Assessing toxicities of chemotherapy
- Modifying or delaying chemotherapy when necessary due to treatment toxicities or laboratory results
- Amending chemotherapy supportive care such as anti-emetics
- Accurately prescribing chemotherapy and supportive care
- Completing the paperwork related to each visit

The 17 team members selected to undertake these responsibilities so far have been experienced pharmacists, excited about extending their roles. These people went on to undertake the non-medical prescribing qualification. Based on their own experience and the needs of the unit, clinical specialism areas were chosen for them to work in: breast, genito-urinary, gynaecology and urology were the first areas to be developed due to the volume of patients and strong knowledge/experience of the staff in these areas.

To ensure the continued professional development of the non-medical prescribers, the chief pharmacist works to make time for them to keep up to date with best practice knowledge and provides forums for knowledge-sharing to take place. For instance, the Velindre's non-medical prescribers attend monthly medical oncology teaching sessions for oncology registrars. They are expected to actively participate to these sessions, bringing what they have independently learned in their healthcare professional training.

"If more is to be done with non-medical prescribing, there need to be available job plans – like there are for medics – which protect training time, time for clinics, as well as the other important enabling activities"

Chief pharmacist

They also undertake an annual competency assessment with the lead consultant where learning needs and personal development action plans in their chosen speciality are agreed. An important consideration for the implementation of this programme has been ensuring appropriate back-fill for the roles of the new non-medical prescribers. Centres are likely to need to secure some additional funding to make this possible, and the Velindre continues to work to identify potential funding opportunities.

4. Results

Having had more time to take on information and interact with their pharmacists, all patients in the Velindre's satisfaction survey for the unit were either satisfied or extremely satisfied. The year after this was introduced, the proportion of patients waiting longer than 30 minutes for their clinic appointment dropped from 69% to 37%. The Velindre Cancer Centre won the award "Embracing the strengths of non-medical prescribers: a truly multi-disciplinary approach".

5. Making it work

Time to train: non-medical prescriber roles shouldn't be seen as just a way to alleviate oncologist demand and save money - they are development opportunities for highly skilled pharmacists looking to take on a greater variety of activity and a way to make the most of many years' experience in a specific area. For this reason, the enhanced responsibility should be accompanied by protected time to stay on top of sector and scientific knowledge. A change to job plans could help with this.

Consultant therapeutic radiographer in Leeds

1. Background

Leeds is the third largest cancer centre in the UK, and has a high and increasing volume of patients. More than 20% of these are breast cancer patients, necessitating a large body of experts in the field. The centre was looking to expand the workforce model by implementing consultant radiographer practice; the aim being to widen the career opportunities for radiographers, whilst reducing the need for recruitment of additional clinical oncologists in this particular specialism. The Department of Health had already defined core elements of a non-medical consultant role, and the Society of Radiographers¹¹² had done further work on defining how advanced roles would work in radiotherapy in particular to ensure the broad scope of the role across spheres of expert clinical practice, research, education and leadership.

2. Challenge

How can we make the most of our skilled radiographers and manage the increasing oncology workload for the most common cancers?

3. Implementation

Following a rigorous and competitive process, a candidate was appointed. The candidate had worked as an advanced clinical practitioner in breast pre-treatment planning for seven years. This gave him a solid foundation upon which to build the necessary knowledge, skills, and behaviours via a formal training programme aligned with the FRCR for this new and

exciting role. The consultant radiographer was employed in a training post whilst he underwent a year of training to reach the competency standards.

A multi-professional group from Leeds Teaching Hospitals oncology directorate and supported by the Royal College of Radiologists and Society of Radiographers developed the competency syllabus. Much of the content covered was adapted from Parts I and II clinical oncologist registrar training with close clinical and educational supervision and clinical assessments. Assessments were made in line with the foundations of Good Medical Practice (GMP)¹¹³. The confidence to deliver independent clinics was built up over time with a clinical oncologist running clinics in parallel and available to offer peer support and governance.

“When having an ‘all-in-one’ consultation, patients don’t always get enough information about radiotherapy, so a radiotherapy specialist can really be helpful for informing patients. I can also see patients throughout their time with us, so they benefit from continuity of care”

Breast consultant therapeutic radiographer

The post holder’s job plan is at least 50% clinical, independently delivering clinics at the cancer centre in Leeds or at peripheral hospitals across the network. They have the capacity to see around 10 new breast cancer patients each week and following up with them throughout and beyond treatment. The rest of their time is divided between teaching at the link university or on site, research activity, as well as working on local and national developments in breast radiotherapy.

As a relatively new post, the governance structures around a unique advanced role and work had to be done to define where ultimate liability lies - who is held accountable for the patient in the end. Indeed, the only ‘disadvantage’ of developing the post was that existing guidelines on how to build such a role are inconsistent, and so the structure and support for the training and full post had to be figured out at the local level with support from Higher Education Institutions, the Society of Radiographers, and the Royal College of Radiologists. Now the programme has proven to be successful this paves the way for a smoother transition for people taking on such roles in the future.

4. Results

Increased capacity at outpatient clinics both in Leeds and at the peripheral site for new breast cancer referrals for radiotherapy. Patients are being recruited to a radiotherapy trial at a peripheral site across the cancer network for the first time, as a direct result of this role. The consultant radiographer has provided a permanent and successful solution to an outstanding clinical oncologist vacancy. The system is now more flexible and resilient with respect to oncologist and registrar absence or sickness, for example: with the extra capacity, small disruptions are manageable, and don’t create significant delays or backlogs. Radiographer presence and input at MDT is secured. Patients are guaranteed consistency in care throughout the treatment pathway and into follow up.

5. Making it work

Gaining team support for the training programme and remit: Support and recognition of the training programme and scope of the role is key if a new position is to be accepted amongst the multi-disciplinary team at all levels within the organisation. Leeds was open to change, and existing members of the oncology team were pleased to have their workload alleviated by an appropriately skilled and trusted colleague, so the process was relatively easy. However, it was still important to undertake consultation, and offer staff the opportunity to collaborate when defining how the new position would work.

Additional funding is also required to support the on-going professional development of the consultant radiographer, so they are aligned with their clinical oncologist colleagues. Presentations of this skills mix intervention nationally and providing input to national bodies are just a few of the metrics used to define the success of this role. This however requires funding to release the consultant from his post to attend such events.

Consultant Pharmacists in Oxford

1. Background

With an increasing pressure on chemotherapy services in Oxford and a medical oncologist shortage, it was a struggle to see all patients on time and to give them the amount of time that they needed. In 2005, the Department of Health introduced the consultant pharmacist role as a protected title to retain highly skilled clinical pharmacists in the NHS. The consultant pharmacist role includes the elements of expert practice; research, evaluation & service development; education, mentoring and overview of practice; and professional leadership. The consultant pharmacist role has the capacity to lead on pharmacy services to take on many elements of the medical consultant role.

2. Challenge

How can we develop the consultant pharmacist leadership and role to develop pharmacy services in a way that alleviates the pressures in the chemotherapy units?

3. Implementation

The development of the consultant pharmacist role is being championed both internally and nationally by the chief consultant pharmacist in Oxford. Internally, the consultant pharmacist leads the cancer pharmacy service and has implemented a range of pharmacy services that alleviate the pressures on the chemotherapy units. The consultant pharmacist has established a band 7 specialist cancer pharmacist rotational and training programme to ensure that all the pharmacists in the team have the required competencies to support these services. Band 8a pharmacists lead in the specialist areas of oncology and haematology, and support the consultant pharmacist in the delivery of the pharmacy service. Advanced pharmacist practitioner posts are being developed in the future as additional support to chemotherapy services to improve the skill mix. Cancer pharmacy technicians work alongside pharmacists providing a medicines management and accuracy checking service to ensure pharmacists are backfilled for tasks they traditionally undertook.

The development towards becoming a consultant pharmacist takes time and experience. 'Consultant pharmacist' is a protected title, contingent upon completion of a number of qualifications and competencies defined at a national level including a Clinical Pharmacy Diploma/MSc, a research qualification, and accreditation at Advanced Level 2 or Fellowship by the Royal Pharmaceutical Society (RPS) Faculty. The RPS has published a roadmap for pharmacists on how to work towards advanced and consultant level practice. The RPS Consultant Pharmacist Group is developing a RPS Ultimate Guide on consultant pharmacist posts to support leaders in developing these posts across health economies. Consultant Pharmacists lead clinics, take on patient reviews, prescribe for patients and attending MDT meetings. The clinical side of their work should be up to 50% of the job plan. Other key elements are education, research and leadership.

4. Results

Patient feedback has revealed high satisfaction: people report that they like to see people with a lot of knowledge in medicine and are very pleased to have access to more pharmacist time spent providing information and support.

The position of consultant pharmacist is a compelling ambition for many younger pharmacists. They are drawn to the centre because of the opportunities on offer, and the role that the first consultant pharmacist has played in championing the Consultant Pharmacists role nationally.

5. Making it work

Leadership: at Oxford, the consultant pharmacist leads change, liaising with higher education institutions and professional bodies, to improve service locally as well attract people in to the profession and facilitate the process of developing consultant pharmacists for the future. The role is not a 'stand in' for a doctor, but rather a unique position that is necessary for specialised service development in an age of more varied and complex chemotherapy and growing workloads.

Specialist therapeutic radiographers at The Royal Marsden Hospital (RHM), London

1. Background

Given the pace of change in cancer treatments and the persistent workforce shortages nationally, the Human Resources team looked to re-think their staff model, and try to develop a more sustainable way of using the workforce. In addition, there was a sense of plateau amongst skilled radiographers who were looking for better development opportunities. Finally, a local survey of medical registrars had revealed that clinical demands were compromising the time spent on education and training.

2. Challenge

How can we enable our skilled radiographer team to utilise all their skills and experiences in a way that helps the sustainability of the future workforce and alleviates the pressure on oncology registrars?

3. Implementation

RMH worked to identify both the areas of need and the areas of ability that would benefit from a specialist radiographer role. Urology was an area with high patient footfall and increasing demand; the number of radiotherapy attendances had increased by 25% in the course of just 6 years. Moreover, it had 2 therapeutic radiographers with great experience and knowledge of urology treatment. It was decided that in line with the Society of Radiographers' Four Tier Model, 2 specialist radiographer roles would be established.

Following several months of training, the specialist radiographers run 2 clinics a week in the radiotherapy unit in Sutton. They see patients throughout their treatment course in order to discuss side effects and check on holistic needs related to undergoing cancer treatment. Further contributing to the patient experience, they run education sessions to teach incoming patients about what to expect.

The role has also improved planning capacity. As plans have become so much more complex - the time traditionally set aside for oncologists to plan is no longer sufficient. The specialist radiographers have helped to bridge that gap by undertaking radiotherapy planning responsibilities as well.

"We have really enjoyed developing our clinical skills to help achieve this patient-centred pathway"

Urology specialist
radiographer

4. Results

The role has helped to reduce the workload for specialist registrars and consultants: after 7 months of the 12 month pilot, the radiotherapy planning workload for specialist registrars had been reduced by 30% and the volume of follow up patients in the oncologists' radiotherapy clinic had been reduced by 55%.

It has provided an exciting career development opportunity for staff, which in turn aids staff retention. It provides better patient experience and continuity of care, by protecting staff time to understand holistic needs and discuss symptoms or expectations.

5. Making it work

Succession planning and backfill: There needs to be sufficient backfill and succession planning when new roles are developed. The elements of the old role should be identified, and their redistribution should be factored into any business case or workforce plan. For instance, a specialist radiographer role might leave the radiographer team short of 0.5 FTE as they take on more consultations and RMH is trying to improve the way it prepares to backfill.

Wide engagement: This is a completely new way of working and requires multiple groups of people to be engaged and on board with the proposed changes.

Radiotherapy Assistants at Mount Vernon

1. Background

Patient feedback suggested that people didn't feel they were getting as much time and information as they would have liked when undergoing radiotherapy treatment. As a very

busy centre, Mount Vernon was hard pushed to find capacity from their existing radiographers to spend additional time with patients.

2. Challenge

How can we best use our available resources to ensure that patients are getting the time and care that they need?

3. Implementation

To become a Band 3 Radiotherapy assistant, employees need to have an NVQ Level 3 in Health and social care. They then receive in-house competency based training for the specific radiotherapy activities that they will be undertaking. In line with the Society of Radiographer's Four Tier Model, Mount Vernon hired a number of radiotherapy assistants in order to both relieve some of the strain from radiographers and enhance patient experience. The priorities include a lot of support and information giving, as well as coordinating the advanced administration required for organising radiotherapy pathways.

The radiotherapy assistants lead conversations with patients when they first come in, providing information about radiotherapy treatment and what to expect. This can be on an individual basis, although increasingly they are running group sessions for information giving- particularly in breast cancer due to the increased number of patients having breast radiotherapy. This has the benefit of patients meeting with other people going through the same thing as well as receiving the information that they need from a health professional.

They also lead the Holistic Needs Assessment with patients: these are a requisite that are often delivered at a time that isn't best for the patient, due to the stretch upon resources and the lack of clinical nurse specialists. At Mount Vernon, the radiotherapy assistants have developed skills in going through these with patients, and are able to do so at the right time for the patient. This is often early to mid-way through a treatment course to ensure that and necessary changes or support can be put in place in a timely fashion. Finally, the radiotherapy assistants are using their health knowledge to better organise and book treatments and work through associated admin.

4. Results

Interaction with patients helps people early in their radiographer careers to gain good patient exposure, and learn all of the pastoral and support skills that they will need as they progress to higher bands. Surveys have revealed that patient satisfaction has improved, as people receive more pastoral and supportive care.

The entry requirements for becoming a radiotherapy assistant mean that there is a wider pool to recruit from, as opposed to trying to seek people with specific degrees with radiotherapy relevance. This provides the centre with a pool of people; some of whom will be able to progress to become senior radiographers in the future.

5. Making it work

Patients as advocates: when making the case to hire more people or work in a new way, the Head of Radiotherapy makes the most of patient responses and feedback in order to shed

light on true need, for example by taking patient responses and feedback to senior leadership. This helps to identify the consequences of issues for the patients, and also helps to tell the story of the real impact of changes when it comes to evaluation.

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