Department of Health and Ageing

Radiation Oncology Workforce Planning

Final Report

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Appendices

List of abbreviations and acronyms

AAPROP	Australian Association of Private Radiation Oncology Practices
ABS	Australian Bureau of Statistics
ACPSEM	Australasian College of Physical Scientists and Engineers in Medicine
AHTAC	Australian Health Technology Advisory Committee
AHMAC	Australian Health Ministers Advisory Council
AIHW	Australian Institute of Health and Welfare
AIR	Australian Institute of Radiography
AMC	Australian Medical Council
AMWAC	Australian Medical Workforce Advisory Committee
APWG	Advanced Practice Working Group
ARC	Adelaide Radiotherapy Centre
ARECQA	Accreditation in Radiotherapy Equipment Commissioning and Quality Assurance
AROMP	Accreditation in Radiation Oncology Medical Physics
BTE	Basic Treatment Equivalent
CARO	Canadian Association of Radiation Oncologists
CPD	Continued Professional Development
DHS	Department of Human Services
DMLC	Dynamic Multileaf Collimators
DoHA	Department of Health and Ageing
FRO	Faculty of Radiation Oncology
FTE	Full Time Equivalent
GDP	Gross Domestic Product
IGRT	Image Guided Radiation Therapy
ICS	Integrated Cancer Services
IMRT	Intensity Modulated Radiation Therapy
HDR	High Dose Rate
LDR	Low Dose Rate
Linac	Linear accelerator
MBS	Medical Benefits Schedule
MRI	Magnetic Resonance Imaging
MSAC	Medical Services Advisory Committee
NHMRC	National Health and Medical Research Council
NRAG	National Radiotherapy Advisory Group
PDY	Professional Development Year
PET	Positron Emission Tomography
QA	Quality Assurance
RAH	Royal Adelaide Hospital
RANZCR	Royal Australian and New Zealand College of Radiographers
RMIS	Radiotherapy Management Information System
RO	Radiation Oncologist
ROI	Radiation Oncology Inquiry
ROMP	Radiation Oncology Medical Physicist
RORIC	Radiation Oncology Reform Implementation Committee
RPH	Royal Perth Hospital
RT	Radiation Therapist
RTAP	Radiation Therapy Advisory Panel
SCGH	Sir Charles Gardiner Hospital
TEAP	Training, Education and Accreditation Program
VMAT	Volumetric Modulated Arc Therapy
WHO	World Health Organization
WWG	Workforce Working Group

Glossary of terms

ACPSEM Formula 2000: the formula developed by the ACPSEM to assess the radiation oncology medical physicist requirements for an individual department based on available technology and techniques. Formula 2000 calculates the requirements for all physics staff, including physics technicians.

Adjuvant therapy: treatment given in addition to the primary treatment (e.g. surgery) to enhance the effectiveness of the primary treatment.

Age standardisation: age standardisation is a statistical method that adjusts crude rates to account for age differences between study populations. Age standardisation enables better comparisons between different populations.

Area of Need: the program that enables the recruitment of suitably qualified overseas-trained doctors into declared Area of Need positions on a temporary basis.

ARECQA: Accreditation in Radiotherapy Equipment Commissioning and Quality Assurance; the accreditation program in radiation oncology medical physics offered by the ACPSEM prior to the development and implementation of the Training Education and Accreditation Program.

AROMP: Accreditation in Radiation Oncology Medical Physics; the accreditation awarded by the ACPSEM after successful completion of the Training Education and Accreditation Program.

Attendance: a single presentation by a patient for radiotherapy treatment; at each attendance a fraction of the prescribed treatment course is delivered.

Brachytherapy: radiotherapy for cancers where the radiation source is placed directly in contact with the malignancy.

Basic treatment equivalent: the BTE model was developed in 1996 in an attempt to improve the measurement of linear accelerator throughput in radiotherapy. The BTE is a productivity measure for radiation oncology linear accelerator treatment delivery that accounts for variations in complexity. It is derived by measuring the fraction durations and the treatment factors that affect fraction duration across a large number of radiation oncology departments.

Chemotherapy: refers to the use of anti-cancer drugs to destroy cancer cells. In most treatments a number of drugs may be given at the same time. This process is referred to as combination chemotherapy.

Clinical workload: comprises anything linked to patient care, including: new patient/follow up clinics, multidisciplinary clinics, planning/simulation, contouring organs/voluming, treatment review, multidisciplinary team meetings, remote case conferences, patient/clinician phone calls, and ward rounds.

College Fellow RANZCR: the postgraduate qualification awarded by the Royal Australian and New Zealand College of Radiologists (RANZCR) after appropriate examinations and training, approval of Council, and payment of the subscription.

Cone beam computed tomography (Cone beam CT): provides three-dimensional axial CT slices of a patient's tumour(s), enabling clinicians to compare these images with initial treatment planning images to determine how precisely focused the radiation set-up is. This technique enables the clinician to make position adjustments if necessary to deliver a more targeted therapy to the patient.

CyberKnife: frameless robotic radiosurgery system.

Dosimetry: measurement of radiation exposure from x-rays, gamma rays, or other types of radiation used in the treatment or detection of diseases, including cancer.

Educational Affiliate of RANZCR: a person who is practising as a radiation oncologist in Australia but is not a Fellow of RANZCR who, by paying a membership fee, establishes an association with the College for the purposes of participating in educational activities, meetings and seminars organised by the College.

Equipment commissioning and quality assurance workload: includes acquisition and installation of new equipment; safety checks; initial radiation survey and acceptance testing; commissioning of the machine for clinical use; establishment of the baseline quality assurance parameters and schedule; and routine quality assurance activities.

Fields: exposures of radiation from a prescribed direction either alone or as part of a multi-beam treatment technique; this includes exposures that are static in nature, or those delivered dynamically as part of an IMRT technique, or those that are comprised of multiple control points, or "fields within fields".

Four dimensional computerised tomography (4DCT): uses technology to take images that capture the tumour and also capture the movement of the body's organs or of the tumour over time. This additional dimension is very important for tumours located on or near organs that move, in that it makes treatment more accurate.

Fractions: the number of smaller doses (i.e. parts) required to deliver the total prescribed treatment course.

FTE: the number of full-time equivalent professionals is defined as the number of professionals multiplied by the average weekly hours worked, divided by the number of hours in a 'standard' full-time working week. The 'standard' hours in the Award under which staff are employed is used in the calculation. In the absence of an Award, 'standard' is defined as 45 hours for medical practitioners and 37.5 hours for radiation therapists and radiation oncology medical physicists.

Gated delivery: refers to respiratory gating during free breathing, by limiting irradiation to part of the breathing cycle. The motion of the tumour caused by breathing can be limited during irradiation.

Headcount: The number of individual persons employed by the facility irrespective of the hours that they are paid to work.

HDR: High dose rate brachytherapy, uses a dose of 20 cGy per minute or above. HDR is an alternative to LDR in cases where it can be administered without a large number of fractions.

Hypo-fractionation: The delivery of higher doses of radiation in fewer treatments than conventional radiation therapy.

Image guided radiotherapy (IGRT): refers to the use of frequent imaging in the treatment position during a course of radiotherapy to localise the tumour prior to or during each treatment.

Image fusion for treatment planning: is the process of combining relevant information from two or more images into a single image. Image fusion can be performed by using hybrid scanners that combine two distinct medical imaging modalities such as positron emission tomography (PET) and computed tomography (CT) into a single device. There is also a software-based image fusion technique which can merge image datasets taken at different times or with different medical imaging modalities.

Independent practice: used to refer to radiation oncologists who are no longer working under supervision, generally characterised by the completion of specialised vocational training to become a qualified radiation oncologist.

Intensity Modulated Radiotherapy (IMRT): A type of three-dimensional radiation therapy that uses computer-generated images to show the size and shape of the tumour. Thin beams of radiation of different intensities are aimed at the tumour from many angles. This type of radiation therapy reduces the damage to healthy tissue near the tumour.

Intra-operative radiotherapy: radiation treatment aimed directly at a tumour during surgery.

LDR: or low dose rate brachytherapy, involves implanting radioactive material temporarily or permanently. It is commonly used for cancer of the oral cavity and oropharynx and sarcoma, as well as prostate cancer. LDR also refers to seed implantation.

Linear accelerator: A high energy machine that delivers external beam radiotherapy.

Mesothelioma: A benign or malignant (cancer) tumour affecting the lining of the chest or abdomen. Exposure to asbestos particles in the air increases the risk of developing malignant mesothelioma.

Metropolitan: includes areas within the city limits of Sydney, Melbourne, Brisbane, Perth, Adelaide, Newcastle, Gold Coast, Canberra, Wollongong, Sunshine Coast, Hobart, Geelong, Townsville and Cairns.

Management/Administration workload: includes quality assurance activities (except for radiation oncology medical physicists, quality assurance activities are included in *equipment commissioning and quality assurance workload*), dictating/correcting letters, management director/associations, meetings, reports, guidelines, surveys.

Modulated arc therapy (includes VMAT and RapidArc): is a system for intensity modulated radiotherapy incorporating capabilities such as variable dose-rate, variable gantry speed, and accurate and fast dynamic multileaf collimators (DMLC), to deliver a highly conformal dose to the tumour site.

New patients: patients presenting to a facility for the first course of treatment for a given cancer diagnosis (i.e. they have not received a previous course of radiotherapy for the given cancer diagnosis at any facility).

Number of days for commissioning or decommissioning: the integer number of days that the linear accelerator is not available for at least half the day for treating patients because it is being commissioned or de-commissioned. For days where time is exactly equally divided between two functions, allocate the day in the preference order: treatment, maintenance, commissioning or decommissioning then non-operating.

Number of days for maintenance or calibration: the integer number of days that the linear accelerator is not available for at least half the day for treating patients because of planned or unplanned maintenance or calibration. For days where time is exactly equally divided between two functions, allocate the day in the preference order: treatment, maintenance, commissioning or decommissioning then non-operating.

Number of non-operating days: the integer number of days that the linear accelerator is not used for any purpose for at least half the day (i.e. the machine is available but not being used because it is a weekend or public holiday day, suitable staff are not available, the machine is unserviceable, etc.). For days where time is exactly equally divided between two functions, allocate the day in the preference order: treatment, maintenance, commissioning or decommissioning then non-operating.

Number of treatment days: the integer number of days that the linear accelerator is used to treat patients for at least half the time it is operating on the day. For days where time is exactly equally divided between two functions, allocate the day in the preference order: treatment, maintenance, commissioning or decommissioning then non-operating.

Outreach services: are services provided by clinicians to patients in locations other than from their usual/main workplace e.g. in the patient's home or place of work, or in clinics in other hospital settings or community health centres; an outreach service involves the clinician travelling to the patient.

Palliative treatment: cancer treatment to alleviate potential/actual symptoms due to the underlying cancer, without the prospect of cure.

PDY: Professional Development Year: the vocationally based professional development year that radiotherapy graduates are required to complete prior to being eligible for full accreditation with the Australian Institute of Radiography.

Positron Emission Tomography (PET): is a nuclear medicine imaging technique which produces a three-dimensional image or picture of functional processes in the body.

Radiation safety and protection workload: includes activities ensuring equipment is functioning properly and according to applicable standards and that the equipment is installed and used in a way which provides maximum radiation safety for operators, patients and others; and examination of protective equipment and shielding to ensure that they are present and provide the required protection.

Radical treatment: cancer treatment with the aim of curing the cancer. Include all treatments where the aim is to increase survival. The radiotherapy course could be either primary or adjuvant treatment.

RapidArc: refer to *Modulated arc therapy*

Research workload: investigations/activities that are carried out as part of a recognised research project and/or clinical trial for which a specific proposal has been prepared and approved by a relevant body (e.g. work under a funded research grant, work approved by the hospital's ethics committee).

Re-treatment patients: patients having a second or subsequent course of radiotherapy after having previously received a course of radiotherapy for the same primary diagnosis (including treating a second anatomical site for the same primary diagnosis) whether or not the previous course(s) was delivered in the same facility.

Stereotactic radiosurgery: A type of external radiation therapy that uses special equipment to position the patient and precisely give a single large dose of radiation to a tumour. It is used to treat brain tumours and other brain disorders that cannot be treated by regular surgery.

Sub-specialist: a clinician who has an advanced knowledge of, expertise or experience in, a particular area within their speciality.

Superficial/orthovoltage radiotherapy: a type of radiotherapy used to treat lesions that do not require a dose of radiation to a great depth, such as skin and bone cancers or scars.

Teaching workload: supervising medical students, radiation oncology registrars, and/or other registrars/students; and preparing lectures and presentations to be given in seminars, grand rounds and related activities where the principal purpose is to educate students/trainees.

Tomography: A series of detailed pictures of areas inside the body. The pictures are created by a computer linked to an x-ray machine.

Tomotherapy: uses a dynamic delivery in which the gantry, treatment couch, and multileaf collimator leaves are all in motion during treatment. Tomotherapy is a type of intensity-modulated radiation therapy, also called helical tomotherapy.

TEAP: Training, Education and Accreditation Program: this program addresses the training of medical physicists to become accredited (be awarded the AROMP) as a ROMP by the Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM).

Total annual treatment hours: the aggregate in a one year period of the number of hours that the linear accelerator is booked for treating patients.

Vacant position: a position for which there are funds available, that is not currently occupied (i.e. no-one is being paid from the funds available to fill the position), and there are active processes in place and/or it is clearly intended to find a suitable person to fill the position.

VMAT: refer to *Modulated arc therapy.*

Working independently: used to refer to radiation oncology medical physicists who are no longer working under direct supervision, generally characterised by the completion of the ACPSEM Training Education and Accreditation Program or a similar program to become an accredited radiation oncology medical physicist (i.e. no longer considered to be in training).

Executive Summary

On 28th January 2009, the Commonwealth Department of Health and Ageing (DoHA), commissioned a project to:

> ***'undertake a review of the current status and capacity of the three main professions that make up the radiation oncology workforce (radiation oncologists (ROs), radiation therapists (RTs) and radiation oncology medical physicists (ROMPs)) and to identify opportunities for ensuring an adequate supply of a well trained radiation oncology workforce'***

Radiotherapy is an important component of cancer treatment; it increases cure rates, and lessens the suffering of patients and their families. Research has shown that over 52% of cancer patients stand to benefit from the use of radiotherapy at some time during their disease trajectory[1], either for cure or for palliation of advanced disease. As a result of the data collected for the purposes of this project, it is estimated that, in 2008, 38.1% of newly diagnosed cancer patients received radiotherapy treatment indicating that additional service delivery capacity is required to achieve the best practice treatment rate.

A key part of further increasing the capacity to provide radiotherapy services is to ensure that there is an adequate balance between the supply of, and demand for, trained professionals in the key radiotherapy disciplines, being ROs, RTs and ROMPs. DoHA, working with the Radiation Oncology Reform Implementation Committee (RORIC), has recognised that workforce planning is a key tool for addressing the supply demand balance and commissioned this project with objectives to:

- provide information on the current radiation oncology workforce profession numbers and issues affecting radiation oncology service provision in Australia;
- provide a methodology which will ensure reliable workforce planning can be conducted in the future; and
- identify opportunities to address workforce and skills shortages.

Project methodology and any need for change

The project methodology relied heavily on primary data collection. Its principal components were a "facilities' survey" that collected data on equipment, service utilisation and workforce from all radiation oncology facilities operating in Australia in 2008 and a "professions' survey" with three sub-components, one each for ROs, RTs and ROMPs. The facilities' survey was undertaken with the cooperation and support of the state/territory health departments and the private radiation oncology providers. The professions' surveys were undertaken with the cooperation and support of the Royal Australian and New Zealand College of Radiologists (RANZCR) for ROs, the Australian Institute of Radiography (AIR) for RTs, and the Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM) for ROMPs. Another part of the project was the use of case studies which consisted of site visits to 20 radiation oncology facilities (11 public and nine private (one from each ownership group)) around Australia by the project team to collect qualitative data on workforce planning issues.

[1] Delaney G, Jacob S, Featherstone C and Barton M (2005). The role of radiotherapy in cancer treatment: Estimating optimal utilization from a review of evidence-based clinical guidelines. *Cancer,* Volume 104, Issue 6

There was a 100% response rate to the facilities' survey and high levels of cooperation from stakeholders participating in the case study process. The response rates for the professions' surveys were 53.2% for ROs, 50.4% for RTs and 80.1% for ROMPs. On this basis, it is considered that the data generated by the project are suitable as a basis for the five and ten year workforce projections for each of the professional groups. In particular, the 100% response rate for the facilities' survey, which enabled the development of an accurate baseline for the number in the workforce for each professional group, provides an assurance that the results of the workforce projections model are robust and can be used with confidence.

Current radiation oncology workforce and utilisation

By combining the data derived from the facilities' and professions' surveys, Table ES.1 sets out the estimated radiation oncology workforce as at 31st December 2008.

Table ES.1: Radiation oncology qualified and trainee workforce, headcount and FTE by state/territory, 2008

State/Territory all facilities	ROs				RTs				ROMPs			
	Specialists		Registrars		Qualified		PDYs/Trainees		Qualified		Registrars	
	Adjusted Headcount	Reported FTE	Adjusted Headcount	Reported FTE	Adjusted Headcount	Reported FTE	Adjusted Headcount	Reported FTE	Adjusted Headcount	Reported FTE	Adjusted Headcount	Reported FTE
NSW	83	78.9	42	40.3	448	401.6	70	63	77	73.4	30	29.0
Victoria	67	64.4	34	31.9	384	344.8	44	39.4	44	41.4	10	9.6
Queensland	42	39.9	18	16.9	286	256.6	30	27	30	28.9	11	10.5
WA	13	12.5	7	7.0	109	97.3	11	10	14	13.8	2	1.5
SA	14	13.6	5	5.0	96	86.0	11	10	18	17.0	2	2.0
Tasmania	6	5.5	0	0.0	42	37.7	8	7	6	6.0	0	0.0
ACT	6	6.2	2	2.0	36	32.1	3	3	4	3.8	2	1.8
Total	**231**	**220.9**	**108**	**103.1**	**1,401**	**1256.1**	**177**	**159.4**	**193**	**184.2**	**57**	**54.4**

Source: Radiotherapy facilities' survey and professions' surveys, 2009

The surveys have produced estimates of 339 ROs working in Australia (231 specialists and 108 registrars), 1,578 RTs (1,401 qualified and 177 PDYs) and 250 ROMPs (193 qualified and 57 registrars) working in Australia as at 31st December 2008. The study has also produced details of key workforce characteristics such as age and gender profile, working hours, range and mix of professional qualifications, numbers of working professionals recruited from overseas, and working intentions (including retirement intentions). It is vital that the professions' and facilities' surveys be repeated at regular intervals for the purposes of ongoing workforce monitoring, and to allow refinements of the workforce projections model (regular 'snapshots' of the workforce allow longitudinal data to be imputed).

Also, it is clear from this study that there is an ongoing need for information about the utilisation of radiotherapy services in Australia. NSW Health has developed the Radiotherapy Management Information System that has been operational for nearly 20 years which collects data from public and private facilities in that State. DHS Victoria has recently commenced collection of a similar data set for public sector facilities. There do not appear to be similar developments in other states/territories. Given the ongoing need to monitor radiotherapy services, particularly if attainment of the benchmark treatment rate of 52.3% is pursued, a nationally consistent radiotherapy data collection will be required. As a minimum the facilities' survey developed for this project (or near equivalent) could be repeated annually to form the basis of a national data collection.

Current radiation oncology staffing practices

A key component of the project was to analyse radiation oncology staffing practices. Table ES.2 examines staffing practice for ROs, in terms of the number of ROs per linac (as required by the project contract), and the number of new patients per RO (for which the RANZCR promulgates the benchmark of 250 new patients per RO per annum).

Table ES.2: ROs (excluding registrars) workforce ratios by state/territory, Australia, 2008

State/Territory	FTEs	Linacs	No of ROs per linac		New patients	No of new patients per radiation oncologist	
			Average	Median		Average	Median
NSW public	67.0	33	2.1	2.0	10,816	165.4	146.8
Vic public	51.1	23	2.0	2.0	7,633	196.6	159.5
Qld public	23.4	15	1.5	1.6	6,390	292.6	246.7
WA public	5.9	5	1.2	1.2	2,480	420.3	420.3
SA public	6.6	4	1.7	1.7	1,527	231.4	231.4
Tas public	5.5	4	1.4	1.4	1,207	221.3	221.3
ACT public	6.2	3	2.1	2.1	965	155.6	155.6
Total Public	165.6	87	1.9	2.0	**31,018**	**204.5**	**173.0**
Total Private	55.3	43	1.3	1.1	**15,623**	**269.7**	**283.2**
Grand Total	**220.9**	**130**	**1.7**	**1.7**	**46,641**	**230.1**	**214.5**

Source: Radiotherapy facilities' survey, 2009

Table ES.2 illustrates a significant difference in RO staffing practice between the public and private sector. The average number of ROs per linac in the private sector is 1.3, significantly different to the average of 1.9 in the public sector. The difference in the medians (1.1 private and 2.0 public) is even more significant. The data also shows that the median number of new patients seen by full time ROs in the public sector is 173.0 compared to 283.2 in the private sector, a difference of over 100 patients or 63.7%. The private sector figure is above the 250 new patients per annum for an RO promulgated by the RANZCR, whereas in the public sector the median numbers are below the 250 RANZCR figure in every state/territory except WA.

Table ES.3 examines staffing practices for RTs, in terms of the number of RTs per linac, and the number of RTs per linac hour (the Radiation Technology Advisory Panel (RTAP) of the AIR[2] recommends a staffing formula based on 1.06 FTE RTs per linac hour (calculated at the level of a shift), excluding a range of activities (e.g. brachytherapy, treatment planning for a range of radiotherapies and external to facility work (e.g. lecturing students)).

Table ES.3: RTs (excluding PDYs) workforce ratios by state/territory, Australia, 2008

State/Territory	FTE	Linacs	No of RTs per linac		Linac hours	No of RTs per linac hour	
			Average	Median		Average	Median
NSW public	334.0	33	10.2	10.3	65,441	1.13	1.10
Vic public	250.5	23	10.2	10.3	51,723	1.01	0.91
Qld public	179.9	15	11.7	11.9	32,117	1.18	1.17
WA public	51.7	5	10.3	10.3	10,521	1.06	1.06
SA public	39.0	4	9.8	9.8	8,248	1.02	1.02
Tas public	37.7	4	9.4	9.4	8,038	1.01	1.01
ACT public	32.1	3	10.7	10.7	4,893	1.41	1.41
Total Public	924.9	87	10.4	10.3	180,981	1.09	1.08
Total Private	331.3	43	7.5	7.8	86,762	0.85	0.83
Grand Total	**1256.1**	**130**	**9.3**	9.4	**267,743**	**1.00**	**0.97**

Source: Radiotherapy facilities' survey, 2009

[2] Australian Institute of Radiography Radiation Therapy Advisory Panel, July 2001, Radiation Therapy Staffing Model, The Radiographer, Vol 48, No 2, pp.79-83

Table ES.3 reveals that public sector RT staffing levels (average 10.4 RTs per linac) are 38.7% higher than those in the private sector (average 7.5 RTs per linac), which is partly attributable to the fact that the ratio of trainee to qualified RTs is higher in the public sector. It also shows that the national median RTs per linac hour is 0.97, about 8.5% below the RTAP benchmark with the private sector at 0.83 RTs per linac hour (21.7% below RTAP benchmark and the public sector at 1.08 RTs per linac hour (1.9% above RTAP benchmark). It should be noted that these figures are only broadly comparable because the excluded activities in the RTAP benchmark could not be excluded in the facilities' survey data since direct timing them, as recommended by RTAP, was outside project scope. If these times were excluded, the gap between the actual practice ratio and the RTAP benchmarks would be wider.

Table ES.4 examines the staffing practices for ROMPs, in terms of the number of ROMPs per linac (ACPSEM recommends a staffing formula based on 1.7 qualified ROMPs per linac (plus 0.5 registrar/trainee) to model the total ROMP workforce needs in Australia[3]). It shows that, as with ROs and RTs, the private sector adopts a very different staffing model with a median of 1.0 ROMP per linac, compared to 1.5 in the public sector (partly due to the fact that the ratio of trainee to qualified ROMPs is higher in the public sector). The public sector median of 1.6 ROMPs per linac is close to the figure of 1.7 based on the ACPSEM Formula 2000[4], but the private sector median is well below.

Table ES.4: ROMPs (excluding registrars) workforce ratios by state/territory, 2008

State/Territory	FTEs	Linacs	No of medical physicists per linac			
			Average	Lowest	Median	Highest
NSW public	62.1	33	1.8	1.3	1.9	2.5
Vic public	30.4	23	1.2	0.5	1.5	2.0
Qld public	21.5	15	1.5	1.1	1.3	2.3
WA public	8.8	5	1.8	1.8	1.8	1.8
SA public	12.0	4	3.0	3.0	3.0	3.0
Tas public	6.0	4	1.5	1.5	1.5	1.5
ACT public	3.8	3	1.3	1.3	1.3	1.3
Total Public	144.5	87	1.6	0.5	1.5	3.0
Private Sector	39.7	43	1.0	0.5	1.0	2.5
Grand Total	**184.2**	**130**	**1.3**	**0.5**	**1.3**	**3.0**

Source: Radiotherapy facilities' survey, 2009

Overall the data show that for each profession, there is a considerable (estimated) difference between actual staffing practice and the current benchmark recommended by the relevant professional body. There are likely to be a variety of reasons for the differences, some of which may be related to the fact that the benchmarks were developed before much of the currently used radiotherapy technology came into widespread practice. For this reason, given the fact that the workforce ratios are widely used in practice, it is timely to review and redevelop the threshold levels for the existing benchmarks.

The data generated by this study should inform the review process however, use of these data must have regard to the fact that the RO and RT benchmarks for each facility could not be accurately measured. With respect to the RO benchmark, many facilities estimated, rather than measured, the number of new patients. Also, use of the RT benchmark requires direct

[3] Round, W.H. 2007, A survey of the Australasian clinical medical physics and biomedical engineering workforce, Australasian Physical & Engineering Sciences in Medicine; 30(1): 13-24

[4] Oliver, L., Fitchew, R & Drew, J 2001, Requirements for radiation oncology physics in Australia and New Zealand, *Australasian Physical and Engineering Sciences in Medicine*, 24(1): pp. 1-18

timing of excluded tasks (e.g. brachytherapy, SRS and IMRT planning), which was beyond the scope of this study. A review of threshold levels for the current benchmarks will be, at best, of short term value. In the mid-term, better benchmarks are required which are not as simplistic as having the number of linacs or the number of new patients as the denominator.

The study also found key differences exist between the public and private facilities regarding the desired staffing model. For this reason, in the short term, it is better to have separate benchmarks for the public and private sectors until the workload of facilities is more closely aligned. Based on the information gathered in the case studies, it seems that that the patient treatment processes are similar in the two sectors (there may be differences in casemix, which could not be measured in the study as there is no agreed measure of patient complexity), but the teaching, training and research workload is significantly greater in the public sector. Until workload benchmarks are developed that can take these differences into account in the formulae, separate public and private sector thresholds for the existing workforce benchmarks would be most appropriate when considering the number of staff required for a facility.

Methods for projecting the radiation oncology workforce

The 20 case studies of radiation oncology facilities and consultations with other stakeholders identified current approaches to staffing facilities and planning for the future workforce. At the State/Territory Health authority level, workforce planning has been addressed as part of the development of radiotherapy service plans (development of such plans was an initiative that flowed from implementation of the Baume Inquiry). Not all states/territories have completed these plans and not all are in the public domain, but for those that the project team has had the opportunity to review it is clear that there is a propensity, in the public sector, to adopt the RANZCR, AIR and ACPSEM workforce planning benchmarks of 250 new patients per RO, 1.06 RTs per linac hour and 1.7 ROMPS per linac.

Operators of private sector facilities are aware of the professional body benchmarks but based on the information derived from the cases studies, they make little use of them. They set staffing levels based on what they consider financially sustainable given the revenue stream generated from the MBS and patients. The general private sector view was that staffing to the level recommended by the professional bodies was not financially sustainable nor was it desirable. However, representatives of private sector facilities consistently stated that if specific funding to support teaching, training and research activities was provided more staff would be taken on to carry out these activities (hence moving private sector staffing levels closer to the professional body benchmarks).

Ideal radiation oncology workforce and affordability

The project brief requested a determination of “the ‘ideal’ supply of each profession to operate existing linacs, including the basis for determination and an assessment of its affordability”. Determining the ‘ideal’ workforce level normally requires a set of data that reflect a normative or best practice approach to carrying out the work. Typically, the work would be broken down into tasks and the time required to complete each task would be determined (either by direct measurement of a set of actual times leading to the determination of the ‘efficient time’ or by convening a focus group of practitioners to estimate the ‘efficient time’ using a process known as ‘magnitude estimation[5,6]’). ‘Ideal’ staffing levels would then

[5] Hsiao WC, Yntema D, Braun P, Dunn D and Spencer C (1988). Measurement and analysis of intraservice work. *Journal of the American Medical Association*. Vol 260, (16), 2361-2370.

be calculated by measuring the number of times each task needs to be carried out in the radiation oncology facility, multiplying by the time required for each task, and aggregating to obtain total time. However, the study methodology did not provide for either direct timing or magnitude estimation so this methodology could not be followed.

The study only measured actual staffing levels and obtained a range of stakeholder opinion as to what is 'ideal'. It has been found that actual staffing levels vary considerably, as do stakeholder views on the level of staff required to operate a radiation oncology facility. Certainly, it is possible to conclude that the current staffing levels are not 'ideal' as there is widespread agreement that more ROMPs would be recruited if qualified applicants were available. The situation is less clear for the RTs and ROs. The study has determined that, apart from problems in recruiting to some regional areas, overall, there is no current shortage of ROs and RTs (given current radiotherapy treatment rates). This does not, however, mean that the current RO and RT workforce is 'ideal', there may be other reasons (e.g. available funds) that better account for staffing levels.

It is also considered that the benchmarks promulgated by the professional bodies do not reflect 'ideal' staffing levels (even though they are often used as a reference point in the public sector). The benchmarks are out-of-date. For the RT and ROMP benchmarks, the project team reviewed the supporting papers which revealed that the threshold levels reflect radiotherapy practice in the late 1990's. Consequently, the RT and ROMP benchmarks are not considered to represent the 'ideal' workforce levels. Despite repeated attempts through liaison with RANZCR, a paper describing the basis for the RO benchmark could not be found. However, it is also considered that the benchmark is out-of-date and stakeholder opinion is that it certainly does not reflect the additional work required of a RO as a result of the introduction of a range of therapies that require much more sophisticated treatment planning.

To address this problem, a comprehensive review of workforce benchmarks is needed. This review would start by developing casemix adjusted measures of workloads that can be used in the benchmarks. Due to the emergence of brachytherapy (not linac based) as a treatment modality, and the wider range of radiotherapy delivery methods on the linacs (with their associated differences in workload), simple benchmarks that use linacs (undifferentiated) as the denominator are not adequate. Given the systematic differences in staffing practices between the public and private sector for all three professional groups, any future analysis of workforce needs to be based on benchmarks that reflect the mix of work, as well as patient and treatment complexity in the two sectors (otherwise different thresholds need to be developed for the two sectors, as has been suggested in the short term).

The project objectives also required investigation of the issue of 'affordability' of the 'ideal' staffing models. The question of affordability cannot be addressed without an assessment of capacity to pay, which was not provided for in the project methodology. In the public sector affordability can be interpreted as the capacity of governments to invest in radiotherapy services relative to the other potential uses of public monies. By definition, the current staffing models are affordable because they are funded. However, for the reasons already discussed, the current staffing levels are not considered to be 'ideal'. Also the current staffing levels result in a treatment rate of 38.1% whereas the project brief states that 'RORIC has established that 52% of cancer patients will need and/or benefit from radiotherapy and that

[6] National Centre for Classification in Health (2000). Review of the literature on relative values carried out by NCCH in 1998 to inform the PRS. Resource material C. Prepared for Medicare Schedule Review Board.

about a quarter of these patients are not accessing treatment within the recommended timeframes'. The workforce modelling provides information on the staffing numbers that would be required to deliver a 52.3% treatment rate, but governments will need to determine whether these staffing levels are affordable.

In the private sector, affordability can be measured by the capacity of the facility to hire staff to provide quality services whilst generating a commercial return for shareholders. Currently, this equation results in lower staffing levels for private radiotherapy facilities relative to public. Based on data derived from the facilities' survey these staffing levels, in turn, result in a lower capacity of private services to bear the teaching, training and research workload. Again, the current private sector staffing levels are 'affordable', but they are not considered 'ideal'. A full costing study of radiotherapy services would be required to determine what is possible in terms of the mix of treatment services, teaching, training and research that can be sustained at a given level of revenue for private facilities. The revenue level is a matter for both government (through setting the MBS fee) and private providers (through policies on co-payments, and required rate of return on investment). It is important to note that such a costing study could also be used to develop casemix adjusted measures of workload.

Current radiation oncology workforce vacancies

The facilities' survey asked the respective heads of ROs, RTs and ROMPs for data on vacancy rates. Table ES.5 presents the data showing a 4.5% vacancy rate for ROs, 1.8% for RTs and 13.7% for ROMPS. In all three professions, vacancy rates are higher in the public sector than the private sector.

Table ES.5: Radiation oncology workforce (ex trainees) vacancies by state/territory, 31st December 2008

State/Territory	ROs		RTs		ROMPs	
	Average FTE	Vacancy Rate	Average FTE	Vacancy Rate	Average FTE	Vacancy Rate
NSW public	67.0	1.6%	334.0	3.9%	62.1	8.8%
Vic public	51.1	6.8%	250.5	0.1%	30.4	6.3%
Qld public	23.4	11.2%	179.9	3.1%	21.5	21.6%
WA public	5.9	15.6%	51.7	0.0%	8.8	36.4%
SA public	6.6	14.1%	39.0	0.0%	12.0	29.4%
Tas public	5.5	0.0%	37.7	0.0%	6.0	0.0%
ACT public	6.2	0.0%	32.1	0.0%	3.8	25.0%
Total Public	165.6	5.5%	924.9	2.1%	144.5	14.6%
Private Sector	55.3	1.8%	331.3	1.0%	39.7	10.3%
Grand Total	**220.9**	**4.5%**	**1256.1**	**1.8%**	**184.2**	**13.7%**

Source: Radiotherapy facilities' survey, 2009

Overall, the vacancy rates for ROs and RTs reflect natural turnover in the workforce (the RT vacancy rate reflects a very tight employment market). These measurements are consistent with the qualitative information that consistently highlighted that there was very little difficulty in recruiting to RO and RT positions (there were some exceptions to this general rule in regional areas). It was identified through the professions' surveys that there were qualified ROs and RTs looking for work in Australia. However for ROMPS, the vacancy rate reflects a workforce shortage, a finding that is consistent with information provided by stakeholders who highlighted difficulties in recruiting qualified ROMPs to vacant positions.

In all three professional groups, the number of vacant positions is an indicator of unmet workforce demand. It is also the case that the number of vacant positions may reflect the availability of funds, and it might be that more positions are required but there are no funds to allow recruitment. Anecdotally, feedback from case study site visits supports the claim that funding shortages, rather than the lack of need, restrict the number of positions. However, the impact of funding shortages cannot be determined using the study methodology. The study has shown that current staffing levels are below the benchmarks promulgated by the AIR and ACPSEM, but consistent with the benchmarks promulgated by RANZCR. However, these benchmarks are not considered to represent the 'ideal' level of workforce.

Impact of new technologies on workforce

The consultative process identified that radiotherapy practice is changing rapidly with new technologies regularly emerging. Professionals were asked to provide an opinion on the impact of new technologies on their work in response to the question 'estimate in percentage terms, ignoring the short term impact that is typically associated with professionals learning and becoming proficient in a new technology', the ongoing impact of a range of technologies on workload. Table ES.6 sets out the responses in terms of the proportion of respondents that commented on a particular technology and the impact on workload they reported. Note that the question specifically asked respondents to answer only if they had 'direct experience in working with the specified technology'.

Table ES.6: Assessment by radiation oncology workforce (ex trainees) of technology impact on workload

Technology	ROs		RTs		ROMPs	
	% reporting increase	Average increase	% reporting increase	Average increase	% reporting increase	Average increase
Intensity Modulated Radiotherapy (IMRT)	64.0%	14.3%	61.5%	16.4%	82.4%	15.5%
Brachytherapy – HDR	42.0%	13.0%	21.3%	13.0%	65.7%	14.7%
Brachytherapy – LDR	18.9%	15.0%	8.9%	9.2%	20.7%	8.8%
Brachytherapy – seed	31.1%	16.8%	17.5%	14.0%	56.9%	15.5%
Modulated arc therapy	17.3%	7.1%	13.9%	12.5%	47.1%	9.4%
Stereotactic radiosurgery/radiotherapy	25.5%	13.0%	21.7%	10.9%	55.3%	11.2%
Image fusion for treatment planning	73.6%	11.3%	78.0%	10.8%	70.5%	6.4%
Treatment verification imaging	61.1%	10.8%	82.8%	15.9%	81.6%	9.5%
Gated delivery	9.8%	9.0%	25.1%	11.5%	37.1%	6.9%
Four-dimensional computerised tomography	20.0%	9.0%	32.2%	13.4%	37.1%	7.3%
Adaptive planning and treatment (including IGRT)	46.3%	11.0%	64.5%	14.9%	66.7%	10.6%

Source: ROs, RTs and ROMPs professions surveys, 2009

Table ES.6 shows that 'intensity modulated radiotherapy (IMRT)', 'image fusion for treatment planning', 'treatment verification imaging' and 'adaptive planning and treatment' were consistently reported by large proportions of each professional group as generating an increased workload. The average reported impacts were almost uniformly reported as being between 10% and 15% increase in hours (i.e. 10% to 15% more hours would be required to treat the same number of patients). These data are difficult to interpret, particularly as the rate of penetration of the new technologies is unknown.

However, it seems clear that the more frequent and sophisticated use of technology (particularly imaging technology) in radiotherapy will impact on workload. The most common stakeholder view was that technology advances increase the workload of the three professions, particularly with regard to increases in non patient contact time i.e. planning and quality assurance processes required to treat patients. The amount of the increase is too difficult to determine with any confidence, as is the extent of any counter-balancing savings from other technologies (e.g. paperless medical records) or changes to work practices. Compensating changes in work practice and/or time saving technologies need to be explored so as to ensure that a severe workforce shortage does not emerge (particularly for ROMPs).

The potential impact of technology is so significant that a further detailed study is warranted. There is a history of such studies in radiation oncology, for example the establishment and evaluation of trials of facilities with a single machine. Similar studies could be set up to evaluate the impact on workload of the various emerging radiotherapy technologies. Such studies could be at multiple sites and there could be a bias to involving facilities in regional areas to provide an opportunity for staff to participate in research and development activities. As necessary and appropriate the studies could have a broader focus, and include evaluation of treatment outcomes (not a pre-requisite as studying workload impact alone would be challenging, particularly establishing suitable baseline measures).

Impact of new service models on workforce

The case studies also examined the issue of the role of radiotherapy in cancer treatment and how it might change over time. The majority stakeholder view was that radiotherapy would continue to be an important component of cancer treatment and care. The pace of evolution in clinical practice will determine the future role of radiotherapy in cancer treatment but, based on the consultations carried out for this study, the goal of 52.3% of cancer patients receiving radiotherapy treatment for either curative or palliative purposes at some stage in their cancer journey remains relevant and should guide the development of radiotherapy facilities and workforce for at least the next five years.

At the level of individual cancers, stakeholders cited the reduced incidence of gynaecological cancers as a factor that may reduce radiotherapy workload and the increased detection and treatment of prostate cancer was cited as a factor that could increase workload. There is insufficient evidence to determine whether there will be a net effect, but stakeholders consistently advised the number of patients needing radiotherapy treatment will not decrease (either in absolute terms or as a proportion of patients diagnosed with cancer). Newer service model developments such as intra-operative radiotherapy (one dose applied intra-operatively as substitute for a course applied over 20 fractions) and hypo-fractionation (larger doses in each fraction, thereby reducing the number of fractions) were seen as potential sources of workload reductions but it is too early to be definitive about potential workforce impact. These developments should be monitored.

Short-term workforce required to support new facilities

There are two aspects to considering the workforce situation going forward. The first is the short term situation, which is best examined by projecting the workforce requirements by profession based on the estimated number of linacs that will be commissioned (drawn from the information provided by stakeholders). Table ES.7 presents the workforce requirements by sector based on the medians of the distributions derived from the facilities' survey of ROs per linac, RTs per linac, and ROMPs per linac calculated separately for the public and private sectors and then totalled. It should be noted that this analysis is based on current staffing practice, which is not considered to be 'ideal', particularly in the case of ROMPs.

Table ES.7: Radiation oncology workforce required (FTE) to additional staff linacs 2009 -2014

Sector	2009	2010	2011	2012	2013	2014
Public						
- linacs	7	6	5	7	3	2
- ROs (2.0 per linac)	14.0	12.0	10.0	14.0	6.0	4.0
- RTs ((10.3 per linac)	72.1	61.8	51.5	72.1	30.9	20.6
- ROMPs (1.5 per linac)	10.5	9	7.5	10.5	4.5	3
Private						
- linacs	5	6	5	2	6	0
- ROs (1.1 per linac)	5.5	6.6	5.5	2.2	6.6	0
- RTs (7.8 per linac)	39.0	46.8	39.0	15.6	46.8	0
- ROMPs (1.0 per linac)	5.0	6	5	2	6	0
Total						
- linacs	12	12	10	9	9	2
- ROs	19.5	18.6	15.5	16.2	12.6	4
- RTs	111.1	108.6	90.5	87.7	77.7	20.6
- ROMPs	15.5	15	12.5	12.5	10.5	3

Source: Radiotherapy facilities' survey and stakeholder consultations, 2009

Using this approach, Table ES.7 shows that significant growth in the workforce will be required over the next six years. Note that the nature of this analysis, given that the number of linacs beyond 2011 is very uncertain, is that only the years 2009, 2010 and 2011 should be considered in any detail. To put this growth into context Table ES.8 matches the projected need for the radiotherapy workforce by discipline against the expected supply, based on the current workforce planning parameters (note that these data do not come from the workforce projections model (it is not possible to do so, as due to small numbers in each profession, the model results are only robust at five year intervals, single year forecasts are not meaningful)). Rather, the workforce supply figures are derived from a simple extrapolation of the data obtained from the profession's surveys which predict net growth of 10.5 ROs per year (see section 6.4), 92.5 RTs per year (see section 7.4) and 4.5 ROMPs per year (see section 8.4).

Table ES.8: Radiation oncology workforce supply and demand 2009 - 2014

Profession	2009	2010	2011	2012	2013	2014
ROs						
- net growth	10.5	10.5	10.5	10.5	10.5	10.5
- required	19.5	18.6	15.5	16.2	12.6	4
Surplus (deficit)	(9.0)	(7.1)	(5.5)	(5.7)	(2.1)	6.5
RTs						
- net growth	92.5	92.5	92.5	92.5	92.5	92.5
- required	111.1	108.6	90.5	87.7	77.7	20.6
Surplus (deficit)	(18.6)	(16.1)	2.5	4.8	14.8	71.9
- ROMPs						
- net growth	4.5	4.5	4.5	4.5	4.5	4.5
- required	15.5	15	12.5	12.5	10.5	3
Surplus (deficit)	(11.0)	(10.5)	(8.5)	(8.5)	(6.0)	1.5

Source: Radiotherapy facilities' and professions' surveys, and stakeholder consultations, 2009

Review of Table ES.8 suggests that there will be significant workforce shortages for ROMPs (consistent with all the other analyses in this report) and smaller shortages for ROs and RTs based on current practice and workforce flows. In interpreting the data it must be noted that the linac acquisition schedule (Table ES.7) is based in information reported by stakeholders, therefore it may be somewhat optimistic. Linacs usually take longer to acquire and commission than is predicted, so with only relatively small delays to the acquisition schedule the shortfalls in respect of ROs and RTs could be fairly easily managed (particularly for RTs, where there are currently qualified staff looking for work). Notwithstanding this initial conclusion Table ES.8 should be interpreted cautiously, as there has been no attempt to project linacs (the linacs shown are those advised to the project team by stakeholders).

Workforce projections model

The detailed workforce projections model allows a comparison of supply and demand for all three professions, taking account of the current age profile of the workforce, expected new entrants, and estimated attrition rates. Table ES.9 summarises the supply side projections for ROs, RTs and ROMPs using the base workforce planning model.

Table ES.9: Workforce supply projections by profession using the base model

Profession	2009	2014				2019			
	Supply	Entrants	Attrition	Growth	Supply	Entrants	Attrition	Growth	Supply
RO	339	105	13	92	431	105	41	64	495
RT	1,578	746	490	256	1,836	776	440	336	2,171
ROMP	250	97	28	69	319	97	19	78	396

Note: figures may not sum due to rounding

Review of the data highlights that there is a significant problem with attrition of RTs. The numbers projected to leave the profession are extremely high, and the professions' survey data show that the great majority are not leaving due to retirement, but due to a decision to pursue an alternative career. This situation is similar to that reported for the UK where a four tier skills mix model was developed and work was carried out to improve the training experience to reduce the high attrition rates for RTs. Similar work is required in Australia to develop strategies for making RT careers more attractive, otherwise the high attrition rates will continue and the benefits of investing in training additional RTs will be diminished.

Anecdotally, on a related matter, representatives of the relevant Universities advised that student numbers in radiation therapy courses have decreased and dropout rates from the same courses have increased because student RTs perceive that there is considerable difficulty in finding employment and/or dissatisfaction with the opportunities afforded by career as an RT. Again, this situation needs to be closely examined to ensure that there is an appropriate return on the investment in training RTs. There would be value in surveying students who have recently withdrawn from RT courses to determine their reasons and to formulate strategies for limiting the attrition rates.

The supply of the workforce can be best put into context by comparing with demand. Table ES.10 compares the workforce supply projections with demand projections for the best practice treatment rate (52.3% as in the base model), a treatment rate of 45.0% (i.e. move towards best practice) and the current treatment rate (38.1%). New facilities were not used as a demand indicator in the workforce projections model because it is impossible to be definitive about how many there will be in the 10 year projection period. Also, capacity can be increased by adding facilities or by working the equipment in existing facilities harder (e.g. by using shift work). For the purposes of workforce planning the difference in approach is not important, all that needs to be forecast is how many staff are needed to deliver services to the required number of patients.

Table ES.10: Workforce supply and demand by profession based at 52.3% and 38.1% treatment rates

Profession	2014							2019						
	Supply	Treatment rate						Supply	Treatment rate					
		52.3%		45.0%		38.1%			52.3%		45.0%		38.1%	
		Demand	Diff	Demand	Diff	Demand	Diff		Demand	Diff	Demand	Diff	Demand	Diff
RO	431	540	-109	467	-36	398	34	495	610	-115	527	-31	448	47
RT	1,836	2,447	-612	2,105	-270	1,781	53	2,171	2,764	-593	2,377	-206	2,011	159
ROMP	319	423	-104	369	-50	318	1	396	474	-78	413	-17	355	41

Note: figures may not sum due to rounding

Review of the data shows that there will be very large workforce shortages in all three professions relative to what is required to attain the 52.3% best practice treatment rate in five and 10 years time. Even if an interim target treatment rate of 45.0% is adopted, there will still be considerable shortages at five years with the situation improving at 10 years. By way of comparison, at the current treatment rate of 38.1%, only the ROMPs present a problem at five years, and there should be no shortages at 10 years. Note that the 38.1% treatment rate scenario is somewhat artificial, as based on what is happening with RTs at present, training in the professions will become unattractive if no jobs are available so student numbers and hence workforce supply will reduce. The real issue is to put in place strategies to ensure that the projected shortfalls relative to the desired benchmark treatment rate are ameliorated.

It is most important to ensure that the supply side training issue is addressed. The base model assumes 21 new RO registrars, 155 new RT PDYs and 15 new ROMP registrars per year. There must be sufficient training positions to support at least this level of entry into the workforce. However, Table ES.10 shows that even at these levels there will be considerable shortages in all professions at 2014 and 2019 at benchmark treatment rate (52.3%) and also at 45.0% treatment rate. To generate the workforce required to achieve the 52.3% treatment rate in 10 years annual targets of 32 new RO registrars, 205 new RT PDYs and 23 new ROMP registrars should be adopted. If the aim is to achieve a treatment rate of 45.0% in ten years then annual targets of 24 new RO registrars, 175 new RT PDYs and 17 new ROMP registrars should be adopted to generate the required workforce. These targets assume that there will be no significant change in net overseas migration.

Related targets will need to be adopted for graduates from radiation therapy and medical physics programs to ensure that there are sufficient graduates to fill the vocational training places. There should be few problems for ROs as medical school intakes have already been increased in Australia and additional medical graduates are expected annually from 2011 onwards, thereby provided a source for filling the extra radiation oncology registrar positions. To generate the graduates to fill the vocational training positions required to achieve the 52.3% treatment rate in 10 years annual targets of 250 radiation therapy students and 70 medical physics students. If the aim is to achieve a treatment rate of 45.0% in ten years then annual targets of 210 radiation therapy students and 52 medical physics students should be adopted to generate the graduates necessary to fill the vocational training positions.

It should be noted that the shortages forecast above are based on current staffing practices, which are not considered 'ideal'. Also, any workload increase generated by new technology has not been taken into account. Inclusion of these factors would only make what are predicted to be severe workforce shortages even more severe. While current staffing practice may suffice in the short term, it must change as a result of the development of better workforce benchmarks (as has been suggested). The problem is most acute for ROMPs where current staffing practice appears to be inadequate to keep pace with the required work. The gap will only widen as new and more complicated technologies are introduced into radiotherapy service delivery. Thus, the suggested studies of technology impact on workload would also provide an important input into the workforce planning process.

Workforce development initiatives

The workforce planning model demonstrates that there will be significant workforce shortages of ROs, RTs and ROMPs if an increase in the radiotherapy treatment beyond the current level of 38.1% is pursued. The position is best illustrated by the prediction that, if the current workforce planning parameters are maintained, Australia will be 109 ROs, 612 RTs and 104 ROMPs short of achieving the 52.3% treatment rate in 2014, with no significant improvement in the situation by 2019. Should the lower treatment rate of 45.0% be adopted as the target, Australia will still be 36 ROs, 270 RTs and 50 ROMPs short in 2014 based on the current workforce planning parameters. Immediate action on workforce development is required if any increase in treatment rate is to be achieved within a reasonable time period.

The case study process and discussions with other stakeholders identified a range of existing workforce development initiatives that have been successful in alleviating the shortages identified by the Baume Inquiry in ROs and RTs and less successful in respect of ROMPs. Many of these initiatives should be continued, however new initiatives are required to generate the workforce necessary to increase the radiotherapy treatment rate. Table ES.11 summarises the issues, the strategies used to address them to date, and the opportunities to take further action. To facilitate consideration of implementation actions, opportunities are grouped into short-term and mid-term.

Of the initiatives identified in Table ES.11, it is most important to carry forward the opportunities that sustain and expand the existing vocational training infrastructure, as additional ROs, RTs and ROMPS will need to be trained every year to increase the radiotherapy treatment rate. Currently, much of the funding for vocational training positions for RT PDYs and ROMP registrars is short term (i.e. non-recurrent). Recurrent funding for training positions would assist in ensuring that there will be an appropriate number of RTs and ROMPs (much of the funding for medical registrar positions in the public sector is already recurrent; funding of medical registrar positions in the private sector should be further explored) to deliver radiotherapy services at the required rate in the future.

An important part of the vocational training infrastructure is support positions such as clinical placement coordinators, tutors/educators, and preceptors. Funding for these positions has been provided by the Commonwealth and state/territory health authorities. This funding should continue. Similarly, DoHA has provided funding to support universities to attract students to programs in radiation therapy. The results of the workforce projections model demonstrate that it is important that these student numbers be maintained so this support should also continue.

Notwithstanding the suggested investment in training positions and related infrastructure, the workforce planning model shows that there will be a continuing requirement for recruitment of ROMPs from overseas at the current level or greater for at least five years. Accordingly the overseas recruitment process should be investigated and arrangements made to ensure that ROMPs are allocated the highest priority for obtaining working visas so that any unnecessary delays in overseas qualified ROMPs taking up positions in Australia are eliminated.

Table ES.11: Workforce development initiatives identified through case study process and opportunities for further development

Workforce issue	Application							Existing workforce development strategies	Workforce development opportunity	
	Profession			Pub facilities		Priv facilities				
	RO	RT	ROMP	Metro	Reg	Metro	Reg		Short term	Mid term
Working hours		X	X	X	X	X	X	Most employers public and private offer a range of flexible working arrangements including nine day working fortnight (RTs); time off in lieu of additional hours worked; access to overtime payments; access to part time work; maternity leave; and access to leave without pay (e.g. to pursue overseas work).	Facilities to continue with local initiatives that best meet needs, no need for system level action.	
Remuneration		X	X	X	X	X	X	Many employers have modified standard remuneration arrangements to attract and retain qualified RTs and ROMPs. In a number of cases (e.g. ROMPs in NSW) there have been significant salary increases. In other cases, public sector remuneration arrangements have included special allowances or retention payments to allow employers to compete at market rates for labour. In the private sector many employers routinely offer a pre-determined add-on to the local public sector award remuneration package to attract and retain staff.	Jurisdictions to consider reviewing relevant Awards with the objective of moving towards national parity of pay and conditions for ROMPs across Australia.	Consider the development of nationally consistent pay and conditions for RTs and ROMPs.
Overseas recruitment			X	X	X	X	X	Many employers have looked overseas to find qualified staff to fill positions, historically for ROs, RTs and ROMPs but currently mainly for ROMPs. Overseas applicants have been offered support by way of funding for travel to Australia to assess the working environment. Many stakeholders made the point that immigration requirements make the process of recruiting from overseas slow and often frustrating.	Change immigration requirements to allocate the highest entry priority level to qualified ROMPs who wish to work in Australia	
Vocational training program for ROMPs			X	X	X	X	X	The Commonwealth government, some state/territory health authorities and ACPSEM worked together to develop the TEAP program, that has provided structured vocational training for ROMPs. This program, which is widely regarded as having been successful, has created a clear pathway for ROMPs to enter and progress through the workforce.	Continue development of TEAP	Review length of the TEAP for candidates who hold Masters or PhD level qualifications in physics, but not medical physics
Vocational training positions		X	X	X	X	X	X	The Commonwealth government has provided support for funding (part salary) PDY trainee positions for RTs and registrar positions for ROMPs. A number of state/territory health authorities have directly matched this funding (i.e. separate to the budget allocated to the radiotherapy facility). Also, many private facilities have supplemented the Commonwealth funding to take on trainees.	Continue existing funding of vocational training positions;	Imbed funding of vocational training positions into budgets of public facilities. Consider further funding to support vocational training positions in private facilities
Vocational training and continuing education infrastructure	X	X	X	X	X	X	X	The Commonwealth government and often the state/territory health authorities have provided funding for positions such as clinical placement coordinators, tutors/educators, and preceptors, to put in place staffing infrastructure that allows effective vocational training and support for education.	Continue and extend funding (to reflect the additional vocational training support infrastructure that will be required to increase radiotherapy treatment rate) for positions that support vocational training and continuing education.	

Workforce issue	Application							Existing workforce development strategies	Workforce development opportunity	
	Profession			Pub facilities		Priv facilities				
	RO	RT	ROMP	Metro	Reg	Metro	Reg		Short term	Mid term
Role of private sector in vocational training	X	X	X			X	X	Some private facilities have pursued opportunities to become more involved in training ROs, RTs and ROMPs, but there have been barriers in terms of the requirements of existing training programs and the need for financial support.	Review existing training programs to identify (and remove as appropriate) any barriers to more ROs, RTs and ROMPs being trained in the private sector	Review of the MB and assess the need to take into account CPD, research and other costs to provide and incentive for private facilities to offer these opportunities.
Access to professional development opportunities		X	X	X	X	X	X	Many employers, public and private have provided staff with access to professional development opportunities including attendance at national and international conferences. In the Victorian public sector, a professional development allowance is paid on top of salary, which can be accessed for any purpose. More commonly in the public and private sector a professional development allowance is available to employees to attend an overseas conference.	Facilities to continue with local initiatives (consistent with jurisdictional requirements in the public sector) that best meet needs, no need for system level action.	
Access to opportunities to work conduct research and development work	X	X	X	X	X	X	X	Many employers (public and private) seek to provide staff with opportunities undertake research and development work opportunities, although in practical terms, research seems to take place more often in public sector facilities	Pursue suggested studies of the impact of emerging technologies on workload.	
Access to opportunities to develop and apply skills in emerging technologies	X	X	X	X	X	X	X	Many employers (public and private) aim to provide staff with opportunities to train on and use the latest available radiotherapy technologies as a method of attracting and retaining them. Nonetheless, professionals in all disciplines often expressed concern about the pace of adoption of new radiotherapy technologies relative to overseas countries.		Consider the barriers to the adoption of new radiotherapy technologies in Australian and, as may be appropriate, and develop strategies for overcoming them.
Career progression opportunities		X	X	X	X	X	X	The professional bodies, particularly for RTs and ROMPs, have been examining role substitution and sub-specialisation (practitioner roles) opportunities in order to make RT and ROMP careers more attractive and satisfying.	Undertake a review of the role of the RT in Australia and consider adopting the UK model to enhance job satisfaction of the Australian workforce	
Professional isolation in regional facilities	X	X	X		X		X	Some attempts at networking regional and metropolitan services to provide collegial and backfill support were identified, but these were at an early stage of development.	Further develop cancer service networks that include regional and metropolitan radiotherapy services.	Consider a program to that funds short term rotation of regional radiotherapy service staff into metropolitan centres
Support for undergraduate and postgraduate programs		X	X					The Commonwealth government and often the state/territory health authorities have provided funding to, and worked with, the universities to support the provision of undergraduate and postgraduate courses in radiation therapy. These initiatives have resulted in an increased flow of graduates in the discipline	Continue support to Universities, as significantly increased graduate numbers will be required to generate the workforce to increase the radiotherapy treatment rate.	
Lack of awareness of professions	X	X	X					Some employers are taking initiatives to make school students more aware of the career opportunities in radiation oncology. In Victoria, basic medical physics has been introduced into the year 11 curriculum as an elective with a view to generating interest in a career in medical physics.	Consider national campaign to raise the awareness of the three key professions involved in delivery of radiation oncology services	

A range of other short-term (pursuit within six months) workforce development opportunities are identified in Table ES.11. These opportunities include moving towards closer alignment of pay and conditions for ROMPs across Australia, the continued development of the ACPSEM TEAP, the further development of regional/metropolitan cancer services networks to address the issue of professional isolation of practitioners in regional facilities, and the conduct of a national campaign to promote the attractiveness of radiation oncologist, radiation therapist and radiation oncology medical physicist careers.

Table ES.11 also identifies a range of workforce development opportunities that should be pursued in the mid-term (between six months and two years). These opportunities include the development of nationally consistent pay and conditions for RTs and ROMPs; a review of the length of the ACPSEM TEAP for candidates who already hold Masters or PhD level qualifications in physics but not medical physics; a review the radiation oncology items in the MBS to assess the need to take into account CPD research and other costs to provide incentives for private facilities to offer these opportunities, a consideration of the barriers to the adoption of new radiotherapy technologies in Australia and, as may be appropriate, development of strategies for overcoming them; and a consideration of a program that funds short term rotation of regional radiotherapy staff into metropolitan centres.

Implementation actions

It is important to pursue all the opportunities identified in this project to prevent a recurrence of the workforce shortages in ROs and RTs experienced earlier this decade and to address the current shortage of medical physicists. There are significant risks if no action is taken. Not only will Australia's radiotherapy treatment rate stagnate at round 38%, but careers in the radiation oncology disciplines will become less attractive as the potential student perceive that employment on graduation is difficult to obtain, thereby causing a return to workforce shortages for RTs and ROMPs even at the 38% treatment rate. According to the information gained from the case study process, a significant number of new facilities, and additional linacs in existing facilities, are being planned so the current workforce planning parameters must be changed to ensure there are qualified staff available to operate these new services.

Pursuit of an increase in the radiotherapy treatment rate to the 52.3% benchmark will require very significant action. The workforce planning model predicts that an additional 11 ROs (50% increase on current numbers), 205 RTs (33% increase on current number and 23 ROMPs (50% increase on current number) are needed each year for 10 years to produce sufficient qualified staff to treat 52.3% of new cancer patients with radiotherapy in 2019. So even with a very aggressive investment in training (i.e. training 50% more ROs and ROMPs and 33% more RTs each year) it will take 10 years to attain the desired treatment rate. Implementing the opportunities for workforce development identified in this project, which have classified into priority groups in the List of Opportunities, is the key to moving forward.

Finally, as with any workforce planning study of this magnitude conducted at a point in time, it is important to maintain the currency of the underlying information. Repetition of the facilities' and professions' surveys at regular intervals has been proposed as an opportunity to monitor changes in workforce characteristics. Repetition, in full, of this radiation oncology workforce planning study in 2012 is also proposed as an opportunity to reset the planning parameters having regard to the evolution of radiotherapy services and the associated workforce in the intervening period.

List of opportunities for workforce development

Priority Immediate – Action to commence within three months

O11: Closely monitor the pace of development and commissioning of new facilities over the next three years to ensure that there are sufficient ROs, RTs and, in particular, ROMPs to staff the new facilities.

O12: Undertake a study of the reasons for the high attrition rates from the RT profession. The study should examine the career progression opportunities for RTs and develop strategies for how they might be improved. The UK work on developing the four tier skills mix model for RTs should be used as a reference.

O13: Undertake a study of RT students to determine the reasons for the high drop-out rate from university training programs. The study should formulate strategies for reducing the attrition rates.

O14: Adopt targets of 32 new RO registrars, 205 new RT PDYs and 23 new ROMP registrars for each of the next ten years if the aim is to achieve a 52.3% treatment rate in 2019 or targets of 24 new RO registrars, 175 new RT PDYs and 17 new ROMP registrars for each of the next ten years if the aim is to achieve a 45.0% treatment rate in 2019.

O15 Adopt targets of 250 new radiation therapy students and 70 new medical physics students (masters level) for each of the next ten years, if the aim is achieve a 52.3% treatment rate or 210 new radiation therapy students and 52 medical physics students for each of the next ten years if the aim is to achieve a 45.0% treatment rate, allowing for the fact that not all students will graduate and not all will pursue careers in radiation oncology services in Australia.

O18: Continue to sustain the vocational training support infrastructure by DoHA and state/territory health authorities funding positions such as clinical placement coordinators, tutors/educators, and preceptors in radiation oncology facilities.

O19: Attract additional students to radiation therapy and medical physics programs by DoHA continuing to provide funding support to Universities offering radiation therapy and medical physicist undergraduate and postgraduate programs.

O20: Examine the overseas recruitment process for ROMPs and make arrangements to ensure that ROMPs are allocated the highest priority for obtaining working visas so that any unnecessary delays in overseas qualified ROMPs taking up positions in Australia are eliminated.

Priority Short-term – Action to commence within six months

O3: Review, in the short term, the current threshold levels for the existing widely used workforce benchmarks (new patients per RO, RTs per linac hour, and ROMPs per linac) and reset them, as necessary, to make them relevant to current practice.

O4: Develop, in the short term, separate public and private sector threshold levels for the existing widely used workforce benchmarks (new patients per RO, RTs per linac hour, and ROMPs per linac), pending the development of new benchmarks that take account of the differences in service delivery (casemix), teaching, training and research workloads in the two sectors.

O5: Review the role of the private sector in teaching, training and research activities relating to radiation oncology services and assess the need for a specific source of funds (in addition to current Commonwealth and state/territory government initiatives to partly fund RT PDY and ROMP registrar positions) to support further private sector participation in teaching training and research work.

O8: Establish studies to evaluate the impact of emerging imaging technologies on workload, initially focusing on 'IMRT', 'image fusion for treatment planning', 'treatment verification imaging', and 'adaptive planning and treatment'.

O9: Include a significant number of regional radiotherapy services in the 'impact of emerging technologies on workload studies' to provide an additional opportunity for staff of these services to be involved in research and development activities.

O16: Imbed the funding for vocational training positions for RT PDYs and ROMP registrars into the staffing structures of public radiotherapy facilities. The current situation where most funding for PDYs and ROMP registrars is provided on a limited term basis creates uncertainty, and given that there will be a continuing need to vocationally train RTs and ROMPs, recurrent funding would provide facilities with a better opportunity to manage and plan their workforce.

O17: Determine, through a process of DoHA working with state/territory health authorities, how best to support the private sector to participate in vocational training for ROs, RTs and ROMPs having regard to the current, largely Commonwealth government funded initiatives (see related opportunity 5).

O21: Pursue, in the short term (within six months), the further development of the radiation oncology workforce by:

- **jurisdictions reviewing relevant Awards with the objective of moving towards national parity of pay and conditions for ROMPs across Australia;**
- **continuing the development of the ACPSEM TEAP;**
- **further developing regional/metropolitan cancer services networks to address the issue of professional isolation of practitioners in regional facilities; and**
- **conducting a national campaign to promote careers as radiation oncologists, radiation therapists and radiation oncology medical physicists.**

Priority Mid-term – Action to commence within six months to two years

O1: Repeat the professions' surveys at least every two years by working with the relevant professional bodies.

O2: Repeat the facilities' survey annually and consolidate the results as the basis of a national radiotherapy services data collection.

O6: Develop new workforce benchmarks ratios for ROs, RTs and ROMPs that incorporate a casemix adjusted measure of workload in the denominator which reflects both patient and treatment complexity.

O7: Undertake a full costing study of radiation oncology services to develop a better basis for measuring radiation oncology services workload, which can be used to design revised workforce benchmarks; and to develop a better understanding of the need and basis for funding services.

O10: Monitor developments in radiotherapy service delivery models such as hypo-fractionation and intra-operative radiotherapy to determine their impact on workload and hence the required workforce.

O22: Pursue, in the mid-term (between six months and two years), the further development of the radiation oncology workforce by:

- **developing nationally consistent pay and conditions for RTs and ROMPs;**
- **reviewing the length of the ACPSEM TEAP program for candidates who hold Masters or PhD level qualifications in physics but not medical physics;**
- **reviewing the radiation oncology items in the MBS and assessing the need to take into account CPD, research and other costs to provide incentives for private facilities to offer these opportunities;**
- **considering the barriers to the adoption of new radiotherapy technologies in Australia and, as may be appropriate, strategies for overcoming them; and**
- **considering a program that funds short term rotation of regional radiotherapy staff into metropolitan centres.**

O23: Repeat, in full, the radiation oncology workforce planning study in 2012 so that the planning parameters can be reset having regard to the evolution of radiotherapy services and the associated workforce in the intervening period.

1

Introduction

On 28th January 2009, the Commonwealth Department of Health and Ageing (DoHA), commissioned a project to:

> ***'undertake a review of the current status and capacity of the three main professions that make up the radiation oncology workforce (radiation oncologists (ROs), radiation therapists (RTs) and radiation oncology medical physicists (ROMPs)) and to identify opportunities for ensuring an adequate supply of a well trained radiation oncology workforce'***

This chapter presents the project background, objectives and scope; and the methodology used by the project team to conduct the assignment.

1.1 BACKGROUND

Radiation treatment is an important component of cancer therapy; it increases cure rates, and lessens the suffering of patients and their families. Research has shown that over 52% of cancer patients stand to benefit from the use of radiotherapy at some time during their disease trajectory[7], either for cure or for palliation of advanced disease. In May 2008, the Royal Australian and New Zealand College of Radiologists (RANZCR) stated that the national uptake rates for radiotherapy remain on average about 35%, indicating that a third of cancer patients who could benefit from radiotherapy are not receiving optimal care[8].

A key part of further increasing the capacity to provide radiotherapy services is to ensure that there is an adequate balance between the supply of, and demand for, trained professionals in the key radiotherapy disciplines being ROs, RTs and ROMPs. DoHA, working with the Radiation Oncology Reform Implementation Committee (RORIC), has recognised that workforce planning is a key tool for addressing the supply demand balance and commissioned this study, the objectives of which are to:

- prepare information on the current radiation oncology workforce profession numbers and issues affecting radiation oncology service provision in Australia;
- formulate a methodology which will ensure reliable workforce planning can be conducted in the future; and
- identify opportunities to address workforce and skills shortages.

DoHA intends to use the information generated by the project to provide recommendations to the Commonwealth Government on strategic workforce initiatives. State/Territory Health Authorities intend to use the data on public sector facilities within their jurisdiction to develop

[7] Delaney G, Jacob S, Featherstone C and Barton M (2005). The role of radiotherapy in cancer treatment: Estimating optimal utilization from a review of evidence-based clinical guidelines. *Cancer*, Volume 104, Issue 6
[8] RANZCR Faculty of Radiation Oncology Submission to The National Health and Hospitals Reform Commission (NHHRC) on its Terms of Reference and Draft Principles for Australia's Health System (May 2008) http://www.nhhrc.org.au/internet/nhhrc/publishing.nsf/Content/159/$FILE/159%20RANZCR%20Faculty%20of%20Radiation%20Oncology%20Submission.pdf

further their radiation oncology workforce initiatives. The objective at both Government levels is to ensure the delivery of timely, accessible and quality radiation oncology services.

1.2 PROJECT SCOPE

The scope of the study, as set out in the project contract, divides the work into two phases:

Phase 1: Conduct a census of the current radiation oncology workforce

- Develop further the draft Project Work Plan provided with the RFQ response and deliver a final Project Work Plan;
- Design a staff survey in consultation with the professional bodies involved in the delivery of radiation oncology and administer it through the professional bodies that takes into account the following variables:
  - age profile of the workforce;
  - overseas recruitment; and
  - programs to recruit to regional and rural areas.
- Conduct a census of the three main oncology workforce professions sorted by facility including:
  - the current ratio of each profession per linear accelerator;
  - the current methodology used to project workforce supply requirements; and
  - the 'ideal' supply of each profession to operate existing linear accelerators, including the basis for determination and an assessment of its 'affordability'.
- Provide an analysis of the current profile of the radiation oncology workforce noting variances across public and private facilities. The analysis should also include current numbers and shortfalls (vacant Full Time Equivalent (FTE) positions).
- Provide analysis of the various methodologies currently used by state and territory health departments, private providers and professional organisations to address current shortfalls in workforce numbers and what will be required to meet the 'ideal' supply (including an assessment of the future position if the extant planning system is retained).

Phase 2: Undertake workforce projections for the radiation oncology workforce

- Develop a workforce planning methodology that is able to accommodate different staffing models to project workforce supply requirements;
- Using the methodology, undertake a workforce projections exercise to project current supply requirements with predictions for the next five to ten years; and
- Using the information gathered, conduct a detailed analysis of the factors that might influence the profile of the radiation oncology workforce into the next five to ten years to identify possible opportunities to address current workforce shortages, meet future supply requirements (five to ten years) and to maintain ideal numbers.

1.3 PROJECT METHODOLOGY

The methodology used by the project team to undertake the radiation oncology workforce planning study involved eight stages as set out below:

(1) **Detailed project planning**: the project team met with DoHA Project Officers, received a briefing, and finalised the study parameters including communication process, stakeholders to be consulted, consultative process to be used, and identification of information sources. A detailed project plan was prepared and submitted to the DoHA Project Officer for review and comment on 6th February 2009. Amendments were made, as required, and the final project plan was submitted on the 27th February 2009.

(2) **Situation analysis:** the project team met with relevant DoHA staff (as part of the project planning meeting) to develop our understanding of the project context. We reviewed the documentation provided and searched the literature on best practice in service development and workforce planning and projections relating to radiation oncology services. The project team visited the RANZCR, AIR, and ACPSEM and had discussions with key staff with the objective of introducing the study and obtaining support for the survey and information gathering processes. All of the material obtained was synthesised and used as the basis of the survey development process.

(3) **Survey of radiation oncology professions**: the project team worked with the RANZCR, AIR and ACPSEM to develop a draft questionnaire and three key supporting tools including guidelines, a web-based application and a database. The draft questionnaire and other survey infrastructure were submitted to the Project Officer for approval prior to being used. The professional bodies were asked to use their mailing lists to distribute the questionnaire and guidelines to members working in radiation oncology services. The survey period was three weeks with up to four rounds of follow-up. The professions' survey data collection was completed by 30th June 2009.

(4) **Survey of radiation oncology facilities**: the project team worked with representatives of the State/Territory Health Authorities and private radiotherapy facilities to develop a draft questionnaire and supporting tools including guidelines and a database. The draft questionnaire and other survey infrastructure were submitted to the Project Officer for approval prior to being used. The project team worked with the State/Territory Health Authorities to distribute the public facilities questionnaire and directly emailed the survey to private facilities. The survey period was eight weeks with six rounds of follow-up. The facilities' survey data collection was completed by 30th June 2009.

(5) **Qualitative data collection:** the project team visited 20 radiation oncology facilities covering all private sector ownership groups and a sample of public services to discuss the issues associated with the supply of, and demand for, ROs, RTs and ROMPs. A case study framework was prepared and sent to the sites to guide the discussions. Two members of the project team visited each site and conduct a series of meetings and, as appropriate, a focus group with ROs, RTs and ROMPs. The remaining stakeholders on the agreed list were contacted, and a meeting (face-to-face or teleconference) with the project team was organised and held to discuss the workforce issues. The qualitative data collection was completed on 13th August, 2009.

(6) **First Report:** the project team analysed the professions' and facilities' survey data; and the data from the consultation process. We consolidated the situation analysis paper; and the analyses of the survey and consultation data to produce a preliminary draft First Report which was provided to the Project Officer for review and comment by 17th July. We then meet with RORIC's Workforce Working Group on 22nd July to present the

preliminary draft First Report. Taking account of the comments received we conducted further analysis to prepare the second draft First Report, which was discussed, by teleconference, with the Workforce Working Group (WWG) on 10th August. The resulting comments were addressed and the final draft First Report was submitted to the Project Officer for review and comment on 17th August, 2009.

(7) **Workforce planning and projections:** the project team liaised with the identified data custodians and obtained the data that were available to assist us to formulate workforce projections (university graduates in relevant courses, cancer incidence, retirement rates from the Australian Bureau of Statistics (ABS) and the Australian Institute of Health and Welfare (AIHW) for relevant professional groups). Using the quantitative and qualitative data a five and ten year workforce projections model was developed in Microsoft Excel. Using the model, the impact of various changes in demand for, and supply of, the radiation oncology workforce, for each of the three disciplines was analysed. The workforce projections model was completed on 31st August, 2009.

(8) **Final Report:** using the outcomes of the workforce projections modelling and associated workforce planning; and First Report, the project team prepared the draft Final Report which was provided to the Project Officer for review and comment on 1st September, 2009. The project team met with a subgroup of the WWG on 1st October to discuss written comments provided by WWG members and the DoHA project officer. The draft Final Report was then amended to take account of the comments received. The Final Report, the professions' and facilities' survey databases, and the workforce projections model were provided to the DoHA Project Officer on 26th October 2009.

1.4 STRUCTURE OF THIS DOCUMENT

This document represents the Final Report of the project. The structure of the report is:

- **Chapter 2** provides details of the radiation oncology workforce including national and international approaches to workforce planning.
- **Chapter 3** describes the data collection methodology.
- **Chapter 4** describes radiation oncology workforce planning activities in Australia.
- **Chapter 5** analyses the data collected from the facilities' survey.
- **Chapter 6** analyses the data collected from the ROs professions' survey.
- **Chapter 7** analyses the data collected from the RTs professions' survey.
- **Chapter 8** analyses the data collected from the ROMPs professions' survey.
- **Chapter 9** presents a thematic analysis of the information collected from the visits to 20 radiation oncology services around Australia.
- **Chapter 10** presents the workforce planning model and projections for 2014 and 2019.
- **Chapter 11** presents the conclusions and opportunities for workforce development.

2

Radiation oncology workforce

This chapter provides background information to the radiation oncology workforce focussing on the key disciplines that are the subject of this workforce planning study: ROs, RTs and ROMPs. Details of both national and international workforce benchmarking and guidelines are described along with a description of international approaches to workforce planning. The chapter concludes with a short review of recruitment and retention strategies and issues. More detailed background information on cancer incidence and mortality in Australia; radiation oncology facilities and treatment modalities; available cancer services including radiotherapy; and treatment activity is provided in Appendix A.

2.1 RADIATION ONCOLOGY WORKFORCE

The radiation oncology team is comprised of not only ROs, RTs and ROMPs but also includes oncology nurses, social workers and other health professionals, counsellors, engineers and technical personnel and administrative support. Consistent with the project objectives, this study focused only workforce issues for ROs, RTs and ROMPs. The roles of these professionals working in the multi-disciplinary team can be broadly described as:

- **ROs:** the medical specialists responsible for the patient's cancer management and radiotherapy treatment. The RO makes the decision to proceed with a course of radiotherapy and, under existing arrangements, is responsible for the management of the whole treatment process.
- **RTs:** radiation treatment specialists who undertake treatment, simulation and planning, deliver radiotherapy to patients according to a prescription and have an ongoing relationship with patients throughout their course of treatment.
- **ROMPs:** scientific specialists who establish, implement and monitor processes which allow optimal treatment using radiation, taking account of the radiation protection of patients and others.

The key professional bodies that represent these groups are:

- Royal Australian and New Zealand College of Radiologists (RANZCR);
- Australian Institute of Radiography (AIR); and
- Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM).

In 2002, the Baume Inquiry[9] highlighted that the low rate of use of radiotherapy is linked to shortages in the key professions, namely ROs, RTs and ROMPs, and recommendations to overcome shortages were proposed. There have been a number of radiation oncology workforce development strategies implemented since 2002 by the Commonwealth government, state/territory governments and the professional bodies working together. This study provided an important opportunity to assess the impact of the resultant initiatives to assess the extent to which workforce shortages remain.

[9] Baume P. *Radiation Oncology Inquiry. A vision for radiotherapy*. Canberra, ACT: Commonwealth of Australia, 2002

2.2 RADIATION ONCOLOGY WORKFORCE TRAINING

In order to appreciate the supply side issues of the workforce (i.e. training new entrants) it is important to provide an overview of the training process.

2.2.1 Radiation oncologists' training

It takes at least 15 years to qualify as a RO[10] and the average age at accreditation is 34[11]. The process starts with obtaining a medical degree, which may be undertaken as a five or six year undergraduate degree (or four year graduate degree). Medical graduates then undertake an intern year and (usually) two to three years as residents before being accepted as registrars (trainees) in radiation oncology. The registrar program (specialised vocational training) is designed to be completed in five years although is often takes six years[12]. Currently the RANZCR offers 23 new trainee positions in radiation oncology per year[13].

2.2.2 Radiation therapists' training

It takes approximately four years to complete the undergraduate RT training or five years if the postgraduate program is undertaken. As shown in Table 2.1 six universities offer radiotherapy courses that are AIR-accredited. In recent years the universities have diversified the RT course they offer. Historically, the program was characterised by a three year undergraduate program followed by completion of a professional development year (PDY) to gain professional accreditation[14]. The University of Newcastle, Queensland University of Technology and RMIT currently offer this style of program.

Table 2.1: Radiotherapy university courses

University	The type of course		The length of course (years)		PDY requirement	
	Undergrad	Postgrad	Undergrad	Postgrad	Yes	No
University of Sydney	×[a]	×	3	2	×	
University of Newcastle	×		3	-	×	
RMIT	×	×[b]	3	2	×	
Monash		×	-	2		×
Queensland University of Technology	×		3	-	×	
University of South Australia	×		4[c]	-		×

[a]Sydney University is moving from an undergraduate to postgraduate course. The final undergraduate intake is 2009 and students will be graduating from the undergraduate program for the next three to four years. [b]The RMIT masters program will begin in 2010. [c]The University of South Australia has recently moved from a three year to a four year program; final three year graduates will complete the course in 2009

Two universities, Monash University and the University of Sydney have moved to a two year postgraduate masters program, with Sydney University in addition requiring students to complete the PDY. RMIT has a new graduate entry masters program that is beginning in 2010, that will run in conjunction with the undergraduate program. The University of South Australia is starting a four year undergraduate program with no PDY requirement in 2010. Representatives of the universities consulted by the project team stated that reasons for the change in course structure include the fact that the RT course has historically had a high attrition rate and moving to a postgraduate program is likely to attract students more suitable and committed to working as a RT.

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[10] RANZCR (Media release) 2002, Huge effort needed for Australians to receive cancer services they deserve.
[11] Australian Medical Workforce Advisory Committee (1998). The specialist radiation oncology workforce in Australia. Supply and Requirements 1997-2007.
[12] ibid
[13] Personal communication with RANZCR representatives, August 2008
[14] AIR website: http://www.air.asn.au/html/s02_article/article_view.asp?art_id=141&nav_cat_id=146&nav_top_id=58

2.2.3 Radiation oncology medical physicists' training

It takes about nine years to become a qualified ROMP[15]. There are about 160 student enrolments in fourth-year physics each year, but few enter medical physics[16]. Currently five universities offer an ACPSEM accredited postgraduate masters program in medical physics: The University of Sydney; RMIT; The University of Wollongong; Queensland University of Technology; and the University of Adelaide. The programs range from 1.5 to two years full-time (or part-time equivalent) with a blend of coursework and research programs offered.

Historically, the pathways to becoming a qualified ROMP varied across Australia; in some states ACPSEM accreditation was required to work unsupervised, whereas in other states it was not necessary. These national variations led to unstructured training pathways. The Baume Inquiry recognised this problem and recommended that ACPSEM develop a national five year training program to be implemented in 2005[17]. As a result, the Training, Education and Accreditation Program (TEAP) was developed and is now well established.

TEAP now spans five years of vocational training including the completion of an ACPSEM accredited Masters in Medical Physics course. Medical physicists who have already completed an accredited masters program can complete the vocational training in two to three years to gain accreditation. The development of the TEAP program has assisted in streamlining the career pathway to becoming a ROMP as well as developing a nationally consistent and recognised training program.

2.3 RADIATION ONCOLOGY WORKFORCE BENCHMARKS

This section examines current documentation about radiation oncology workforce planning, benchmarks, starting with an overview of the workforce planning context. The different standards and benchmarks that exist for the radiation oncology workforce (ROs, RTs and ROMPs) in Australia and overseas are then discussed.

2.3.1 The radiation oncology workforce planning context

Radiotherapy is distinguished by a number of features[18], including:

- the need for a large team of professionals, including ROs, RTs, ROMPs and engineers – other professions such as oncology nurses may also be involved;
- the length of a course of treatment, usually requiring repeated daily doses (or "fractions") delivered over a number of weeks at a purpose-built facility;
- a reliance on expensive equipment – establishing a basic radiation oncology facility with two linacs can cost $8 million to $12 million for equipment alone, though capital costs are not the majority of the costs per service, because of the lifespan of the equipment; and
- the rapid changes in technology that impact on the service delivery model and therefore the required workforce.

The RANZCR Faculty of Radiation Oncology established that a planning model for radiation oncology services must be based on the number of people with cancer who need treatment[19].

[15] RANZCR (Media release) 2002, Huge effort needed for Australians to receive cancer services they deserve.
[16] The Australian Institute of Physics, The Physicist, 37(1), 2000
[17] Baume P. *Radiation Oncology Inquiry. A vision for radiotherapy*. Canberra, ACT: Commonwealth of Australia, 2002.
[18] DOHA, available at: http://www.health.gov.au

The proportion of people with cancer who need radiotherapy is the determining factor, not the capacity of the current infrastructure to provide services. According to the National Strategic Plan for Radiation Oncology 2001[20], any planning model must be able to determine:

- the number of new cancers requiring radiotherapy;
- the number of linear accelerators required; and
- the number of specialist staff required to provide a safe, quality service.

Localisation, planning systems and quality assurance are also vital to modern radiation oncology facilities and a methodology for determining the level of provision of these resources needs to be developed[21]. Trainee intake is also an important consideration in any workforce projections. The number of trainees accepted into training programs should be targeted to cover but not exceed the needs for future optimal staffing of departments[22]. The calculations should consider rates of retention of trainees. In addition, provision for teaching the trainees needs to be factored into workload considerations[23].

2.3.2 Workforce benchmarks for radiation oncologists

There are two measures used in benchmarking the number of ROs required:

- the number of new cases of cancer per year per RO; and
- the number of ROs per million population.

In 1985 the WHO accepted the equivalent of 250 new courses of treatment per ROs per year as a suitable guideline. The RANZCR endorsed these guidelines and further outlined that there, 'must be a minimum of three FTE consultant ROs employed in each department, each of whom has RANZCR continuing medical education (CME) currency and who ideally sees approximately 250 (range 150 - 350) new patients per annum[24]. The Baume Inquiry advised some caution when using this benchmark as, in practice, the number of new patients per RO can vary from 150 to more than 400 new cases per year[25].

The Canadian Association of ROs report[26] published in 1999 proposed a methodology to project staffing benchmarks based on tumour site-specific patient care needs. They recommended that, based on a 65% allocation of radiation oncology manpower to direct patient care, a RO annual caseload should not exceed 185 new patients per year. Their calculation was based on regional treatment protocols and referral patterns in Canada, therefore it should not be automatically assumed that this is the correct result for Australian centres, but provides some guide[27].

In the UK the Royal College of Radiologists recommended in 1998 that a consultant in clinical oncology should have a workload that does not exceed 315 new patients per annum[28].

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[19] National Strategic Plan For Radiation Oncology (Australia) (2001)
[20] ibid
[21] Baume P, chairperson. Radiation Oncology Inquiry. A vision for radiotherapy. Canberra, Commonwealth of Australia, 2002. Available at: www.health.gov.au/roi/inquiry/report.htm.
[22] Tripartite Committee, 2005. Developing standards for radiation treatment services in Australia: Discussion Paper.
[23] ibid, p. 23
[24] RANZCR communication, Discussion paper (unpublished) 'Recommendation on the number of new patients per RO per year.' Last updated July 2008
[25] Baume P. *Radiation Oncology Inquiry. A vision for radiotherapy*. Canberra, ACT: Commonwealth of Australia, 2002. p: 54
[26] Canadian Association of ROs (CARO) 1999, Manpower study report. Agnew Peckman and Associates, <online>availablefrom:http://www.caro-acro.ca/About_Us/Publications/CARO_Manpower_Report_1999.htm
[27] Triparite Committee, 2005. Developing standards for radiation treatment services in Australia: Discussion Paper. p.23
[28] The Royal College of Radiologists (2003). Good practice guide for clinical oncologists, 2nd edition, London. Available from: http://www.rcr.ac.uk/docs/oncology/other/Good%20Practice%20Guide%20for%20Clinical%20Oncologists.htm

This figure reflected increasing treatment complexity, the availability of new additional treatments, rising expectations of detailed discussion with patients, the greater involvement of patients in treatment decisions and the emphasis on a service that is consultant based[29]. The maximum workload figure of 315 new patients per annum was based on a typical casemix and included an expectation that consultants will be involved in structured training, continuing medical education, audit, and in obtaining informed consent for treatment. With increased site specialisation and the many and various therapeutic advances and refinements of recent years there are now circumstances under which a specialist workload is of such intensity that the above figure would be deemed excessive[30].

The alternative method of defining the actual requirements of ROs in terms of population is a suitable measure provided the number increases in proportion to the increase in cancer incidence[31]. In Australia it has been estimated that the number of ROs per million population should be 10.5 by 2009[32], this figure is in line with predictions from other countries including New Zealand, the USA and Canada[33]. Table 2.3 highlights country specific recommendations for RO per million.

Table 2.3: Recommended number of ROs per million population for various countries

Country	Recommended	Year
Australia	10.2	2007
New Zealand	10.0	2007
Canada	9.7	1999
USA	13.5	1998
Holland	9.0	2005

Source: Wigg D & Morgan W (2001). Radiation oncology in Australia: Workforce, workloads and equipment 1986-1999, Australasian Radiology (25): 146-169

2.3.3 Workforce benchmarks for radiation therapists

The Radiation Technology Advisory Panel (RTAP) of the AIR[34] recommends a staffing formula based on 1.06 FTE RTs per hour of linear accelerator operation. The 1.06 includes the allocation of staff to both linac case planning and linac operation (or treatment delivery). Linac operating hours includes normal hours and any additional permanent or regularly scheduled shift hours. It also incorporates allocations for administration, education and staff development, quality, and research and development. The derivation of the 1.06 FTE RTs per hour of linear accelerator operation is based on:

- planning hours per linac operating hour = 2.5;
- linac treatment hours per linac operating hour = 3.5;
- education and staff development hours per linac operating hour = 0.25;
- quality hours per linac operating hour = 0.5;
- administrative hours per linac operating hour = 0.5; and
- research and development hours per linac operating hour = 0.2.

[29] ibid
[30] ibid., p:102
[31] Wigg, D & Morgan, W. 2001, Radiation oncology in Australia: Workforce, workloads and equipment 1986-1999, Australasian Radiology (25): 146-169
[32] Diagnosis Pty Ltd, Refinement of analysis of the supply of and requirements for radiation oncology services. Diagnosis Pty Ltd, Melbourne, September 1994
[33] Wigg, D & Morgan, W. 2001, Radiation oncology in Australia: Workforce, workloads and equipment 1986-1999, Australasian Radiology (25): 146-169
[34] Australian Institute of Radiography Radiation Therapy Advisory Panel, July 2001, Radiation Therapy Staffing Model, The Radiographer, Vol 48, No 2, pp.79-83

The calculation also builds in a relief factor of 1.04 hours per linac operating hour. All factors total to 8.49 hours per eight hour shift and based on eight linac hours per shift equates to 1.06 FTE per hour of linac operation. It should be noted that the formula excludes the hours required for kilovoltage and brachytherapy services (planning and treatment); stereotactic radiosurgery/radiotherapy, total body irradiation, paediatrics, and intensity modulated radiotherapy (planning only); and external commitments (e.g. giving lectures). RTAP recommends that these activities be direct timed in each facility and added to the result of applying the formula to give the total required staffing level.

A study conducted in Scotland assumes that each machine (linac, orthovoltage, or simulator) requires four RTs per 9am-5pm working day (two per hour)[35]. The College of Radiographers in the UK has developed short term benchmarks for standard core functions within radiotherapy[36]. They propose that the staffing required per linac hour is 1.33 for a certain list of core activities. Some activities were excluded from the benchmark including: brachytherapy, research, mould room, volume delineation, physics, planning, dosimetry and quality management.

2.3.4 Workforce benchmarks for radiation oncology medical physicists

Australasian and other international guidelines have recommended 2.2 ROMPs per linac[37]. The widely accepted guideline in Australia is 1.7 qualified (plus 0.5 trainee) ROMPs per linac[38]. This is a simplification of the more complicated ACPSEM formula 2000 that is used when assessing the ROMP needs of an individual department. The formula calculates the requirements for all physics staff, including physics technicians and caters for the most recent radiation oncology advances in technology[39,40]. The simpler formula (yielding the 1.7) can only be used when averaging over a large number of departments and cannot be applied to individual hospitals where the need may be higher[41].

For example, the simpler formula will grossly underestimate staffing requirements in departments that use specialised techniques including brachytherapy and/or stereotactic radiosurgery. The ACPSEM formula 2000 yields similar numbers to international professional body recommendations[42]. According to the Baume Inquiry no state in Australia had the recommended level of ROMPs[43]. An alternative workforce standard proposed for European centres based on high GDP countries was for one ROMP per 400-450 patients[44].

2.4 RADIATION ONCOLOGY WORKLOAD MEASURES

This section examines current documentation about radiation oncology workload measures. In assessing workforce requirements, it is necessary to have standards for the expected workload of a radiation oncology facility.

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[35] The Royal College of Radiologists (2005) Equipment, workload and staffing for radiotherapy in Scotland 1997-2003.
[36] The College of Radiographers 2005, Radiographic staffing: Short term guidance 2005 Benchmark for standard core functions within radiotherapy, London
[37] Ministry of Health, 2001. Improving non-surgical cancer treatment services in New Zealand
[38] Baume P. *Radiation Oncology Inquiry. A vision for radiotherapy*. Canberra, ACT: Commonwealth of Australia, 2002. p: 54
[39] Oliver, L., Fitchew, R & Drew, J 2001, Requirements for radiation oncology physics in Australia and New Zealand, *Australasian Physical and Engineering Sciences in Medicine*, 24(1): pp. 1-18
[40] Round, W.H. 2007, A survey of the Australasian clinical medical physics and biomedical engineering workforce, Australasian Physical & Engineering Sciences in Medicine; 30(1): 13-24
[41] ibid p 13-24
[42] ibid p 13-24
[43] ibid
[44] Triparite Committee, 2005. Developing standards for radiation treatment services in Australia: Discussion Paper. p.23

2.4.1 Linear accelerator throughput

A benchmark value of 450 treatment courses per linac per year was proposed by the Australian Health Technology Advisory Committee (AHTAC) in 1996. More recently, Barton et al examined cancer services in WA and determined that, based on 19 attendances per course; 4.1 attendances per hour; eight operating hours per day; and 240 working days per annum, linacs have a capacity to deliver 432 courses per year[45]. This figure aligns with those used in European countries where benchmarks range from 400 to 600 courses per year[46]. A European study that looked at developing evidence-based guidelines for radiotherapy infrastructure and staffing needs in Europe used the 450 treatment courses per linac per year as their benchmark[47].

2.4.2 Radiotherapy utilisation rate

In an often quoted study, Delaney et al 2005[48] estimated the optimal utilisation rate for radiotherapy by reviewing evidence based clinical guidelines. The study concluded that the proportion of patients with cancer that should receive external beam radiotherapy according to the best available evidence is 52.3%, with a 25% re-treatment rate. A comparison with actual radiotherapy utilisation data suggests a shortfall in actual radiotherapy delivery nationally, with actual treatment in most states falling around 35%[49,50].

Other countries including the UK indicate an optimal utilisation rate of about 50%, but as is the case in Australia actual utilisation falls below this benchmark. A European study looked at developing evidence based guidelines for radiotherapy infrastructure and staffing needs[51]. The study used data from 25 European countries to estimate the average number of linacs required per million population based on appropriate rates of radiotherapy utilisation for different cancer types (using the Delaney et al[52] paper as the main source of evidence based radiotherapy utilisation). The average for the 25 countries was 5.9 linacs per million people.

2.4.3 Linking to workforce benchmarking

It is clear that four basic estimates are required to estimate the required number of linacs in a country: the proportion of patients with a given type of cancer who present or develop an indication for radiotherapy, the incidence of these cancer types in the country, the radiotherapy re-treatment rate and the machine throughput in terms of number of treatment courses per year for a linear accelerator. This process is interrelated with workforce planning, as a given staffing level will be required to achieve the benchmark throughput for a linear accelerator. The benchmark radiotherapy treatment rate of 52.3% has been used throughout this study as input to the workforce planning process, reflecting the fact that it has been adopted as a goal by the Commonwealth and State/Territory Governments.

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45 Barton, M., Gabriel, S and Shafiq, J (2008). Overview of cancer treatment services in Western Australia.

46 Bentzen, S., Heeren, G., Cottier, B., Slotmsn, B., Glimelius, B., Lievens, Y & Bogaert, W (2005). Towards evidence-based guidelines for radiotherapy infrastructure and staffing needs in Europe: the ESTRO QUARTS project. Radiotherapy and Oncology, 75: 355-365

47 ibid p355-365

48 Delaney, G., Jacob, S., Featherstone, C & Braton, M, 2005. The role of radiotherapy in cancer treatment: Estimating the optimal utilization from a review of evidence-based clinical guidelines, *Cancer*, 104 (6): pp.1129-1137

49 ibid

50 Auditor-General's report, performance audit June 2009, Tackling cancer with radiotherapy: NSW Department of Health

51 Bentzen, S., Heeren, G., Cottier, B., Slotmsn, B., Glimelius, B., Lievens, Y & Bogaert, W (2005). Towards evidence-based guidelines for radiotherapy infrastructure and staffing needs in Europe: the ESTRO QUARTS project. Radiotherapy and Oncology, 75: 355-365

52 Delaney, G., Jacob, S., Featherstone, C & Braton, M, 2005. The role of radiotherapy in cancer treatment: Estimating the optimal utilization from a review of evidence-based clinical guidelines, *Cancer*, 104 (6): pp.1129-1137

2.5 INTERNATIONAL RADIATION ONCOLOGY WORKFORCE PLANNING

Radiation oncology under-utilisation is an issue worldwide. Many countries including the UK and Canada find it difficult to meet the demand for radiation oncology. Slow uptake of technology and shortages in equipment and workforce influence a country's ability to meet service demand. Workforce planning has taken place in other countries aside from Australia to address under-utilisation, through predicting optimal staffing levels and utilisation benchmarks to ensure that departments have the adequate capacity to meet the future demand for radiation oncology. Some country specific examples are highlighted in this section.

2.5.1 Workforce planning in the United Kingdom

A report published by the UK National Radiotherapy Advisory Group (NRAG) (2007) used a similar model to that used by the Australian Medical Workforce Advisory Committee (AMWAC) and the Australian Health Workforce Advisory Committee (AHWAC) to make recommendations for the future radiotherapy workforce[53]. The report came about after a large gap (63%) between current activity levels and optimal treatment levels was identified. The NRAG also noted that there was considerable variation in the number of fractions delivered per million population between cancer networks. Recommendations to meet optimal radiotherapy treatment levels included[54]:

- 48,000 fractions per million population need to be delivered annually to meet demand, this will increase to 54,000 fractions per million population by 2016 – the National Health Service currently delivers around 30,000 fractions per million population;
- each linac needs to deliver 4-4.5 fractions on average per hour;
- linacs within radiotherapy departments need to work 9.2 hours per day;
- radiotherapy departments require a service efficiency machine that is used 50-75% of the time providing capacity to deal with peaks in workload and linac breakdowns;
- all new and replacement machines need to be capable of image guided four-dimensional adaptive radiotherapy;
- linacs need to be replaced every 10 years; and
- radiotherapy equipment needs to be supported with an adequate radiation oncology workforce.

Based on their findings, NRAG made a number of workforce recommendations including[55]:

- a radical workforce re-design focused on skills over job titles, reducing high attrition from training by improving the training experience for RTs and the four-tier skills mix model (see below) for RTs to be introduced nationally; and
- improving the RTs training experience, at the time of the report the attrition rate was 35%; part of the improvement includes the development of laboratories with linacs and CT simulators to reduce training demands on clinical departments.

The four-tier skills mix model was developed out of a need to reduce high attrition of RTs in the UK[56]. The model has been designed to encourage clinical role development, flexible

[53] National Radiotherapy Advisory Group, 2007, Radiotherapy, developing a world class service for England <available online>: http://www.cancerimprovement.nhs.uk/%5Cdocuments%5Cradiotherapy%5CNRAG_0507.pdf
[54] ibid
[55] ibid
[56] Department of Health, 2003. Radiography Skills Mix: A report on the four-tier service delivery model. United Kingdom

working within teams and lifelong learning in support of a career path that remains clinically focused. The model has four levels that reflect escalating competencies and responsibilities[57]:

- ***Assistant practitioner*** – performs protocol-limited clinical tasks under the direction and supervision of a state-registered practitioner;
- ***Practitioner*** (state registered) – performs a wide-ranging and complex clinical role; is accountable for his or her own actions and for the actions of those they direct;
- ***Advanced practitioner*** (state registered) – autonomous in clinical practice, defines the scope of practice of others and continuously develops clinical practice within a defined field; and
- ***Consultant practitioner*** (state registered) – provides clinical leadership within a specialism, bringing strategic direction, innovation and influence through practice, research and education.

2.5.2 Workforce planning in Canada

A report conducted by CARO 1999 stressed the need to factor all categories of professional activity into a workforce calculation. The four health professional activity categories in the CARO paper are clinical patient care service, clinical administration, teaching and education, and research[58]. They noted that variations in staffing and work mix figures have been cited over the years but no recommendations have been standardised and accepted as a workable guide[59]. Australia's Tripartite Committee[60] recommended that a similar project to that performed by CARO (1999) could be conducted in Australia. This work would provide a factual and region-specific basis to estimate workforce requirements and needs in Australia. The Tripartite Committee argued that local studies employing local models that are adaptive to changing technologies and delivery of health services need to be developed[61].

2.5.3 Workforce planning in Europe

A study conducted by Slotman et al (2005) collected information surrounding national guidelines for infrastructure and workforce across 44 countries in Europe. The authors varied their workforce estimations based on countries Gross Domestic Product (GDP) per capita. For high GDP countries they suggested one linear accelerator per 450 patients, one RO per 200-250 patients and one physicist per 450-500 patients[62]. Slotman et al stressed that these are only crude guidelines and that the actual needs are heavily dependent on the population structure, cancer incidence and treatment strategies, which differ between various countries.

2.5.4 Workforce planning in Scotland

Access to radiotherapy in Scotland continues to be limited by lack of linacs and staffing. The Royal College of Radiologists in 2005 highlights that changes in skill mix and patterns of working cannot solve the problem of staff under-provision[63]. They recognise a need to increase the number of ROs, RTs and ROMPs, particularly the later two. They also suggest

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[57] ibid
[58] Canadian Association of ROs. (CARO). 1999. Manpower study report.
[59] Triparite Committee, 2005. Developing standards for radiation treatment services in Australia: Discussion Paper.
[60] ibid
[61] ibid, p. 23
[62] Slotman, B., Cottier, B., Bentzen, S., Heeren, G., Lievens, Y & Bogaert, W. 2004 (Abstract). Overview of national guidelines for infrastructure and staffing of radiotherapy. ESTRO-QUARTS: Work package 1. *Journal of the European Society for Therapeutic Radiology and Oncology*: 75(3).
[63] The Royal College of Radiologists (2005) Equipment, workload and staffing for radiotherapy in Scotland 1997-2003.

that a minimum annual 5% increase in workload should be built into future planning assumptions. Further workforce planning initiatives included[64]:

- employment of radiotherapy helpers for non-clinical tasks;
- increasing the intake of students into relevant radiotherapy and physics degrees;
- increasing the number of medical physics training posts and improving the medical physicist career structure;
- medical students, medical physics students and radiographer students need to be exposed to oncology services in their training; and
- exploring ways to adjust the RTs skill mix to allow them to work in a way that will facilitate modern technology.

Also in 2005, the Scottish Executive Health Department published a report of the Radiotherapy Activity Planning Group[65]. The report concentrated on facilities development strategies for increasing service capacity by about 50%, with a specific focus on extending the operating hours for existing equipment to reach more cost effective levels. In respect of workforce, the report recommended identifying the funding required to increase the number of medical physicists in training for four to six per year for therapy physics, and providing pump-priming funding for advanced practitioners and/or consultant therapy radiographers in at least the larger centres to enhance recruitment and retention[66].

2.6 RECRUITMENT AND RETENTION OF HEALTH PROFESSIONALS

Information regarding recruitment and retention strategies and issues specific to the radiation oncology workforce is limited in the literature, particularly regarding recruitment and retention in rural and regional areas. This section looks at rural recruitment and retention issues for health professionals in general (as it is expected most workforce shortages will be in rural and regional areas), followed by a discussion of issues that are specific to radiotherapy.

2.6.1 Recruitment and retention of health professionals to regional and rural areas

Rural recruitment and retention is effective when the rural location is a lifestyle choice. What is difficult is attracting and retaining people that would not normally reside in a rural location and providing the right incentives to keep them there. Increasingly more radiation oncology facilities will be built in regional areas. It will be important to develop effective strategies to recruit staff to these locations, particularly ROs and ROMPs where there are currently difficulties in recruiting suitable staff to regional areas.

For allied health professionals, a study has shown that main reasons for working in regional/rural areas are lifestyle, career and family ties while the main reasons for leaving are: lack of career path, personal and social isolation[67]. A Victorian study looking at workforce recruitment and retention for allied professionals indicated that it is essential to target younger professionals and those with young families. Recruitment strategies include the provision of continuing professional development (CPD) and work exchange opportunities; teaching

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[64] ibid.

[65] Scottish Executive Health Department (December 2005), Report of the Radiotherapy Activity Planning Group, Radiotherapy activity planning for Scotland, 2011 – 2015

[66] ibid.

[67] Schoo, A., Stagnitti, K., Mercer., C & Dunbar, J. 2005, A conceptual model for recruitment and retention: Allied health workforce enhancement in Western Victoria, Australia. The international electronic journal of rural and remote health research, education, practice and policy <online> available from: http://www.rrh.org.au/publishedarticles/article_print_477.pdf

managerial competencies; utilising the various health disciplines; enhancing student placement; creating a supportive and creative work environment; and having an active and supportive community[68]. Other strategies have included retention payments as an incentive to keep health professionals in rural and regional areas[69]. The effectiveness of these payments is still largely unknown.

A study conducted across rural NSW looked at strategies that local managers can use to optimise recruitment and retention of mental health staff[70]. Key attractions to rural areas were identified as rural lifestyle and environment. Identified retention factors include family reasons, the field of work and rural lifestyle, availability of support, supervision and good management. The paper concluded that there is room for strategies to improve employment incentives and there is considerable scope for managers at the local level to improve the design and hence the attractiveness of jobs. A shortcoming of the study was that it did not survey professionals who had left the rural setting.

A further study in 2002[71] looked at the factors that influence how long a GP will remain in a rural area. The key workforce problem for rural doctors is an inability to get time away for recreation leave and family considerations, particularly in smaller regional areas without access to good on-call arrangements. Strategies to deal with these issues include recruiting more rural doctors; an appropriate locum strategy; and the development of regional medical practice models to enhance opportunities for professional support[72]. Other workforce retention issues include access to support staff, access to facilities, and access to technology.

2.6.2 Radiation oncology workforce specific strategies

An American paper has looked at radiologist recruitment and retention[73]. On the recruitment side they highlighted the need to develop strategies to sell the profession to students, particularly students on clinical placements. On the retention side part time work as an option, flexibility at work, employing a highly robust support staff and having a dedicated departmental educator in IT were seen as strategies to retain staff.

Some specific strategies for RT recruitment and retention were highlighted in a paper by Ahern et al 2007[74] which looked at radiation therapist subspecialisation. During the 1990's radiotherapy staffing levels were historically low, job satisfaction was low and loss of RTs to other countries with better remuneration was high[75]. Subsequent to 2000, RTs have been better remunerated and professional development has been funded by the Commonwealth Government through the AIR. Anecdotally poor retention was linked to boredom because of the repetitive nature of the some aspects of the profession and cynicism because of limited opportunities for career progression and advancement to senior positions[76]. Ahern et al

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[68] ibid

[69] ibid

[70] Perkins, D., Larsen, K., Lyle, D & Burns, P. 2007, Securing and retaining mental health workforce in far western New South Wales, Australian Journal of Rural Health, 15: pp. 94-98

[71] Humphreys, J., Jones,M., Jones, J & Mara, P, 2002. Workforce retention in rural and remote Australia: determining the factors that influence length of practice, *Medical Journal of Australia*, 176: pp. 472-476

[72] Humphreys, J., Jones,M., Jones, J & Mara, P, 2002. Workforce retention in rural and remote Australia: determining the factors that influence length of practice, *Medical Journal of Australia*, 176: pp. 472-476

[73] Halstead, M., Donnelly, L &Strife, J. 2005, Radiologist recruitment and retention: How can we improve, *Journal of American College of Radiology*, 2: pp. 369-375

[74] Ahern, V., Bull, C., Matthews, K & Willis, D. 2007, Subspecialization of RTs in Australia and New Zealand, *Australasian Radiology*, 51: pp. 104-105

[75] ibid pp. 104-105

[76] ibid pp. 104-105

2007[77] exemplify that career development within radiotherapy is 'required and essential if RTs are to be retained for a longer term in the profession[78].'

One solution and recommendation from the Baume Inquiry is to develop sub-specialties within radiotherapy, possibly including specialities in IMRT, brachytherapy, stereotactic radiotherapy as well as tumour site specialties, reflecting the practice of ROs and drawing the RT into the multidisciplinary model of patient care. Similar models have been implemented in the UK, as a response to job dissatisfaction, staff shortages and the need to provide more recognition of a professional workforce.

Radiation oncology workforce planning needs to consider what attracts people to the profession and what factors aid in supporting professionals throughout their career. A good understanding of what the three key professions value in their career will aid in maintaining and attracting staff to the profession.

[77] ibid pp. 104-105
[78] ibid pp. 104-105

3

Data collection methodology

This Chapter provides an overview of the data collection methodology including the process used by the project team to develop, distribute and collect the survey data from all radiation oncology facilities in Australia as well as the survey of the three key professions (ROs, RTs and ROMPs). It also details the locations of the 20 case studies of radiation oncology facilities and other stakeholder consultations conducted to gather qualitative information to support the project teams' interpretation of the survey data.

3.1 FACILITIES SURVEY

The project team worked in consultation with the Workforce Working Group (WWG) and the relevant professional bodies (RANZCR, ACPSEM and AIR) to develop the facilities survey, which was ready for distribution on the May 4th 2009. Figure 3.1 diagrammatically represents the facility survey development process.

Figure 3.1: Facility survey development process

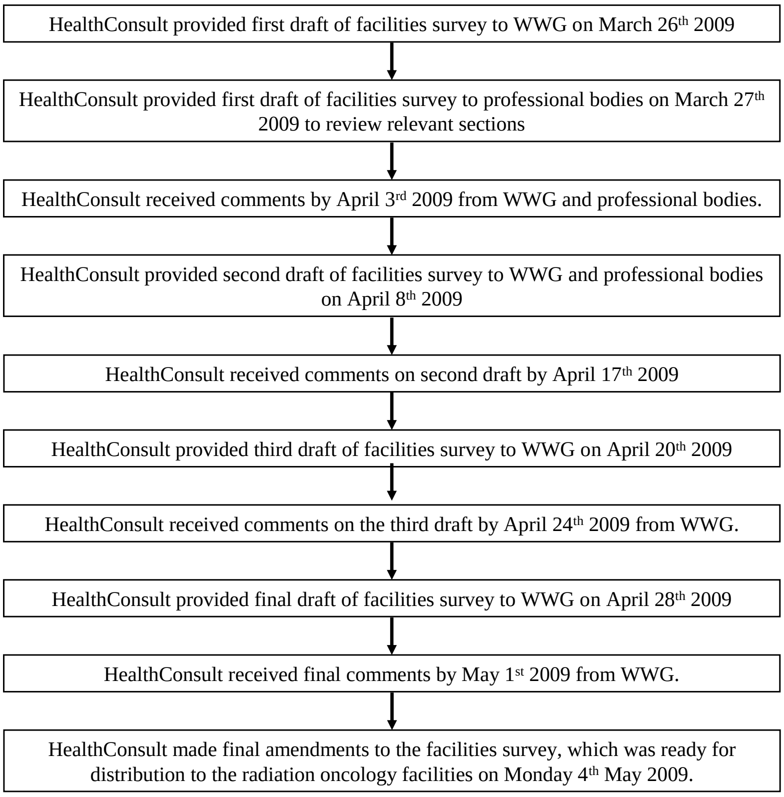
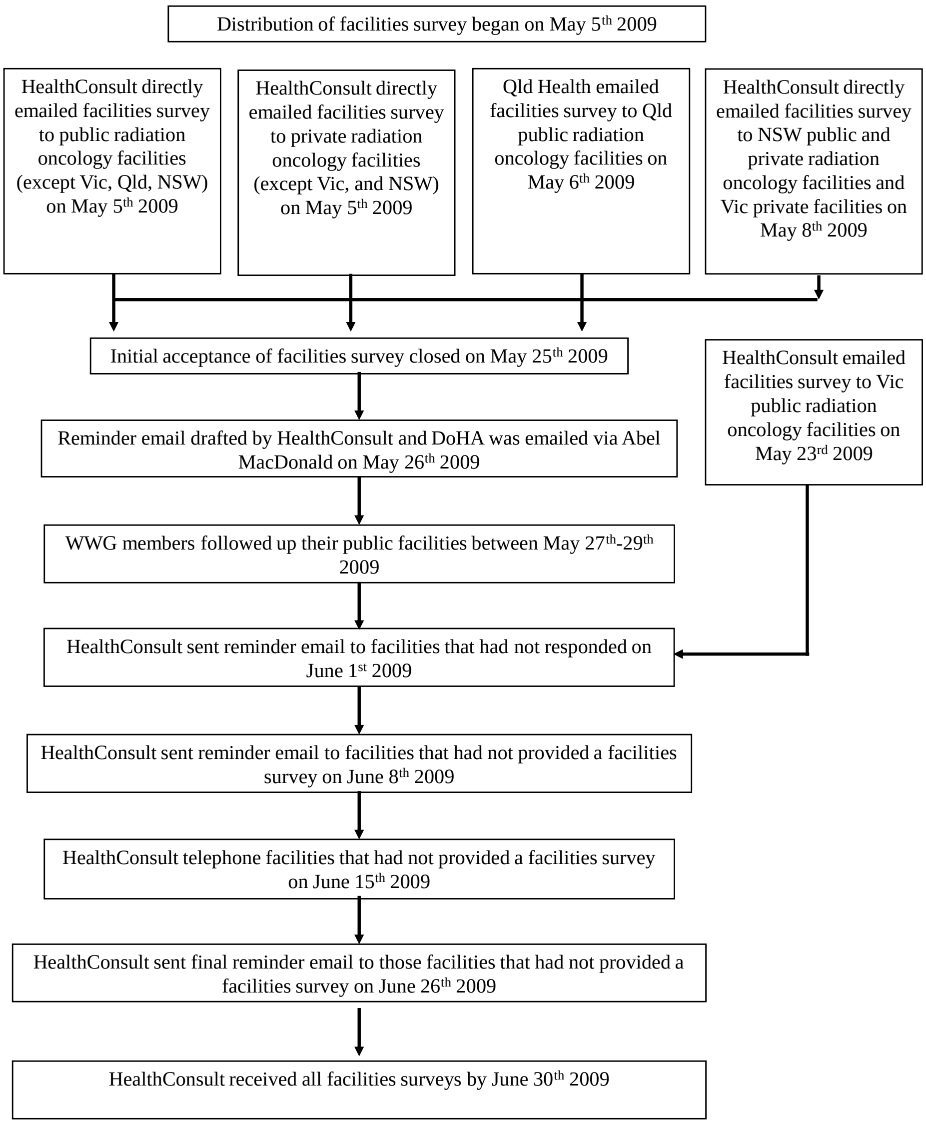


Figure 3.1 shows that the facilities survey went through three drafting stages before it was distributed to the radiation oncology facilities. This process allowed the project team to gain extensive input from relevant stakeholders to ensure the development of a high quality, relevant and practical survey.

Distribution of the facilities survey began on Tuesday the May 5th 2009. Figure 3.2 diagrammatically shows the distribution and survey data collection process, which took place from May 5th to June 30th 2009. Except for public facilities in Victoria, all surveys were emailed either directly or indirectly to radiation oncology facilities between May 5th and May 8th 2009. Due to unforseen issues with the Department of Human Services in Victoria gaining an internal approval to distribute the survey to public radiation oncology facilities, the project team was unable to email the survey to these facilities until the May 23rd 2009.

Figure 3.2: Facility survey distribution and collection process

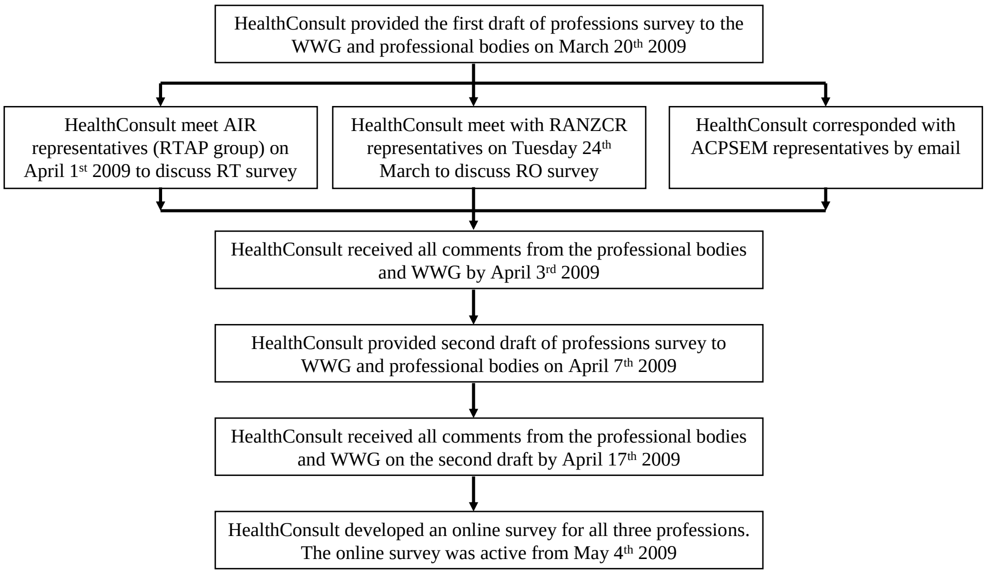


All facility surveys were received by the June 30th 2009. The project team directly sent four reminders throughout this period and was assisted by DoHA staff and WWG members who promoted the survey to their colleagues and encouraged them to complete it. The combined effort resulted in the receipt of a radiation oncology facility survey from all facilities operating in 2008 (i.e. surveys were received from 52 radiation oncology facilities).

3.2 PROFESSIONS SURVEY

The project team worked in consultation with the WWG and the relevant professional bodies (RANZCR, AIR and ACPSEM) to develop the three professions surveys, which were ready for distribution on the May 4th 2009. Figure 3.3 diagrammatically shows the development process of the three professions survey.

Figure3.3: Professions survey development process

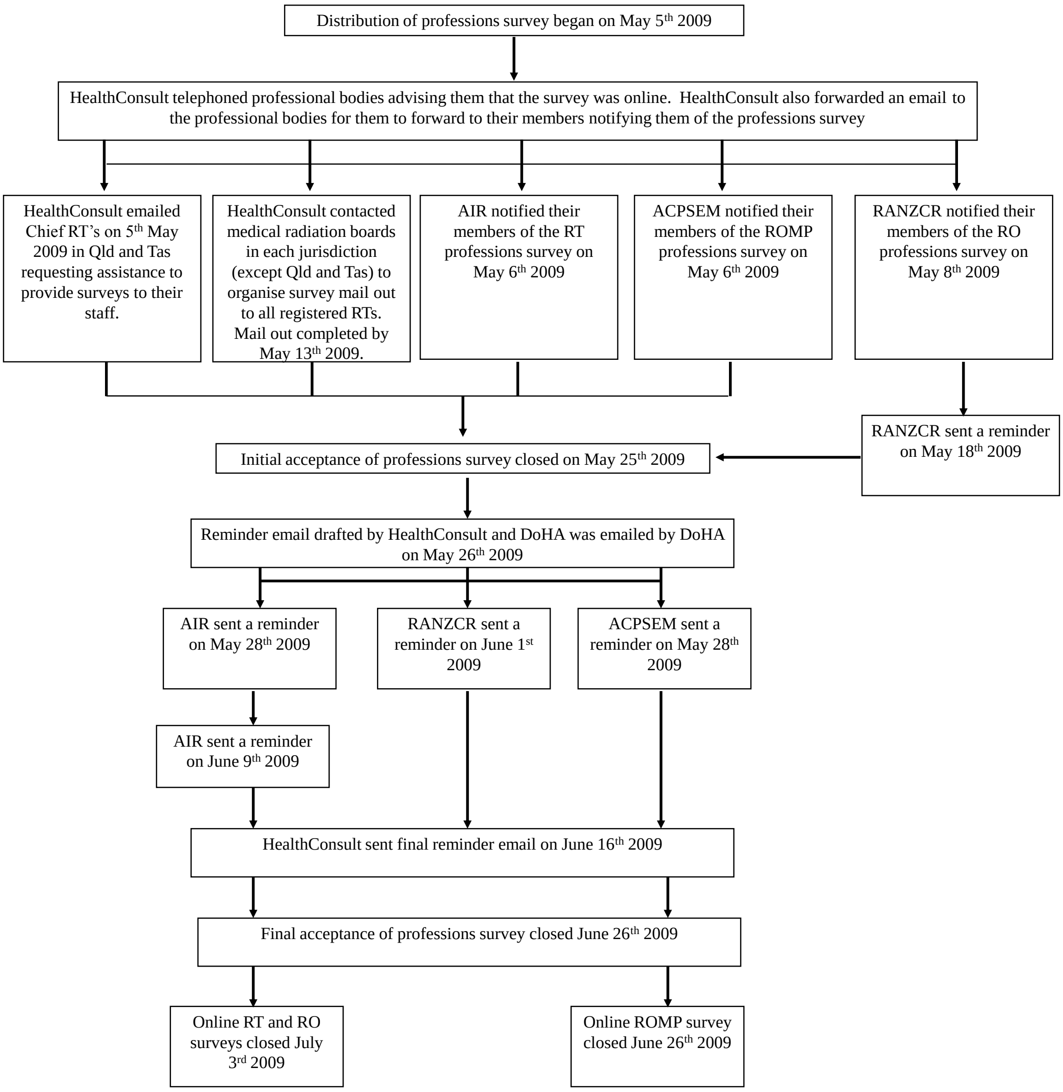


The project team consulted the three professional bodies (RANZCR, AIR and ACPSEM) prior to any survey development asking them to contribute and assist in the development of the professions surveys. The surveys went through two drafting stages and the relevant professional bodies were consulted at each stage before the final survey was ready for distribution on May 4th 2009. The three professions surveys were distributed via their respective professional bodies from May 5th 2009. Additional arrangements were made for distributing the survey to RTs as AIR membership is not compulsory and the take up rate (AIR estimated that only 60% of RTs are members) would not give sufficient coverage of the RT workforce if only the AIR mailing lists was used.

To compensate for this problem, the project team contacted the medical radiation registration and/or licensing boards in each jurisdiction to organise a mail out of surveys to all registered RTs in Australia. Medical radiation registration and/or licensing boards in each jurisdiction except Queensland and Tasmania cooperated and a survey was sent via Australia Post to all RTs registered on their mailing lists. The Queensland Medical Radiation Board was unwilling to participate and Tasmania Registration Board stated they did not have the facilities to assist. Instead, the Chief RTs at all facilities in these States were contacted and they cooperated with the project team to ensure that their staff had access to the survey.

Figure 3.4 diagrammatically depicts the distribution and collection process for all three professions surveys.

Figure 3.4: Professions survey distribution and collection process



Initially the professions surveys due date was May 25th 2009, however due to the low response rate from ROs and RTs the survey deadline was extended to the 26th June 2009. Reminders were sent out intermittently by DoHA Project Officers, the professional bodies and the project team during June. The ROMP survey was removed from the web on 26th June 2009, followed by the RO and RT surveys on July 3rd 2009.

3.3 CASE STUDIES

The project methodology provided for visits to 20 radiation oncology facilities around Australia. In accordance with the project brief, one facility for each private sector ownership group (a total of nine services) was visited and the remaining 11 case study sites were in the public sector. The public sector facilities were nominated by State/Territory Health authority representatives. Table 3.1 lists the 20 radiation oncology facilities visited.

Table 3.1: Radiation oncology facility case study sites

No	Jurisdiction	Sector	Name of facility	Date
1	ACT	Public	The Canberra Hospital	Thursday 23rd July 2009
2	NSW	Public	Royal Prince Alfred Hospital	Thursday 6th August 2009
3	NSW	Public	Macarthur Cancer Therapy Centre	Tuesday 2nd June 2009
4	NSW	Public	Illawarra Cancer Care Centre	Monday 29th June 2009
5	NSW	Private	Sydney Radiotherapy and Oncology Centre	Wednesday 1st July
6	NSW	Private	Riverina Cancer Care Centre	Wednesday 6th May 2009
7	NSW	Private	Radiation Oncology Associates (Mater)	Thursday 13th August 2009
8	Queensland	Public	Royal Brisbane and Women's Hospital	Thursday 25th June 2009
9	Queensland	Public	Townsville Cancer Centre	Wednesday 24th June 2009
10	Queensland	Private	Premion (Wesley)	Thursday 18th June 2009
11	Queensland	Private	St Andrew's Toowoomba Hospital	Friday 26th June 2009
12	SA	Public	Royal Adelaide Hospital	Friday 29th May 2009
13	SA	Private	Adelaide Radiotherapy Centre	Thursday 28th May 2009
14	Tasmania	Public	WP Holman Clinic (Launceston)	Thursday 8th July
15	Victoria	Public	William Buckland Radiotherapy Centre	Friday 10th July
16	Victoria	Public	Peter MacCallum Cancer Institute East Melbourne	Wednesday 22nd July
17	Victoria	Private	Radiation Oncology Victoria (East Melbourne)	Monday 13th July 2009
18	Victoria	Private	Tattersalls Cancer Centre	Monday 13th July 2009
19	WA	Public	Sir Charles Gairdner Hospital	Thursday 11th June 2009
20	WA	Private	Perth Radiation Oncology Centre	Wednesday 10th June 2009

Each case study involved a site visit for two to three hours by two project team members. Each case study site was contacted by a member of the project team and provided with a copy of the case study framework (see Appendix F) which outlined the suggested program for each of the visits. The key meetings held included:

- **Meeting with the Facility Director/Manager (and/or proprietor(s) in the case of private facilities).** These meetings provided the project team with an overview of the service and the issues related to workforce planning. It also enabled us to discuss and resolve any issues associated with completion of the facilities survey.
- **Meeting(s) with the heads of radiation oncology, radiotherapy and medical physics.** These meetings covered the detailed issues with regards to the numbers (actual and desired) of professionals in each discipline, the recruitment and retention issues and the emerging service delivery issues and their impact on workforce needs.
- **Focus Group workshop for ROs, RTs, medical physicists and services managers working at the facility.** These meetings enabled all staff in the three key disciplines to contribute their views on workforce planning issues and their ideas on strategies that might be used to address the issues.

Some facilities organised individual meetings with the Facility Director, heads of radiation oncology, radiotherapy and medical physics. Other facilities chose to have separate 30-60 minute meetings with each. Not all facilities were able to organise focus groups with staff as service delivery would have been compromised. The qualitative information about issues related to workforce planning collected from the case study site visits supplemented the data collected through the professions' and facilities' surveys.

3.4 STAKEHOLDER CONSULTATIONS

Qualitative data and information from state/territory health authorities, professional and industry bodies, universities and other government departments was also sought to inform the workforce planning study. This section provides an overview of the stakeholders consulted.

3.4.1 Government departments

As the project team travelled around the country to conduct the case studies we met with representatives of the state/territory health authorities and Cancer Australia. Consistent with the project brief, these meetings had a specific focus on the workforce planning approaches being used to address the issues in each State/Territory Health authority. We also worked through the 'issues to be discussed' section of the case study framework (see Appendix F) to ensure that we had the perspective of the State/Territory Health authority representatives on all of the issues being addressed by the study. A list of the individuals consulted is provided in Table 3.2.

Table 3.2: Consultations with state/territory health authorities and Cancer Australia representatives

Jurisdiction	Consulted	Date
Cancer Australia	David Currow	23rd July 2009
NSW	Kathy Meleady and Cathryn Cox	13th March 2009
	Cathryn Cox and Tina Ford	28th July 2009
Victoria	Dr Jacqueline Martin	6th March 2009
	Dr Jacqueline Martin and Connie Spinoso	10th July 2009
Queensland	Maureen O'Connor and Nischal Sahai	4th March 2009
	Dr Liz Kenny	15th July 2009
Western Australia	Rhonda Coleman and Meryl Cruickshank	3rd March 2009
	Rhonda Coleman	20th July 2009
South Australia	Jo Hoiles	13th March 2009
ACT	Ewe Lam, Sean Geoghegan and Ben Cooper	12th March 2009
Tasmania	Paul Greeves and Grant Smith	12th March 2009
Northern Territory	Therese Verma and Dr Michael Penniment	12th March 2009
	Therese Verma	12th June 2009

3.4.2 Professional bodies

The project team made early contact with representatives of the RANZCR, AIR, and ACPSEM as their assistance was required to design and conduct the professions surveys. The objective of the first contact was to introduce the study and obtain support for the survey and information gathering processes. The project team worked closely with the professional body representatives in the design and distribution of the surveys, and in the collection of the resultant data. The professional body representatives gave the project team documentation including previous surveys that had been distributed to their members. Table 3.3 lists the key meetings with representatives of the professional body representatives, however there were frequent additional phone and email exchanges which are not represented in Table 3.3.

Table 3.3: Consultations with professional body representatives

Professional Body	Consulted	Date
RANZCR	Professor Chris Milross, Rowena Amin and Kate Lloydhope	24th February 2009
	Professor Chris Milross, Associate Professor Michael Barton, Rowena Amin and Kate Lloydhope	24th March 2009
ACPSEM	Professor Tomas Kron and Jim Crabb	6th March 2009
	John Doody	4th March 2009
AIR	David Collier and Leigh Smith	6th March 2009
	Radiotherapy Advisory Panel to AIR including Leigh Smith, Anthony Arnold, Greg Rattray, Jennie Baxter, Helen Tubb and Debbie Howson	1st April 2009
	Sharon Brackenridge (undertaking review of PDY)	11th August 2009

3.4.3 University Departments

The project team contacted all universities in Australia that offered a Master of medical physics course, or an undergraduate or postgraduate course in radiotherapy. Consultations were held either face-to-face or via teleconference. The focus of the discussions was on the current and future numbers of graduates from the relevant disciplines and any plans to further develop/change the curriculum and or quotas that may impact of the graduating numbers. Table 3.4 provides a list of stakeholders contacted at the relevant universities.

Table 3.4: Consultations with University representatives

University	Course	Consulted with	Date
University of South Australia	Bachelor of Radiotherapy	Eileen Giles and Kerry Thoirs	28th May 2009
	Masters of Medical Physics	Judith Pollard	29th July 2009
University of Sydney	Bachelor of Radiotherapy	Natalie Charlton	9th June 2009
	Masters of Medical Physics	Professor Clive Baldock	29th June 2009
The University of Newcastle	Bachelor of Medical Radiation Science	Shane Dempsey	30th July 2009
Queensland University of Technology	Bachelor of Radiotherapy	Pamela Rowntree	25th June 2009
	Masters of Medical Physics	Andrew Fielding	25th June 2009
RMIT	Bachelor of Radiotherapy	Meg Chiswell	Email exchange
	Masters of Medical Physics	Dr Rick Franich	30th July 2009
Monash University	Masters of Radiotherapy	Marilyn Baird	8th July 2009
University of Wollongong	Master of Medical Radiation Physics	Ass/Prof Bill Zealy	29th June 2009

4

Radiation Oncology Workforce Planning in Australia

This chapter examines the status, as at July 2009, of radiation oncology workforce planning in Australia. As well as defining the concept of workforce planning, previous studies of the radiation oncology workforce are summarised, as are the current initiatives of the State Health Authorities, the professional colleges, and other stakeholders with respect to the radiation oncology workforce.

4.1 WHAT IS WORKFORCE PLANNING?

Workforce planning is the systematic assessment of future human workforce needs and the determination of the actions required to meet those needs[79]. Workforce planning for health is therefore the process of estimating the required health workforce to meet future health service requirements and the development of strategies to meet that need. It may occur at many levels; international, national, state or regional and organisational. The 2002 review of national medical workforce planning in Australia defined health workforce planning as being about planning for the future supply and distribution of properly educated and trained practitioners to best meet the population's need for quality health services, which is part of the broader continuum of overall health services planning and policy development[80].

Workforce planning in the health sector is not an exact science, but rather an attempt to predict and determine the future on the basis of information available in the present[81] . Nor, in the health context, is it an easy task to determine the balance between the supply of labour and the need for labour, or the policies and strategies that need to be employed to correct for any imbalances, both current and expected. Factors such as the long lead time required to produce a fully qualified health practitioner, the range of different occupations for which health professionals can be trained, changes in national health policy, the various institutional frameworks within which practitioners operate, the complexities associated with the determination of need, the unknown effects of more and better health care technology, and a lack of relevant, reliable information can all work to frustrate the workforce planning process[82,83,84,85]. Accordingly, health workforce planning is seen as an evolutionary activity of constant assessment, analysis, validation and renewal.

[79] Ripley, David E. (1995), 'How to determine future workforce needs', *Personnel Journal*, January, pp 83-89
[80] Australian Health Ministers' Advisory Council (2002), *Tomorrow's Doctors – Review Of* The Australian Medical Workforce Advisory Committee, Canberra
[81] ibid
[82] Australian Medical Workforce Advisory Committee (2000), 'Medical workforce planning in Australia', *Australian Health Review*, 23 (4), pp. 8-26
[83] Goldacre, M. (1998), 'Planning the United Kingdom's medical workforce', *British Medical Journal*, 316, pp. 1846-47
[84] Duckett, Stephen (2000), 'The Australian health workforce: facts and figures', *Australian Health Review*, 23, (4), pp. 60-77
[85] Borland, Jeff, (2002), 'The markets for medical specialists in Australia' in Productivity Commission (Australia), *Health Policy Roundtable: Supplier–Induced Demand and Occupational Regulation*, Melbourne, pp. 245-292

4.2 PREVIOUS WORK ON RADIATION ONCOLOGY WORKFORCE PLANNING

Many reports[86,87] and reviews have looked at radiation oncology in Australia over the past 20 years. These reports have highlighted the same issues, in particular workforce and equipment shortages, a widespread lack of understanding of the effectiveness of radiotherapy, and a poor access to radiation oncology facilities by rural Australians. Despite all these reports having similar conclusions, many of the problems continue. This section provides a brief overview of some of these reports and their findings and recommendations that are relevant to workforce planning for radiation oncology.

4.2.1 AHTAC review of radiation oncology services

The Australian Health Technology Advisory Committee (AHTAC) undertook a major review of radiation oncology services in 1996 and made a number of recommendations with respect to infrastructure and specialist workforce requirements for a sustainable radiotherapy sector[88]. Among those recommendations were:

- future planning to be based on a referral rate of 50 to 55%;
- minimum equipment requirements for radiation oncology facilities to be revised regularly in light of technological development;
- progressive expansion of radiotherapy facilities to allow for continuing growth in need for services;
- increased RO and trainee positions to be established;
- regular review of requirements for the RT workforce;
- review of the staffing requirements for medical physicists in radiation oncology;
- national minimum qualifications for medical physicists in radiation oncology; and
- introduction of medical physics training positions.

The AHTAC report was endorsed by the National Health and Medical Research Council (NH&MRC) in 1996, and subsequently endorsed by the Commonwealth Minister for Health and Aged Care. As can be seen, many of the recommendations of that AHTAC report continue to be relevant to the current issues in planning the radiation oncology workforce.

4.2.2 AMWAC review of the specialist radiation oncology workforce in Australia

The Australian Health Ministers' Advisory Council (AHMAC) established the Australian Medical Workforce Advisory Committee (AMWAC) to advise on national medical workforce matters, including workforce supply, distribution and future needs. As part of the 1997-98 AMWAC work plan, AHMAC requested a report on the specialist radiation oncology workforce. An AMWAC Radiation Oncology Workforce Working Party was established as a sub-committee of AMWAC and was asked to provide a report on the optimal supply and appropriate distribution of radiation oncology specialists across Australia, including projections for future requirements. The report was presented to AHMAC in 1998[89].

The Working Party analysed existing data sources and undertook consultation with relevant persons and organisations, in order to make informed comments on the factors affecting the current and future market for radiation oncology services. The Working Party recommended:

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[86] Baume P. *Radiation Oncology Inquiry. A vision for radiotherapy*. Canberra, ACT: Commonwealth of Australia, 2002
[87] National Strategic Plan For Radiation Oncology (Australia) (2001)
[88] Beam and Isotope Radiotherapy, AHTAC Report, December 1996
[89] Australian Medical Workforce Advisory Committee. (1998). The specialist radiation oncology workforce in Australia : supply and requirements 1997-2007. Sydney, NSW.

- there be an increase in the number of funded radiation oncology training positions and trainees;
- that State/Territory health departments undertake negotiations with the RANZCR Faculty of Radiation Oncology for the establishment of an additional 12 training positions;
- that State/Territory health departments develop strategies for the provision of megavoltage machines and other infrastructure requirements in the light of the recommended increase in the workforce and taking account of the recommendations of the NHMRC AHTAC report on Beam and Isotope Radiotherapy (1996);
- that State/Territory health departments and the RANZCR Faculty of Radiation Oncology co-ordinate the establishment of the new training positions and oversee the introduction of any short term measures they may feel are necessary to meet localised service shortfalls;
- that radiation oncology requirements and supply projections be monitored regularly so that they can be amended if new trends emerge, particularly if the anticipated infrastructure expansion is not met and that a full review of the workforce be conducted again in five years; and
- that this monitoring be coordinated by the RANZCR Faculty of Radiation Oncology and AMWAC and the results incorporated into the AMWAC annual report to AHMAC.

Implementation of many of these recommendations has been an important part of the foundation on which Australia's current radiation oncology services, and more specifically RO workforce, is built.

4.2.3 National Strategic Plan for Radiation Oncology

The RANZCR Faculty of Radiation Oncology (FRO) commenced a national strategic planning process for radiation oncology in November 2000 in conjunction with the ACPSEM and the AIR. The report[90] outlined the status of radiation oncology services within Australia and recommended a national strategic plan to increase the infrastructure to allow for a 50% treatment rate of cancer patients with radiotherapy. It also identified a number of trends in the industry including:

- the radiation oncologist, RT and radiation oncology physicist workforce is inadequate to meet the benchmark levels of service provision;
- existing training programs for ROs, RTs and radiation oncology physicists are inadequate to meet present needs;
- training programs in radiation oncology physics need to be more formally established and recognised;
- there are high vacancy rates amongst RTs and radiation oncology physicists with indications of increasing attrition rates within both professions;
- the equipment base is both inadequate and ageing with half of the linear accelerators in the public sector requiring replacement now or in the next two years;
- specific replacement policies for equipment in the public sector are uncommon;
- there are substantial variations in levels of specialist staff and equipment across the nation;
- a significant number of treatment machines are underutilised due to staff shortages; and
- significant variations exist in the capacity of linear accelerators with regard to advanced features designed to enhance safety, efficiency and quality of treatment: older equipment is less likely to have these features.

[90] National Strategic Plan for Radiation Oncology, 2001. The Tripartite Committee, The Royal Australian and New Zealand College of Radiologists. Available at <http://www.ranzcr.edu.au/>

The report stated that "over 10,000 people with cancer who could benefit from treatment did not receive radiotherapy in 2000. If current infrastructure trends continue, this figure may increase to 20,000 by 2005"[91]. The report also identified strategies to create a sustainable sector which included:

- increasing the awareness of the benefits of radiation treatment among the medical profession, and within the lay community and government;
- promotion of a National Planning and Implementation Group networking with State and Territory based planning groups;
- linking the number of ROs, RTs and radiation oncology physicists to a population needs basis as defined in the paper;
- linking the equipment expansion with the growth in the workforce;
- modernising the equipment infrastructure;
- facilitate the development of processes that realise the expansion of the radiation oncology trainee program in line with AMWAC recommendations;
- advocate for reform and expansion of the training programs in radiotherapy and radiation oncology physics;
- facilitate the attraction of RTs and radiation oncology physicists back into the workforce;
- advocate for the review of career structures to make it more attractive to retain staff within the workforce;
- remove the barriers to financial self-sustainability of the sector by revising the Price Waterhouse Coopers cost model with appropriate staffing levels in line with an accreditation model; and
- removing the financial barriers to expansion of radiation oncology services into new sites taking into account the cost of the physical establishment and start up period (acknowledging the current moratorium on rural sites).

As can be seen, there is a degree of similarity in the issues covered, and the recommendations made between the AHTAC, AMWAC and the RANZCR Tripartite Committee reports, with the later document covering a broader range of issues.

4.2.4 Baume Inquiry - A vision for radiotherapy

In response to an announcement made by the Australian College of Radiologists claiming that up to 10,000 cancer patients are missing out on radiotherapy the then Health Minister, Dr Michael Wooldridge, announced a national inquiry into radiation treatment. The inquiry was chaired by the Chancellor of the Australian National University - former Liberal Health Minister - Professor Peter Baume. In June 2002, the Radiation Oncology Inquiry (ROI), delivered its report, *A vision for radiotherapy*[92]. The ROI made 96 recommendations, of which there were five major recommendations. One of these related to workforce and was to "take steps to improve workforce numbers by providing a better career path for RTs and medical physicists, with better remuneration and recognition for their roles. The number of entrants to these professions must also be increased. That is, we must increase simultaneously recruitment to, and reduce attrition from, the workforce".

[91] ibid., p7

[92] Baume P, chairperson. Radiation Oncology Inquiry. A vision for radiotherapy. Canberra, Commonwealth of Australia, 2002. Available at: www.health.gov.au/roi/inquiry/report.htm.

Many of the recommendations of the Baume Inquiry have been implemented, resulting in considerable development in radiation oncology services around Australia. Nonetheless there are still concerns that not all cancer patients who stand to benefit from the use of radiotherapy at some time during their disease trajectory are receiving that treatment. Delaney et al[93] have estimated that based on current evidence, the best practice proportion is 52.3%, and the RANZCR recently stated that the proportion of patients with cancer who receive radiotherapy remains on average at about 35%[94]. This workforce planning study and its associated data collection provides an important opportunity to assess the situation some seven years on from the Baume Inquiry and determine the exponent to which workforce issues are a barrier to improving the access of patients with cancer to radiotherapy.

4.3 STATE/TERRITORY APPROACHES TO WORKFORCE PLANNING

This section presents information on the State/Territory Health Authorities plans and initiatives relating to radiation oncology workforce planning. It was constructed by reviewing publically available documentation, including State/Territory Cancer Plans, and consulting with, and reviewing material provided by, State/Territory Health authority representatives.

4.3.1 New South Wales

Unlike other jurisdictions, NSW Health has for many years collected comprehensive data on radiotherapy equipment, staffing, treatment and source of referral from all radiotherapy facilities, both public and private, in NSW. Data are collected and processed using the NSW Radiotherapy Management Information System (RMIS) which is managed by the Statewide Services Development Branch within the NSW Health Department. Data from the contributing centres is provided annually (calendar year). In addition, quarterly reports on filled and vacant medical physicist positions and half yearly reports on filled and vacant RT positions are submitted.

NSW Health accepts the nationally agreed planning parameter for radiotherapy services that indicates that 52.3% of new cancer patients would benefit from treatment with radiotherapy. The parameters used by NSW Health to inform radiotherapy service planning are a 25% retreatment rate; 19 attendances per treatment course; 4.1 attendances per hour; 8 operating hours per day; and 240 working days per annum. Use of these parameters results in an expected throughput of 414 courses per linac per year, inclusive of 331 new courses per year.

As a result of the radiation oncology workforce shortages reported by the national Radiation Oncology Inquiry in 2002, NSW Health has pursued a number of workforce development strategies in the three key professions. The key strategies for ROs include:

- funding a number of advanced trainees in RO positions since 2002 with the aim of improving the recruitment and retention of the specialists; providing opportunities for increased rotation and exposure to practice in a rural setting; and improving career opportunities for trainees wishing to practice in a rural setting;
- developing two Registrar Training Networks so registrar rotations will be more efficient;

[93] Delaney G, Jacob S, Featherstone C and Barton M (2005). The role of radiotherapy in cancer treatment: Estimating optimal utilization from a review of evidence-based clinical guidelines. *Cancer*, Volume 104, Issue 6

[94] RANZCR Faculty of Radiation Oncology Submission to The National Health and Hospitals Reform Commission (NHHRC) on its Terms of Reference and Draft Principles for Australia's Health System (May 2008) http://www.nhhrc.org.au/internet/nhhrc/publishing.nsf/Content/159/$FILE/159%20RANZCR%20Faculty%20of%20Radiation%20Oncology%20Submission.pdf

- partnering regional facilities with metropolitan services to improve professional practice and support networks (currently pursuing for the new Orange facility);
- reviewing the area wide medical credentialing program (to ensure that ROs are appropriately skilled for the local practice setting); and
- recognising that continuing planning for the RO workforce will need to consider the current age profile as well as the trend towards sub-specialisation.

For radiation therapists key strategies include:

- overseas recruitment strategy in the early 2000's that assisted in dropping the RT vacancy rate from about 25% to 2%;
- funding 50 professional development year (PDY) positions and planning to continue with the PDY support;
- developing and embedding educator/tutor positions as part of the staffing complement in each public facility;
- improving salary packages and career structure;
- supporting trained RTs to re-enter the workforce; and
- supporting additional university places;

For radiation oncology medical physicists, NSW Health has been particularly active with the key strategies including:

- first Australian jurisdiction to implement the Training, Education and Accreditation Program (TEAP) to ensure an adequately skilled and expert workforce;
- providing funding to establish super numerary trainee positions for medical physicists (currently looking to increase number of ROMP registrar positions);
- increasing salary for accredited ROMPs (has improved retention rates);
- establishing a clinical placement coordinator (for registrars);
- funding a Chair of Medical Physics at University of Sydney (currently under review);
- funding for scholarships and continuing professional development including supporting attendance at overseas conferences;
- overseas recruitment programs including funding for airfares and accommodation support;
- currently examining the establishment of a peer support program with WA (would assist in addressing shortage of ROMP staff in WA); and
- developing a preceptor position with funding provided by DoHA (recruitment is in progress, but proving difficult).

In addition NSW Health keeps in contact with relevant staff at the Universities through having them participate on an Advisory Committee.

Through discussion with representatives of NSW Health a number of issues impacting on workforce development and planning were identified including:

- medical physicists are not currently on the "migration on demand" list which means there are delays in recruiting overseas trained ROMPs into Australia;
- there is a shortage of senior ROMPs in NSW, thereby increasing the risk of incidents;
- there are current difficulties in recruiting ROMPs in some regional areas;
- there are opportunities for RTs to get positions in NSW but many do not want to move outside of Sydney; and

- the University of Sydney has changed their RTs course to a postgraduate program which will result in a short term reduction in graduates that may be dealt with by University of Newcastle increasing their intake.

It is also important to note that concurrent with this workforce planning study, the NSW Auditor General undertook a performance review of radiotherapy services in NSW. In June 2009, NSW Health was presented with the Auditor General's report entitled[95] 'tackling cancer with radiotherapy". The objective of the audit was to determine how well NSW Health manages the provision and delivery of radiotherapy services. The audit looked specifically at whether services are located where they are needed and are adequately staffed, and that resources are properly utilised. Specific conclusions relating to workforce planning included:

> *"generally there seemed to be enough staff, but that staffing levels varied considerably. We found that there have been workforce shortages, both nationally and internationally, that in the past have resulted in reduced productivity of radiotherapy machines. NSW Health undertook a number of strategies to address the situation and in recent years NSW vacancy rates have declined. These efforts need to be sustained to ensure adequate staffing into the future."*
>
> *We observed that centres appear to have quite different staffing levels when related to the throughput achieved. The reasons for such variations were not clear, but could be due to more complex treatments, more training commitments and more involvement in research. NSW Health needs a process to analyse this and establish the staffing required at each centre."*

The report made 16 recommendations, four of which related directly to development of the radiation oncology workforce in NSW. These recommendations are repeated below along with the NSW Health response[96]:

- *"develops a workload measure by June 2010 that facilitates comparison of centres with different case-mixes and different techniques."*
  - NSW Health responded "Supported. A Basic Treatment Equivalent model has been used previously with variable uptake by individual ROTCs";
- *"analyses by December 2010 the variations of current staff levels between radiotherapy centres and develops staffing profiles for each centre which reflect volume, case-mix and complexity."*
  - NSW Health responded "Supported with qualification. Implementation will be dependent on resources to undertake review";
- *"establishes by June 2010 more realistic five year and 10 year treatment benchmarks for each Area Health Service as a basis for assessing performance and planning the expansion of facilities."*
  - NSW Health responded "Supported. Implementation will be facilitated through the AHMAC Radiation Oncology Reform Implementation Committee";
- *"develops and publishes by June 2010 a 10 year strategic plan for radiotherapy services, noting that the progress of its implementation will be determined by resource and funding availability."*
  - NSW Health responded "Supported.

[95] Auditor-General's report (2009), Tackling cancer with radiotherapy, NSW Department of Health.
[96] ibid., pp 12-13.

4.3.2 Victoria

The Victorian Radiotherapy Service Plan[97] was developed in 2006-07 as part of a national initiative for all States/Territories to develop five-year strategic plans in radiotherapy. The Plan takes the Integrated Cancer Services (ICS) as its focus and models demand for radiotherapy across each ICS to 2011. The plan also seeks to identify longer-term requirements for radiotherapy in Victoria by continuing forecasts at five-year intervals through to 2021. Service requirements were modelled using parameters agreed upon by Victorian radiotherapy service providers and forecasts of cancer incidence provided by the Victorian Department of Human Services (DHS). Facilities in both the public and private sectors were taken into account. The projections were based on the following parameters:

- population projections to 2011 (calculated using a 1.8% annual increase in cancer incidence – as calculated for the NSW population by Coory and Armstrong in 1998);
- rate of 52% of new cases of cancer receiving radiotherapy;
- rate of 25% of new cancers requiring re-treatment; and
- average of 18.5 attendances per course; 4.1 attendances per hour; operating 8.5 hours per day; working 240 days per year resulting in 450 courses per linac per year.

Application of these parameters resulted in a prediction of 39 linacs in 2006 and 44 linacs in 2011 being required in Victoria (note these projections can be compared to the actual number of 36 linacs operating as at 31st December, 2008 derived from the facilities' survey). To ensure that future radiotherapy service planning is based on accurate information, and to inform ongoing quality and efficiency measures, one outcome of the planning process was a decision that the Radiotherapy Minimum Dataset established for the National Radiotherapy Single Machine Unit Trial Evaluation (at Ballarat) should be continued and expanded to include all Victorian radiotherapy services. It is understood that data collection commenced in December 2008 in the four public radiotherapy facilities.

Discussions with representatives of the DHS revealed that the Service and Workforce Planning Branch in the Policy and Strategic Projects Division is currently undertaking a project to inform workforce planning and policy in Victoria. The project aims to obtain a better understanding of the workforce that delivers medical radiation services and develop informed expectations about the workforce requirements to meet future demand for these services. It is focusing on the medical physicist, medical radiation technologist, and medical specialist workforces involved in the delivery of radiation oncology, diagnostic imaging and nuclear medicine services, in both the public and private sectors, in Victoria. The project includes the collection, analysis and modelling of comprehensive and accurate data on the current and future demand and supply of medical specialists, medical radiation technologists and medical physicists in the public and private sectors in Victoria.

DHS expects that the information collected will identify key workforce issues, demographics, current shortages, and expected future challenges. An extensive environmental analysis is also being conducted to investigate the factors that influence demand and supply for these workforces. Projections that forecast the workforce market trends will be conducted to understand the ongoing adequacy and capacity of the workforce to meet demand, and to guide strategic workforce planning decisions now and into the future. The project completion date is expected to be November 2009.

[97] DHS (2007) Victorian Radiotherapy Service Plan http://www.health.vic.gov.au/radiotherapy/radiotherapy-service-plan06-11.pdf

Discussions with DHS' representatives and other stakeholders (clinicians working in public sector facilities and representatives of the relevant Universities) identified a number of other radiation oncology workforce initiatives undertaken in Victoria including:

- DHS funds RT intern year (equivalent to PDY in other jurisdictions) with "top up" from hospital budgets;
- funding for training wage for second year placements of the Monash University post graduate RT program;
- support for RT educator at each public facility to coordinate the training for clinical placements and interns (PDYs), and to enable continuing professional development (CPD) for staff;
- CPD funding provided in 2005-06 so that RTs or ROMPs can undertake an education activity e.g. attend conferences;
- an allowance of $10K available to support relocation to work/train in some regional areas (if all of $10K not needed to relocate balance can be used towards rental accommodation);
- ROMPs provided with an extra 10% in remuneration if they work in some regional areas;
- co-funding the ROMP registrar positions in public facilities so the registrar positions are fully funded by government (balance funded by DoHA);
- inclusion of some medical physics in the curriculum in the undergraduate physics course at RMIT to make students aware of the specialty;
- introduction of medical physics elective in the year 11 syllabus to assist in creating awareness of career opportunities; and
- investigations into the role of the nurse practitioner in radiation oncology.

Through discussion with stakeholders in Victorian radiotherapy facilities, it was identified that the staffing for the RMIT masters of medical physics program has just been reduced due to redundancies. This change had apparently placed pressure on the remaining university staff and adjunct staff that deliver the course. As a result there may be some reduction in the number of medical physics graduates from RMIT although in follow-up discussions RMIT representatives, the project team was advised that the redundant position may be reinstated next year. On that basis, the project team has not adjusted the forecasts of medical physics graduates from La Trobe (developed by the project team working with La Trobe University representatives using historical graduate numbers) used in the workforce planning model.

4.3.3 Queensland

The Queensland Statewide Cancer Treatment Services Plan states that "evidence indicates 52.3% of cancer patients may benefit from radiotherapy treatment"[98]. In the Plan it was estimated that, as at 2007, only about 32% of cancer patients in Queensland receive radiation treatment due to a lack of capacity and services. Given the recent expansion in statewide capacity, particularly in the private sector, Queensland Health estimates that this ratio is currently in the order of 40%. However, there remains a clear shortfall in the number of linacs in Queensland. There is planned growth of six to eight linacs by 2012, which will make a total of 34-36 linacs in Queensland.

As part of the Plan, Queensland Health has projected cancer services activity by area till 2016, based on the level of activity in 2006 (number of courses and number of patient attendances)

[98] Delaney GP, Jacob S, Featherstone C, Barton MB (2003) Radiotherapy in cancer care: estimating optimal utilisation from a review of evidence-based clinical guidelines. Collaboration for Cancer Outcomes Research and Evaluation, Liverpool Hospital, Sydney, Australia.

per linac, multiplied by the number of proposed new linacs for each Area. This process produces a projected total number of courses and patient attendances in each Area for 2011 and 2016. The calculated data for 2011 and 2016 are then scaled by the ratio of access hours available for these years in relationship to the hours for 2006. The access hours have been calculated based on the planned number of treatment units to be operational in each Area (for each year). It is assumed that each linac would be equated to eight hours of access, and no allowance has been made for the potential of multiple shifts per linac. The projections, as shown in Table 4.1, rely on the current services operating efficiently.

Table 4.1: Projected radiotherapy activity in Queensland 2006-2016

Parameter	2006	2011	2016
Total number of courses	6,531	9,988	12,203
Total patient attendances	118,340	178,095	217,764
Total fields treated	305,650	418,039	504,260
Average available daily machine hours	135	200	244

Source: Queensland Statewide Cancer Treatment Services Plan 2008-2017

Review of Table 4.1 shows that the projections suggest, with the planned level of investment, an expected 86.8% increase in the number of courses statewide between 2006 and 2016, and an 84.0% increase in the number of patient attendances statewide between 2006 and 2016. Associated with these service estimates, Queensland Health has also undertaken workforce projection modelling for the three key professional groups as shown in Table 4.2.

Table 4.2: Radiation oncology disciplines total workforce projected needs

Professional group	2005 (actual)		2011 (projected)		2016 (projected)	
	Public	Total	Public	Total	Public	Total
ROs*	26	43	32	50	37	56
RTs	182.3	300	203-212	297-339	256-263	365-390
ROMPs	35	n/a	41-43	60-68	49-53	73-78

* Data for ROs projected for 2006; Source: Queensland Statewide Cancer Treatment Services Plan 2008-2017, p 185 - 188

The Statewide Cancer Treatment Services Plan states that the 30.2% increase in the RO workforce represents the minimum number of specialist staff required to provide direct cancer services. The document goes on to state that the numbers may be influenced by future changes in cancer incidence, prescribed treatment regimes, models of care and/or skill mix as well as any change to the proportion of work in the private sector, particularly in palliative medicine. Related responsibilities such as provision of outreach services, clinical supervision, training and research were not factored into public-sector workforce planning.

For RTs, the anticipated total (public and private combined) workforce in Table 4.2 was calculated by examining the 2005 workforce, adding expected graduate numbers and subtracting the number anticipated to retire within the next six years. A ratio of 8.48[99] FTE per linac was then applied to determine projected requirements. Based on this information it was anticipated that Queensland may have a surplus RT workforce in 2011 but the public sector workforce needs and locations outside South East Queensland may not be met.

For ROMPs, Queensland Health acknowledges the benchmark of 1.7 ROMPs per linac is recommended by the National Strategic Plan for Radiation Oncology 2001[100]. However,

[99] Royal Australian and New Zealand College of Radiologists, Australasian College of Physical Scientists and Engineers in Medicine, and Australian Institute of Radiography. National Radiation Oncology Strategic Plan. Sydney: RANZCR, 2001
[100] ibid.

although desirable, aiming for this figure was thought to be unachievable by the Queensland Cancer Physics Collaborative in 2007 due to existing shortages and need to expand services. Instead the Collaborative suggested planning for a current ratio of 1.2 ROMPs per linac whilst aiming to steadily increase the ratio over the ensuing years. In line with this recommendation, the projected workforce need for ROMPs in Table 4.2 is based on the existing workforce and then applying the benchmark of 1.2 FTE ROMPs per linac. Even with this method, it was forecast that an increase of more than 100% was needed from 2006 to 2016.

Discussions with representatives of Queensland Health indicate that current workforce initiatives for ROs include:

- creation of two radiation oncology advanced trainee (fellowship) positions since 2006 with the aim of improving the recruitment and retention of radiation oncology specialists;
- 15 Radiation Oncology registrars in training and two new positions created as at July 2009 – one of these new positions is for Townsville to support regional service development.
- reviewing the medical specialist credentialing program;
- overseas recruitment of ROs to strengthen the current workforce - two positions filled in Townsville using this strategy; and
- improved salary packages.

For RTs key strategies include:

- permanent state funding to support up to 21 professional development year (PDY) positions and plans to continue with the PDY support;
- developing and embedding educator/tutor positions as part of the staffing complement in each public facility;
- improving salary packages and career structure;
- developing a framework to support trained RTs to re-enter the workforce;
- State funded RT research position established to build research capacity in the RT profession; and
- access to the Allied Health Learning and Development initiative which includes funding for research fellowships, funding for attendance to present at international conferences and mentoring programs.

For ROMPS key strategies include:

- implementation of the TEAP to ensure an adequately skilled and expert workforce;
- providing funding to establish three super numerary trainee medical physicist positions from 2006 and increasing this number by an additional four positions as from 2010;
- improving salary packages and career structure;
- established and implemented a clinical placement coordinator position (for registrars);
- funding a Cancer Physics Collaborative at Queensland University of Technology (to promote clinical research amongst other activities);
- funding for scholarships;
- overseas recruitment programs as required;
- appointment to a preceptor position with funding provided by DoHA; and
- access to the Allied Health Learning and Development initiative which includes funding for research fellowships, funding for attendance to present at international conferences and mentoring programs.

The discussions with Queensland Health representatives also revealed a number of issues relating to workforce planning and development including:

- difficulty in recruiting ROMPs to regional areas; and
- difficulty in providing supervision for the ROMP training program due to supervisory requirements and length of program – a strategy to address this issue is now being implemented in partnership with ACPSEM.

4.3.4 Western Australia

The WA Health Cancer Services Framework (October 2005)[101] states that "WA has some strategies in place and has invested in a range of initiatives to promote retention and recruitment to these professions" (referring to RTs, ROMPs and ROs). WA acknowledges that the RANZCR has recommended 250 new cases a year as the acceptable workload for a radiation oncologist, and has stated that each application for additional staff will be considered based on current funding available taking the RANZCR benchmark staffing level into consideration.

WA also acknowledges that the AIR has recommended 1.06 RTs per operating hour as a linac staffing standard. The shortage of RTs in WA has been resolved by implementing a number of initiatives including short, medium and long-term contracts to overseas RTs, Department of Health (DOH) scholarships for WA students to train in South Australia; and some dedicated PDY positions to facilitate new graduates obtaining their professional accreditation. A long-term initiative for training RTs within WA in conjunction with Monash University in Melbourne has proved very successful with students rotating between the public and private facilities for their clinical practice while doing all their didactic work via distance learning.

WA also accepts the benchmark of 1.7 ROMPs per linac. The difficulty in WA is retaining senior ROMPs due to many factors including workload, overseas salaries and research opportunities in fully staffed centres interstate and overseas. A key factor in recruitment is the access to research, teaching and new technologies. WA has implemented a recruitment and retention allowance for senior qualified ROMPs in recognition of the essential role of this profession in the radiation oncology team.

Discussions with representatives of the DOH in WA indicate that current workforce initiatives for the three key professional groups include:

- two additional radiation oncology registrars were added to the training establishment one at RPH and one at SCGH;
- one additional RO added to the staffing establishment in the public sector and one in the private sector;
- recruitment of RTs from overseas (mainly from Canada, England, Ireland and South Africa) some coming on working visas and choosing to stay and successfully obtaining permanent residency;
- provision of a relocation costs reimbursement of $4,000 per RT as a short term incentive;
- three PDY positions created and additional PDYs taken with the help of Commonwealth funding many of which have been successful in obtaining permanent positions in WA.

[101] WA Health Cancer Services Taskforce, (2005), WA Health Cancer Services Framework, Department of Health, Western Australia

- two part time RT clinical preceptors established with partial funding from the Commonwealth to support students on undergraduate clinical placements from interstate, PDYs and up skilling of qualified staff;
- implementation of a career progression pathway for experienced RTs;
- providing rotation opportunities for RTs through all clinical areas to make them more likely to stay in WA; and
- offering a 20% salary loading to medical physicists as a recruitment and retention allowance, which also encouraged them to undertake ACPSEM accreditation.

The discussions with representatives of the DOH in WA also revealed a number of issues relating to workforce planning and development including:

- the remuneration in the collective agreement that can be offered is lower than that in other jurisdictions;
- long waiting lists for radiotherapy have been addressed by working extended hours;
- there are difficulties in recruiting ROs because of heavier workload and lower remuneration than in other jurisdictions;
- private operators struggle to get ROs because they cannot offer the support provided through having a registrar position or the resources to do research;
- have to rely on overseas recruitment for WA facilities and recruiting from overseas is slow due to Visa issues; and
- no local undergraduate training program for RTs or ROMPs as they are not considered financially viable in a geographically isolated state with a small population, however a medical physics course will start at the University of Western Australia next year with the support of DOH and the Commonwealth (DoHA).

4.3.5 South Australia

The SA Department of Health (SA Health) has developed a Radiation Oncology Service Plan. The planning process included the development of a workforce planning model that is based on assessing current workforce numbers against numbers of linacs to determine the workforce ratio currently utilised within South Australia[102]. This ratio can then be applied to future service planning information regarding number of linacs (derived from population and cancer incidence projections). Alternative staffing models were run based on benchmark ratios to inform the work of the Cancer Network Group.

Issues considered by SA Health in determining the size of this workforce include[103]:

- training the required numbers, including consideration of attrition;
- supervision of new graduates;
- employment of new graduates (some may need to be supernumerary until other resources are in place);
- retention of new graduates in SA; and
- integration of new technologies into the clinical setting.

As part of the development of the Radiation Oncology Service Plan, SA Health collated data on current number of linacs, utilisation, operating times and staffing (FTE) for the two South

[102] SA Department of Health, Unpublished Extract from Radiation Oncology Service Plan, provided by Jo Hoiles, SA Department of Health, 3rd March, 2009
[103] ibid.

Australian radiotherapy providers operating in 2008 (public facility - Royal Adelaide Hospital (RAH), and the private facility - Adelaide Radiation Centre (ARC)) to establish baseline information for the SA radiotherapy workforce.

The information provided showed qualified RT FTE to Linac hours ratios of 0.92 for the RAH and 0.95 for the ARC[104] both below the RTAP recommended ratio of 1.06. The analysis also showed that, based on 2006 cancer incidence projections, 18 FTE ROs were required in 2009 (compared to the 12 FTE working in SA radiotherapy services in 2008) to treat 50% of newly diagnosed cancer at the RANZCR recommended rate of 250 new cases per RO per annum. Finally the data established that the both radiotherapy facilities were operating below the benchmark of 1.7 ROMPs per linac.

The planning model was used to establish the state-wide need for the radiotherapy workforce. Three scenarios were run based on various assumptions. In conjunction with the Cancer Network Group one scenario was chosen for each discipline to be presented against linear accelerator numbers, with requirements estimated up to a state wide linear accelerator number of 16. A staged linac purchase schedule was anticipated and workforce requirements would increase in keeping with that schedule. SA Health stated that distribution between public and private sector would also contribute to requirement projections, as would changes to service delivery (i.e. hours of operation). Key assumptions included that the operating hours of the two services providing radiotherapy will continue as is the current situation and that the linacs are distributed equally between the two sectors (i.e. 50% public sector and 50% private).

Table 4.3 summarises SA workforce requirements for RTs and medical physicists. For RTs the AIR staffing model recommendation of 1.06 RTs FTE per LINAC hour (plus additional requirements based upon complexity) was used to determined workforce requirements. The additional complexities experienced within the public sector were not attributed to the private sector. For medical physicists, Formula 2000 was used in the public sector and existing ROMP staffing ratios were used in the private sector (Formula 2000 was not considered applicable to the private sector).

Table 4.3: FTE requirements for RTs and ROMPs in SA[105]

Professional discipline	Number of linear accelerators		
	11	14	16
RTs	122.5	155.2	177.4
Medical physicists	15.7	20.8	23.3

Table 4.4 summarises SA workforce requirements for ROs. The projected increase in cancer incidence between 2009 and 2011 and between 2011 and 2016 was used to forecast the need for ROs.

Table 4.4: FTE requirements for ROs in SA

Year	2009	2011	2016
ROs	12	15	20

Discussions with representatives of SA Health indicate that current workforce initiatives for the three key professional groups include:

[104] The ARC analysis of their radiation therapy staffing ratio returned a value of 1.06. The lower reported ratio (0.95) is a result of applying the AIR recommended staffing model which excludes RTs completing their post graduate, or intern year.
[105] Based on an anticipated purchase schedule from approximately 2010 onwards

- co-funding (with DoHA) ROMP registrars for the next three years;
- DoHA funding has been secured for an additional five PDY positions for RTs; and
- providing funding for the rollout out the workforce plan.

The discussions with representatives of SA Health also revealed a number of issues relating to workforce planning and development including:

- RT numbers were considered to be adequate and the additional PDY funded positions would further assist in maintaining the desired workforce; and
- currently experiencing a shortage in ROMPs; the additional registrar positions would assist although there is a long training time so a large registrar pool is required.

4.3.6 Tasmania

Tasmania does not have a published Cancer Plan. However, the Department of Health and Human Services has developed plans for radiation oncology workforce and facilities to 2016 based on the following parameters[106]:

- meeting the national benchmark referral rate of 52.3%;
- projected with cancer incidence growth of 2.5% from 2002;
- 250 new patients per RO;
- 4.2 attendances per hour;
- nine treatment hours per day;
- 235 treatment days per year;
- 19 attendances per course;
- 1.7 FTE ROMPs per linac;
- 0.2 FTE ROMPs per HDR brachytherapy unit;
- 1.06 RTs/hour of linac time;
- an additional 0.5 FTE RTs required for superficial x-ray therapy;
- an additional 1.5 FTE RTs required for HDR brachytherapy; and
- an additional 1.5 FTE RTs required for Clinical Preceptor positions.

Discussions with representatives of the Department of Health and Human Services indicate that current workforce initiatives for the three key professional groups include:

- a third RO has just been recruited to Launceston so will be able to get a registrar position which will assist in retaining and attracting ROs (Hobart has an accredited registrar in place and Launceston has an unaccredited registrar commencing in July this year with the accredited position being advertised for 2010);
- the Launceston facility has just been accredited by ACPSEM and has been able to access Commonwealth funding to fund ROMP registrars, currently looking at recruiting a ROMP registrar and another one in 18 months;
- remuneration for RTs has recently been adjusted so that it is now nationally comparable;
- Commonwealth has funded 1.5 FTE tutoring positions for RTs;
- appointed two students per annum for the past five years to undertake the Monash postgraduate masters program in radiotherapy – the students are paid a salary during their second year and clinical training provided at Hobart and Launceston facilities;

[106] Department of Health of Human Services and Health, Unpublished Excel Model, provided by Grant Smith, Chief Radiation Therapist-Manager Holman Clinic, 16th March, 2009

- changed work practices so some radiotherapy nurses do clinical review work to relieve workload pressure on ROs; and
- also have trained RTs doing HDR brachytherapy planning whereas in other states this work is typically done by ROMPs (RTs have always been involved with brachytherapy planning at the Launceston Clinic).

The discussions with representatives of the Department of Health and Human Services also revealed a number of issues relating to workforce planning and development including:

- recruitment and retention issues for radiation oncology are similar to other regional areas;
- once ROs are recruited to Tasmania they seem to stay and develop good arrangements with private hospitals;
- remuneration an issue for ROMPs, particularly given the recent changes in NSW;
- currently have difficulty in recruiting ROMPs and are hoping that having ROMP registrars will assist in attracting qualified ROMPs as well as contributing to the ongoing development of the medical physicists workforce;
- there is no local training program (University course) for RTs which impacts on recruitment;
- RT undergraduate clinical placements are available at both Launceston and Hobart which has proven to be a good recruitment tool, however getting more difficult to attract students because they are not earning while on placement and as they come from the mainland they need to leave part time paid work which is not attractive for some;
- specific funding for regional placements would assist in attracting and retaining staff in regional facilities;
- Tasmania has had dedicated PDY positions and have been able to recruit the incumbents into permanent positions once they have fully qualified – with future expansion additional qualified position will be created; and
- there is a shortage of qualified (experienced) radiotherapists.

4.3.7 Australian Capital Territory

The ACT has one radiotherapy facility based at the Canberra Hospital. Over the last few years, with the support of ACT Health, there has been a drive to recruit more ROs and ROMPs to the service.

Discussions with representatives of the Canberra Hospital indicate that current workforce initiatives for the three key professional groups include:

- attempting to set up translational research and clinical trials and recruiting a data manager to assist in the process and which will in turn attract staff;
- implementation of the basic treatment equivalent (BTE) units as a tool for scheduling patients which has assisted with staff stress levels;
- an initiative to provide financial support to RTs ($1,250) for continuing professional development (e.g. to attend conferences) is about to be implemented;
- providing opportunity for RTs to work a nine day fortnight;
- RTs and medical physicists have access to "study bank" which is a scheme provided by ACT Health to support staff to undertake additional study; and
- implementing separate pay scales for RTs and medical physicists that are above those offered to other health professionals.

The discussions with representatives of the Canberra Hospital also revealed a number of issues relating to workforce planning and development including:

- difficult to recruit because there is a perception that Canberra is isolated - once recruited they seem to stay but difficult to attract initially;
- unable to implement new technologies due to lack of staff time;
- ageing RT staff, some are close to retirement; and
- the remuneration that can be offered to medical physicists is lower than that in NSW which is the direct competitor for medical physics staff.

4.3.8 Northern Territory

The Northern Territory does not currently have a radiotherapy service however a two bunker radiation oncology facility is in the process of being built with opening scheduled for February 2010. The facility will be privately run, however it will run on a hub and spoke service model involving the staff from the Royal Adelaide Hospital (ROs RTs and ROMPs) with support from the Royal Darwin Hospital (nursing, allied health and administrative staff). The plan is for the Darwin facility to meet the radiation oncology needs for all Territorians so the NT Government has purchased a 54 bed accommodation facility for patients who come to Darwin for treatment. The facility will improve the access of patients with cancer to radiotherapy treatment (currently about 22% of cancer patients receive radiotherapy).

Discussions with representatives of the Darwin radiation oncology service indicate that the workforce will be based on the following parameters:

- 250 new patients per year per Radiation Oncologist;
- six RTs plus practice manager/chief RT; and
- one full-time physicist based in the NT with support from RAH.

The discussions with representatives of the Darwin radiation oncology service also revealed a number of planned workforce initiatives including:

- advertising for a ROMP worldwide;
- offering six weeks annual leave and flights into and out of Darwin to attract staff;
- paid accommodation for rotating staff (with SA and WA); and
- working with the University for dual appointment opportunities (new medical school opening in Darwin in 2012/13).

4.4 CONSULTATION WITH PROFESSIONAL BODY REPRESENTATIVES

The professional bodies (RANZCR, AIR and ACPSEM) not only assisted in the design, distribution and follow-up of the survey of their members working in radiation oncology services but were also consulted to discuss their approaches to workforce planning. This section summarises the information gathered from the consultations with representatives of the professional bodies.

4.4.1 The Royal Australian and New Zealand College of Radiologists (RANZCR)

The RANZCR is the oldest professional organisation for the promotion of the science and the practice of the medical specialties of radiology and medical imaging (diagnostic and interventional) and radiation oncology in Australia and New Zealand. The RANZCR’s mission is to promote, encourage and provide for the advancement of the study of radiology, radiation oncology and allied sciences and for the carrying out of research and experimental work in connection with these sciences.

The RANZCR have recently implemented a new training curriculum which has not altered the length of the training but provides more structure to the training of a radiation oncologist. Representatives of the RANZCR advised that there is a change in demographic of radiation oncology registrars with approximately 60% now being female. This change has resulted in registrars taking longer (on average) to complete their training as female registrars often undertake the fellowship program part time.

Representatives of RANZCR also advised that there has been an increase in competition for registrar positions due to the increase in the number of medical graduates and the increasing attraction of working as a radiation oncologist for females due to lifestyle factors. Competition has also been heightened by the fact that there has also been no increase in government funding available for registrar training positions. For this reason, representatives of the RANZCR suggested that increased private sector involvement in training should be encouraged as a strategy for increasing radiation oncologist numbers so long as private facilities can deliver training to the standards set by the RANZCR.

Most radiation oncology registrars sit their fellowship exam at the end of their fourth year. There has been no coordinated approach for finding placements for registrars to undertake their fellowship year (final year) which has resulted in a number leaving Australia and going to Canada, United Kingdom or the USA to complete their training and start their independent practice careers. Representatives of RANZCR considered that a more coordinated approach to fellowship year placements could see more registrars remaining in Australia.

The RANZCR consider that Australia is still heavily dependent on overseas radiation oncology graduates. ROs are considered as an “area of need” for immigration purposes. To alleviate the problem, representatives of RANZCR suggested that the development of a network which places final year registrars would assist in retaining registrars in Australia and also provide resources for regional/rural areas. The RANZCR supports training networks in the new curriculum, thereby encouraging registrars to go to “less popular” facilities but there is no compulsion as there is with some other Australian medical specialist training programs.

According to the RANZCR representative, some ROs are currently providing chemotherapy services because the medical oncology workforce is in short supply, so radiation oncologists fill this gap. This model is similar to the clinical oncologist role in the UK (where there is dual training). If this model was to be adopted in Australia it could assist in filling the gap in the medical oncology workforce but it could potentially create shortages in the radiation oncologist workforce.

Overall, the RANZCR have no current workforce recruitment strategy in place. Demand for registrar positions exceeds supply and there is no further funding available for registrar positions. As already indicated, the RANZCR guidelines recommend a benchmark workload of 250 new patients per RO per annum. Representatives of the RANZCR considered that the figure may need review given the changes in methods of radiotherapy delivery and the fact that equivalent overseas Colleges suggest the number should be less than 250.

4.4.2 Australian Institute of Radiography

The Australian Institute of Radiography (AIR) is the national professional organisation representing, radiographers, RTs (RTs) and sonographers in Australia. There were approximately 5,000 AIR members in March 2009 and approximately 1,200 members were RTs. The AIR advised that they believe that their membership list covers about 65% of working RTs (including those undertaking their Professional Development Year (PDYs)). This section summarises the views of the AIR on workforce planning for the RT profession.

The AIR stated that nationally Australia is well supplied with RTs. Their representatives considered that the only recruitment difficulties with RTs were in some regional areas. As a result of the Baume Inquiry additional funding was proved to Universities so more RTs could be trained. AIR representatives considered that this strategy had been very successful and if anything some states are verging on over supply. At the time, it was considered that perhaps too many University places had been funded as there were more places in courses than the number of available clinical placements in radiation oncology facilities.

In recent years the supply of RTs has not been an issue so there have been no workforce planning projects initiated by the AIR. However the AIR suggests there should be approximately 10 RTs per linac. This number can be used to estimate the needed RT workforce if the number of linacs to be commissioned and year of commissioning is known. However the supply of RTs needs to be well managed so as not to oversupply, otherwise students will perceive there are no employment opportunities on completion of the degree and will transfer into another course.

The AIR representatives observed that the current RT workforce is young, especially in regional areas. Career development opportunities for the junior RTs appear to be limited as the senior RTs are not moving out of the role. The AIR has focused working on investigating substitution and advanced practitioner roles for RTs and has established the Advanced Practice Working Group (APWG) in 2006. Advanced practitioner roles for RTs have been developed in Canada and the UK. The APWG is currently in the consultation process with both overseas advanced RT practitioners and RTs currently working in Australia.

Examples of advanced practitioner roles being considered include:

- Quality Assessment/Quality Control/Quality Improvement Managers; and
- Clinical Trials Liaison Officer – doctors don't have time to take patients through the requirements of participating in a clinical trial and obtaining formal consent, so there is the potential for a new role for an RT in Australia.

Examples of substitution roles being considered include:

- adaptive radiotherapy 12 month course (funded by DHS) to train RTs to review images as all machines are being equipped with imagining equipment and doctors will not have time to review every image; and
- treatment follow-up reviews currently being undertaken by ROs although already undertaken by senior RT in some radiation oncology facilities around Australia.

4.4.3 The Australasian College of Physical Scientists and Engineers in Medicine

The Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM) represents the professionals who provide a broad range of scientific and engineering services to the medical community. The College's mission is to advance services and professional standards in medical physics and biomedical engineering for the benefit and protection of the community. The ACPSEM examines competencies in specialist areas and confers accreditation in these fields.

One recommendation (no 63) of the Baume Inquiry was that ACPSEM develop a national five year training program for ROMPs to be implemented in 2005. With support from DoHA and some State Health Authorities, ACPSEM implemented the Training Education and Accreditation Program (TEAP) in 2004. TEAP has provided a structured national training pathway for ROMPs.

The ACPSEM representatives identified a number of workforce issues including:

- there is an ageing workforce which means there will be a reduction in the average ROMP experience in the next few years due to retirement – there is currently a high proportion of younger ROMPs which is due to a failure to recruit in the past – this situation will continue as there is a need to increase trainees to address the workforce shortages;
- there are some mature age trainees, mainly people with Masters or PhDs in other areas of physics coming into medical physics
- higher levels of ROMP remuneration in NSW makes it difficult for public facilities in other jurisdictions to recruit senior medical physicists – private facilities outside of NSW have overcome this problem by offering the same remuneration levels;
- a high proportion of medical physicists working in Australia are from overseas so Australia could face a significant shortage if these individuals are attracted back to practice in their home countries but as there are still vacancies in senior physicist positions, more overseas ROMPs are needed; and
- there is little professional recognition of ROMPs; they require the same number of years in training as doctors but they are not a visible part of service provision; some progress is being made through the Tripartite Committee valuing the work done by ROMPs but national registration is needed to raise professional profile.

Attempts to address workforce shortages (many funded by the Commonwealth and/or State Health Authorities) include:

- Commonwealth, State and Private funded registrar training positions;
- Commonwealth funded preceptor/trainer positions;
- Commonwealth support to ACPSEM training program and CPD activities;
- State support to ROMP CPD and educational opportunities;
- Commonwealth funding support for external review of ROMP training;
- Commonwealth funding support for undergraduate conference attendance and promotion of medical physics;
- ACPSEM have participated in ad-hoc university careers days but this needs to be more firmly established; and
- medical physicists automatically get 10 extra points on visa applications as identified as "area of need"; ACPSEM reviews about 3 to 5 applications yearly;

5

Analysis of Facilities Survey

This chapter provides information and descriptive analysis on the surveys received from the radiation oncology facilities. The project team received completed surveys from all 52 radiation oncology facilities that were operational in Australia in 2008. The survey collected a wide range of data on each facility including the number of linear accelerators; the types of radiation oncology services provided, the number of patients treated; details on the ROs, RTs and ROMPs positions filled and vacant at each facility; as well as local recruitment and retention issues for each profession.

5.1 OVERVIEW OF RADIOTHERAPY FACILITIES

Table 5.1 summarises the radiotherapy facilities by state/territory and sector. It shows a total of 130 linacs, which reflects the number that were operating as at 31st December, 2008. Some facilities replaced linacs during the year; in those cases the data have been aggregated for the two machines (i.e. the original and replacement machine only count as one). Four facilities also reported linacs that were effectively not operating (only used in rare circumstances with very low patient volumes); these machines have been excluded from the totals although the small number of attendances has been counted in the workload of the reporting facility.

Table 5.1: Radiotherapy facilities and linacs by state/territory and sector, Australia, December, 2008

State/Territory	Public		Private		Total		% of Total		% Cancer Incidence
	Facilities	Linacs	Facilities	Linacs	Facilities	Linacs	Facilities	Linacs	
NSW	13	33	5	9	18	42	34.6%	32.3%	34.0%
Victoria	9	23	6	13	15	36	28.8%	27.7%	24.3%
Queensland	4	15	6	11	10	26	19.2%	20.0%	20.0%
WA	1	5	2	5	3	10	5.8%	7.7%	9.1%
SA	1	4	2	5	3	9	5.8%	6.9%	8.4%
Tasmania	2	4	0	0	2	4	3.8%	3.1%	2.7%
ACT	1	3	0	0	1	3	1.9%	2.3%	1.2%
NT	0	0	0	0	0	0	0.0%	0.0%	0.2%
Total	**31**	**87**	**21**	**43**	**52**	**130**	**100.0%**	**100.0%**	**100.0%**

Source: Radiotherapy facilities' survey 2009, AIHW, and State/Territory Cancer Registries

Using these adjustments, Table 5.1 shows that the proportion of facilities and linacs in each state/territory is roughly equal to each states/territories proportion of new cancers (calculated based on cancer incidence in 2005, the most recent year for which data were available for all states/territories). In terms of the proportion of linacs, the biggest differences are in WA and SA which have below cancer incidence share and Victoria and ACT which have above cancer incidence share. There were no linacs operating in the NT in 2008 but this situation will change with the opening of a new two linac facility at the Royal Darwin Hospital in early 2010.

Table 5.1 also shows that of the 52 facilities and 130 linacs, 31 (59.6%) facilities and 87 linacs (66.9%) are in the public sector and the remaining 21 (40.4%) facilities and 43 linacs

(33.1%) are in the private sector. This distribution differs across jurisdictions with SA having more than half and WA exactly half their linacs in the private sector; with no linacs in the private sector in Tasmania or the ACT. Facilities in the public sector are typically larger with an average of 2.8 linacs per facility compared to 2.0 linacs per facility in the private sector.

5.2 UTILISATION OF RADIOTHERAPY SERVICES

Table 5.2 summarises the number of new cancer patients treated in each state/territory. It shows that the proportion of new patients treated in each jurisdiction is roughly equal to that jurisdiction's proportion of new cancer patients. The biggest difference is NSW which treats well below new cancer incidence share (29.3% compared to 34.0%). However, a significant number of NSW residents access services in other states/territories (mostly in Queensland, ACT and Victoria), which accounts for a large part of the difference between treatment share and cancer incidence share. Queensland, WA and the ACT all treat above cancer incidence share (the ACT has large inflows from NSW that account for about 33% of treated patients). Most NT patients are currently treated in SA but the aggregate of SA and NT new cancer incidence share (8.6%) is greater than SA's share of new patients treated (8.0%).

Table 5.2: New and retreatment patients treated with megavoltage equipment by State, 2008

State/Territory all facilities	New patients		Re-treatment patients		Total patients		New Cancers incidence		% new patients accessing radiotherapy
	N	% of total	N	Rate	N	% of total	N#	% of total#	
NSW	12,622	29.3%	3,218	25.5%	15,840	29.4%	36,859	34.0%	34.5%
Victoria	10,686*	24.8%	2,780	26.0%	13,466	25.0%	26,285	24.3%	40.7%
Queensland	9,395	21.8%	2,207	23.5%	11,602	21.6%	26,239	20.0%	35.8%
WA	4,887*	11.4%	967	19.8%	5,854	10.9%	9,855	9.1%	49.6%
SA	3,458	8.0%	968	28.0%	4,426	8.2%	9,106	8.4%	38.0%
Tasmania	1,082	2.5%	467	43.2%	1,549	2.9%	2,947	2.7%	36.7%
ACT	923	2.1%	177	19.2%	1,100	2.0%	1,349	1.2%	68.4%
NT							237	0.2%	0.0%
Total Public	28,500	66.2%	7,475	26.2%	35,975	66.8%	n/a	n/a	n/a
Total Private	14,553	33.8%	3,309	22.7%	17,862	33.2%	n/a	n/a	n/a
Grand Total	**43,053**	**100.0%**	**10,784**	**25.0%**	**53,837**	**100.0%**	**112,877**	**100.0%**	**38.1%**

* WA facilities, and Peter Mac Moorabbin, could not provide retreatment patients so estimates based on the national average, and other Peter Mac sites average, respectively; # proportions based on actual incidence in 2005, numbers based on 2005 data scaled by 2.5% per annum
Source: Radiotherapy facilities' survey 2009, AIHW, State/Territory Cancer Registries, DoHA

Looking at re-treatment rates, Table 5.2 shows considerable variation with Tasmania at 43.2% (72.8% above the national average) and ACT at 19.2% (23.2% below national average). Finally, Table 5.2 shows that, at the national level, it is estimated that, in 2008, 38.1% of patients with a newly diagnosed cancer accessed radiotherapy. This figure is below the benchmark of 52.3% published by Delany et al[107], but above the figure quoted by the RANZCR in 2008[108] (note: the estimate is based on 2005 actual cancer incidence data, escalated by 2.5% per annum to 2008, consistent with the index used by DoHA for radiation oncology facilities planning purposes). Table 5.2 includes state/territory level estimates, but as the facilities survey did not collect any data that would allow adjustment for cross border flows (i.e. patients residing in one state/territory and being treated in another state/territory),

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[107] Delaney G, Jacob S, Featherstone C and Barton M (2005). The role of radiotherapy in cancer treatment: Estimating optimal utilization from a review of evidence-based clinical guidelines. *Cancer*, Volume 104, Issue 6

[108] RANZCR Faculty of Radiation Oncology Submission to The National Health and Hospitals Reform Commission (NHHRC) on its Terms of Reference and Draft Principles for Australia's Health System (May 2008) http://www.nhhrc.org.au/internet/nhhrc/publishing.nsf/Content/159/$FILE/159%20RANZCR%20Faculty%20of%20Radiation%20Oncology%20Submission.pdf

the estimates for, in particular, ACT, NT, NSW, SA and Queensland should be interpreted cautiously.

Using the data in Tables 5.1 and 5.2, Table 5.3 summarises the number of new cancer patients per linac treated in each state/territory. It shows that there is a very significant range in the average number of new patients treated per linac in 2008. At one extreme, Tasmania (270.5) is 17.9% below the national average of 325.4 and at the other WA (508.7) is 56.3% above the national average. At the high end, one facility in WA reports 633.0 new patients per linac and one facility in Qld reports 544.0 new patients per linac. Interestingly, at the national level, there was no significant difference in the average number of new patients per linac in the public sector (325.8) and private sector (324.9).

Table 5.3: New patients/linac by state/territory, 2008

State/Territory all facilities	New patients	No of Linacs	New patients/linac			
			Average	Lowest	Median	Highest
NSW	12,622	42	311.4	176.0	303.5	476.0
Victoria	10,686*	36	306.4	197.7	317.5	356.7
Queensland	9,395	26	347.0	268.7	329.5	544.0
WA	4,887*	10	508.7	422.0	471.0	633.0
SA	3,458	9	379.4	336.3	379.4	422.6
Tasmania	1,082	4	270.5	251.0	270.5	290.0
ACT	923	3	307.7	307.7	307.7	307.7
Total Public	28,500	87	325.8	176.0	327.0	544.0
Total Private	14,553	43	324.9	66.0α	319.0	633.0
Grand Total	**43,053**	**130**	**325.4**	**66.0**	**319.5**	**633.0**

* WA facilities, and Peter Mac Moorabbin, could not provide retreatment patients so estimates based on the national average, and other Peter Mac sites average, respectively; α Linac commissioned in later 2008. Source: Radiotherapy facilities' survey 2009, AIHW, State/Territory Cancer Registries, DoHA

Table 5.4 presents patient attendances for megavoltage treatment by State/Territory. It shows that the national average number of attendances per patient (new and re-treatment patients) was 18.6, higher in the private sector at 19.3 than the public sector at 18.1 (maybe due to there being a higher proportion of palliative cases (require fewer fractions), in the public sector). There is variation across the states/territories in the number of fractions per case ranging from a high of 20.3 in Tasmania (9.1% above average) to a low of 16.2 in WA (12.9% below average).

Table 5.4: Patient attendances for megavoltage treatment by state/territory, 2008

State/Territory all facilities	Attendances		No of attendances per patient	No of linacs	No. of attendances per linac			
	N	% of total			Average	Lowest	Median	Highest
NSW	293,531	29.6%	19.0	42	7,160	4,031	7,213	10,237
Victoria	257,336	26.0%	19.4	36	7,411	5,223	7,412	10,025
Queensland	205,788	20.8%	16.9	26	7,180	1,700	7,934	11,953
WA	96,117	9.7%	16.2	10	9,717	8,365	9,816	10,972
SA	87,321	8.8%	19.5	9	9,489	7,569	9,489	11,409
Tasmania	31,636	3.2%	20.3	4	7,909	6,866	7,909	8,953
ACT	19,566	2.0%	17.8	3	6,522	6,522	6,522	6,522
Total Public	636,100	64.2%	18.1	87	7,305	4,031	7,291	9,816
Total Private	355,195	35.8%	19.3	43	7,792	1,700	8,080	11,953
Grand Total	**991,295**	**100.0%**	18.6	**130**	**7,496**	**1,700**	**7,558**	**11,953**

Source: Radiotherapy facilities' survey 2009, AIHW, and State/Territory Cancer Registries

Table 5.4 also shows the average number of patient attendances per linac in 2008. The data show that there is a very significant range in median attendances per linac with, at one end, the ACT 13.7% below the national median of 7,558 and at the other end WA (29.9%) and SA (25.5%) well above the national median. Looking at the same data by sector at the national level, the median number of attendances per linac in the private sector was 8,080 about 10.8% higher than in the public sector number of 7,291.

Taking the linac utilisation theme further, Table 5.5 shows that the median attendances per linac day in WA (39.6) and SA (38.3) are much higher than the national median (32.4), consistent with the fact that these States have the highest average operating hours per day (9.4). The median attendances per linac day in NSW (30.4) and Victoria (30.9) are lower than the national median although NSW has below average operating hours (8.7) and Victoria above (9.1). Comparing across sectors, the median attendances per linac day in the private sector (38.3) was much higher (22.8%) than in the public sector (31.2) but the maximums in the public and private sector are much closer (49.3 and 52.6 respectively or 6.7% difference).

Table 5.5: Patient attendances per linac day for megavoltage treatment by state/territory, 2008

State/Territory all facilities	No of attendances	No of treatment days	Average treatment hours/linac	No of attendances per linac day			
				Average[1]	Lowest	Median	Highest
NSW	293,531	9,400	8.7	31.2	17.1	30.4	52.1
Victoria	257,336	8,625	9.1	30.1	6.6	30.9	43.7
Queensland	205,788	5,622	8.6	36.1	11.5	36.9	52.6
WA	96,117	2,391	9.4	40.2	29.2	39.6	47.4
SA	87,321	2,253	9.4	38.5	29.0	38.3	48.9
Tasmania	31,636	902	8.9	34.3	25.8	36.2	38.9
ACT	19,566	578	8.5	33.7	30.2	33.2	37.9
Total Public	636,100	20,099	8.9	31.6	6.6	31.2	49.3
Total Private	355,195	9,672	8.8	36.4	11.5	38.3	52.6
Grand Total	**991,295**	**29,771**	**8.9**	**33.2**	**6.6**	**32.4**	**52.6**

[1] Note: calculated as the average of the averages for each linac, not the overall average per day as this approach reflects operational practice

Source: Radiotherapy facilities' survey 2009

Table 5.6 presents the number of brachytherapy patients by state/territory. It shows that brachytherapy patients in NSW and Victoria are below cancer incidence share, whereas they are well above cancer incidence share in WA and higher than cancer incidence share in SA and Tasmania. The data also show a preference for certain brachytherapy modalities across the states/territories; there is no LDR brachytherapy reported in the ACT or Tasmania (it is performed at a private hospital in Hobart but the data were not reported) and quite small numbers (relative to HDR brachytherapy) in NSW, whereas LDR brachytherapy seems to be preferred in SA. HDR brachytherapy seems to be the strongly preferred modality in NSW and WA.

Table 5.6: Brachytherapy patients by treatment modality and state/territory, 2008

State/Territory all facilities	Facilities providing brachytherapy		HDR		LDR (including seed)		Total		% cancer incidence
	N	%	N	%	N	%	N	%	
NSW	11	44.0%	495	39.7%	62	8.6%	557	28.3%	34.0%
Victoria	4	16.0%	265	21.3%	93	12.9%	358	18.2%	24.3%
Queensland	4	16.0%	174	14.0%	221	30.6%	395	20.1%	20.0%
WA	2	8.0%	179	14.4%	48	6.6%	227	11.5%	9.1%
SA	2	8.0%	55	4.4%	129	17.9%	184	9.3%	8.4%
Tasmania	1	4.0%	67	5.4%	0	0.0%	67	3.4%	2.7%
ACT	1	4.0%	11	0.9%	0	0.0%	11	0.6%	1.2%
NT									0.2%
Total Public	18	72.0%	872	70.0%	440	60.9%	1312	66.7%	n/a
Total Private	7	28.0%	374	30.0%	282	39.1%	656	33.3%	n/a
Grand Total	**25**	**100.0%**	**1,246**	**100.0%**	**722**	**100.0%**	**1968**	**100.0%**	**100.0**

Source: Radiotherapy facilities' survey 2009, AIHW, and State/Territory Cancer Registries

Looking across sectors, the proportions of brachytherapy patients (66.7% public and 33.3% private) are almost identical to the proportions for megavoltage treatment (66.8% and 33.2%), although relatively fewer private facilities provide brachytherapy services than public (7 out of 21 (33.3%), compared to 18 out of 31 (58.1%)). Also, there seems to be a greater use of LDR (mostly seed) brachytherapy in the private sector, as 39.1% of LDR patients are treated in the private sector.

5.3 RADIOTHERAPY WORKFORCE

The facilities survey collected data on average FTE in 2008 and headcount as at 31st December 2008 from all 52 radiotherapy facilities. In addition, the project team has calculated an adjusted headcount to account for the fact that some radiation oncology professionals (ROs in particular) work across multiple facilities (hence they will have been counted more than once). The adjusted headcount was derived by using data from the respective profession surveys to estimate the average FTE fraction worked by ROs, RTs and medical physicists and then using each fraction to adjust the reported FTE data. The results of this adjustment process are shown in Table 5.7.

Table 5.7: Radiation oncology total workforce FTE, headcount and adjusted headcount by state/territory, 2008

State/Territory all facilities	ROs			RTs			ROMPs		
	Reported Headcount	Reported FTE	Adjusted Headcount	Reported Headcount	Reported FTE	Adjusted Headcount	Reported Headcount	Reported FTE	Adjusted Headcount
NSW	136	119.2	125	509	464.6	518	110	102.4	107
Vic	100	96.3	101	438	384.2	428	55	51.1	54
Qld	62	56.8	59	313	283.6	316	45	39.4	41
WA	32	19.5	20	121	107.3	120	18	15.3	16
SA	22	18.6	19	118	96.0	107	24	19.0	20
Tas	6	5.5	6	50	44.7	50	6	6.0	6
ACT	9	8.2	9	37	35.1	39	5	5.6	6
Total	**367**	**324.0**	**339**	**1,588**	**1415.5**	**1,578**	**263**	**238.7**	**250**

Source: Radiotherapy facilities' survey and professions' surveys, 2009

As might be expected, the most significant impact of the adjustment is for ROs, where based on the facilities survey data, it is estimated that there were 339 individuals (rather than 367) occupying 324.0 FTE positions in 2008. This estimate relies on the average fraction of 0.96 FTE for ROs derived from the professions survey. For RTs, it is estimated that there were

1,578 individuals occupying 1,415.5 FTE positions (based on an FTE fraction of 0.90, and for medical physicists 250 individuals occupying 238.7 FTE positions (based on an FTE fraction of 0.96).

As it will be most appropriate for some analyses to be performed using the total workforce (i.e. qualified plus those in vocational training) and other analyses to be done using only the qualified workforce, the adjusted headcount and corresponding FTE has been calculated for the qualified and in-training workforces for all three professional groups as shown in Table 5.8. The reported totals for the qualified and in-training workforce by State have been used as the baseline numbers for the number of working professionals and FTE in Australia to which the professions survey responses have been adjusted.

Table 5.8: Radiation oncology qualified and trainee workforce, adjusted headcount and FTE by state/territory, 2008

State/Territory all facilities	ROs				RTs				Medical Physicists			
	Specialists		Registrars		Qualified		PDYs/Trainees		Qualified		Registrars	
	Adjusted Headcount	Reported FTE	Adjusted Headcount	Reported FTE	Adjusted Headcount	Reported FTE	Adjusted Headcount	Reported FTE	Adjusted Headcount	Reported FTE	Adjusted Headcount	Report ed FTE
NSW	83	78.9	42	40.3	448	401.6	70	63	77	73.4	30	29.0
Victoria	67	64.4	34	31.9	384	344.8	44	39.4	44	41.4	10	9.6
Queensland	42	39.9	18	16.9	286	256.6	30	27	30	28.9	11	10.5
WA	13	12.5	7	7.0	109	97.3	11	10	14	13.8	2	1.5
SA	14	13.6	5	5.0	96	86.0	11	10	18	17.0	2	2.0
Tasmania	6	5.5	0	0.0	42	37.7	8	7	6	6.0	0	0.0
ACT	6	6.2	2	2.0	36	32.1	3	3	4	3.8	2	1.8
Total	**231**	**220.9**	**108**	**103.1**	**1,401**	**1256.1**	**177**	**159.4**	**193**	**184.2**	**57**	**54.4**

Source: Radiotherapy facilities' survey and professions' surveys, 2009

Table 5.9 examines the distribution of the RO workforce across position levels by sector for 2008. It shows that 14.7% of ROs are Directors in the private sector relative to only 7.8% in the public sector (consistent with the fact that private facilities are on average smaller than public facilities). It also shows that the public sector bears almost all the medical training workload as the ratio of FTE Registrars to Specialists (including Directors and Other) is 1 to 1.7 whereas it is a much higher 1 to 13.8 in the private sector as a whole (many private facilities do not have radiation oncology registrars).

Table 5.9: Distribution of the RO workforce across positions by sector, 2008

Position/Job title	Public		Private		Total	
	FTE	% of total	FTE	% of total	FTE	% of total
Director/Head	20.7	7.8%	8.7	14.7%	29.4	9.1%
Specialist	137.4	51.9%	46.6	78.5%	184.0	56.8%
Registrar	99.1	37.4%	4.0	6.7%	103.1	31.8%
Other	7.5	2.8%	0.0	0.0%	7.5	2.3%
Total	**264.8**	**100.0%**	**59.3**	**100.0%**	**324.0**	**100.0%**

Source: Radiotherapy facilities' survey, 2009

Table 5.10 presents the distribution of the RT workforce across position levels by sector for 2008. It shows that 5.0% of RTs are Chiefs in the private sector compared to 2.9% in the public sector (private facilities are on average smaller than public). The ratio of PDYs/trainees to qualified RTs is 1 to 7.1 in the public sector and 1 to 11.6 in the private sector again reflecting a higher training burden in the public sector (although the difference in the proportion of the workforce in-training between public and private is much smaller than for ROs). It is also interesting to observe that more than half of the RT workforce is at the base grade level, a much higher proportion than for ROs (Table 5.9) or ROMPs (Table 5.11).

Table 5.10 Distribution of the RT workforce across positions by sector, 2008

Position/Job title	Public		Private		Total	
	FTE	% of total	FTE	% of total	FTE	% of total
Chief	31.0	2.9%	18.0	5.0%	49.0	3.5%
Supervisor/Senior	275.1	26.1%	94.8	26.4%	369.9	26.1%
Base grade	561.7	53.2%	207.1	57.6%	768.8	54.3%
PDY/Trainee	130.9	12.4%	28.5	7.9%	159.4	11.3%
Educator/Tutor	31.3	3.0%	3.8	1.1%	35.1	2.5%
Research	12.6	1.2%	1.0	0.3%	13.6	1.0%
Other	13.1	1.2%	6.6	1.8%	19.7	1.4%
Total	**1055.8**	**100.0%**	**359.8**	**100.0%**	**1415.5**	**100.0%**

Source: Radiotherapy facilities' survey, 2009

Table 5.11 examines the distribution of the ROMP workforce across position levels by sector for 2008. It shows that 21.9% of medical physicists are Chiefs in the private sector relative to 11.8% in the public sector (private facilities are on average smaller than public facilities). In respect of training burden, the ratio of registrars/trainees to qualified is 1 to 3.0 in the public sector and 1 to 6.6 in the private sector, again showing that the public sector carries a higher training workload for ROMPs.

Table 5.11: Distribution of the ROMP workforce across positions, 2008

Position/Job title	Public		Private		Total	
	FTE	% of total	FTE	% of total	FTE	% of total
Chief	22.8	11.8%	10.0	21.9%	32.8	13.7%
Senior	79.3	41.1%	22.0	48.1%	101.3	42.4%
Base grade	31.5	16.3%	5.3	11.6%	36.8	15.4%
Research	8.0	4.1%	0.0	0.0%	8.0	3.4%
Trainee/Registrar	48.4	25.1%	6.0	13.1%	54.4	22.8%
Educator/Teacher	1.0	0.5%	0.4	0.9%	1.4	0.6%
Other	2.0	1.0%	2.0	4.4%	4.0	1.7%
Total	**193.0**	**100.0%**	**45.7**	**100.0%**	**238.7**	**100.0%**

Source: Radiotherapy facilities' survey, 2009

5.4 RADIOTHERAPY FACILITIES STAFFING MODEL

By using the radiotherapy facility and utilisation data together with the staffing data it is possible to examine the workforce models being used in radiotherapy facilities. Table 5.12 examines the ratio of ROs (excluding registrars) to linacs. It reveals a considerable range in practice, with NSW, ACT and Victoria at averages of 2.1, 2.1 and 2.0 ROs per linac being above the national public sector average of 1.9. At the other end, WA, Tasmania and Queensland at 1.2, 1.4 and 1.5 ROs per linac are below the national average. Table 5.12 also shows that the mean and median values are close to identical on a State by State basis for the public sector, demonstrating that there is little impact of extreme values.

Table 5.12: ROs (ex registrars) per linac, Australia, 2008

State/Territory	FTEs	Linacs	No of ROs per linac			
			Average	Lowest	Median	Highest
NSW public	67.0	33	2.1	1.3	2.0	3.6
Victoria public	51.1	23	2.0	0.7	2.0	2.9
Queensland public	23.4	15	1.5	1.3	1.6	1.8
WA public	5.9	5	1.2	1.2	1.2	1.2
SA public	6.6	4	1.7	1.7	1.7	1.7
Tasmania public	5.5	4	1.4	1.4	1.4	1.4
ACT public	6.2	3	2.1	2.1	2.1	2.1
Total Public	165.6	87	1.9	0.7	2.0	3.6
Total Private	55.3	43	1.3	0.7	1.1	3.0
Grand Total	**220.9**	**130**	**1.7**	**0.7**	**1.7**	**3.6**

Source: Radiotherapy facilities' survey, 2009

Table 5.12 also illustrates what appears to be a significant difference in RO staffing practice between the public and private sector. The average number of ROs per linac in the private sector is 1.3, significantly different to the average of 1.9 in the public sector. The difference in the medians (1.1 private and 2.0 public) is even more significant. These data compare to the average number of new patients per linac in the public sector of 325.8 against 324.9 in the private sector (refer Table 5.3). The apparent difference in workload may be partly accounted for by the higher medical training (and probably research) workload in the public sector relative to the private sector. Table 5.13 examines the staffing model further by calculating the number of new patients per radiation oncologist.

Table 5.13: New patients per RO (ex registrars), Australia, 2008

State/Territory	FTE	New patients	No of new patients per RO (ex registrars)			
			Average	Lowest	Median	Highest
NSW public	67.0	10,816	165.4	117.3	146.8	275.5
Victoria public	51.1	7,633	196.6	118.2	159.5	537.1
Queensland public	23.4	6,390	292.6	214.5	246.7	462.4
WA public	5.9	2,480	420.3	420.3	420.3	420.3
SA public	6.6	1,527	231.4	231.4	231.4	231.4
Tasmania public	5.5	1,207	221.3	207.4	221.3	235.3
ACT public	6.2	965	155.6	155.6	155.6	155.6
Total Public	**165.6**	**31,018**	**204.5**	**117.3**	**173.0**	**537.1**
Total Private	**55.3**	**15,623**	**269.7**	**58.7**	**283.2**	**537.2**
Grand Total	**220.9**	**46,641**	**230.1**	**58.7**	**214.5**	**537.2**

Source: Radiotherapy facilities' survey, 2009

Review of Table 5.13 supports the differences in the RO staffing practices between the public and private sector identified in Table 5.11. The median number (to minimise the effect of extreme values) of new patients seen by full time ROs in the public sector is 173.0 compared to 283.2 in the private sector, a difference of 100 patients or 63.1%. There is also considerable variation across the public sector with the private sector median being exceeded in the public sector in WA (420.3). This figure is well above the 250 new patients per annum for a RO promulgated by the RANZCR. At the other extreme, the median numbers for the public sector in NSW, ACT and Victoria of 146.8, 155.6 and 159.5 are well below the 250 RANZCR figure.

Table 5.14 examines the ratio of RTs (excluding PDYs) to linacs. For the public sector, it reveals a high degree of consistency in RTs staffing models across NSW, Victoria, WA, SA and the ACT. There seems to be a higher level of RT staff per linac in Queensland and a lower level in Tasmania. The RT staffing levels in the public sector (average 10.4 RTs per linac) are significantly different from those in the private sector (average 7.5 RTs per linac) reflecting a 38.7% higher staffing level (partly attributable to the extra teaching load). It is also worth noting that there is very little difference in the mean and median values on a State by State basis for the public sector and in the private sector showing that there is little impact of extreme values.

Table 5.14: RTs (ex PDYs) per linac, Australia, 2008

State/Territory	FTEs	Linacs	No of RTs per linac			
			Average	Lowest	Median	Highest
NSW public	334.0	33	10.2	8.0	10.3	12.9
Victoria public	250.5	23	10.2	8.0	10.3	13.6
Queensland public	179.9	15	11.7	9.6	11.9	13.5
WA public	51.7	5	10.3	10.3	10.3	10.3
SA public	39.0	4	9.8	9.4	9.8	9.8
Tasmania public	37.7	4	9.4	8.4	9.4	10.5
ACT public	32.1	3	10.7	10.7	10.7	10.7
Total Public	924.9	87	10.4	8.0	10.3	13.6
Total Private	331.3	43	7.5	3.8	7.8	10.6
Grand Total	**1256.1**	**130**	**9.3**	**3.8**	**9.4**	**13.6**

Source: Radiotherapy facilities' survey, 2009

Table 5.15 examines the RT staffing model further by calculating the number of RTs per linac hour. The data are based, as far as possible, on the same assumptions as the paper produced by the Radiation Technology Advisory Panel (RTAP) of the AIR[109] which recommended an RT staffing formula based on 1.06 FTE per linac hour (calculated at the level of a shift). For the purposes of comparison, it is important to note that the key assumptions in the RTAP analysis were 1,720 hour per year and an eight hour working day for RTs. The formula specifically excluded kilovoltage and brachytherapy services (planning and treatment) as well as stereotactic radiosurgery/radiotherapy, total body irradiation, intensity modulated radiotherapy (IMRT) and paediatrics (planning only). As the facilities survey did not ask respondents to allocate RT hours across the various therapies, RTs per linac hour can only be calculated at the level of the total service (i.e. all treatment and planning included).

Table 5.15: RTs (ex PDYs) per linac hour, Australia, 2008

State/Territory	FTE	Linac hours	No of RTs per linac hour			
			Average	Lowest	Median	Highest
NSW public	334.0	65,441	1.13	0.89	1.10	1.55
Victoria public	250.5	51,723	1.01	0.80	0.91	1.28
Queensland public	179.9	32,117	1.18	1.08	1.17	1.30
WA public	51.7	10,521	1.06	1.06	1.06	1.06
SA public	39.0	8,248	1.02	1.02	1.02	1.02
Tasmania public	37.7	8,038	1.01	0.97	1.01	1.04
ACT public	32.1	4,893	1.41	1.41	1.41	1.41
Total Public	924.9	180,981	1.09	0.80	1.08	1.55
Total Private	331.3	86,762	0.85	0.67	0.83	1.11
Grand Total	**1256.1**	**267,743**	**1.00**	**0.67**	**0.97**	**1.55**

Source: Radiotherapy facilities' survey, 2009

Review of Table 5.15 shows that the national median RTs per linac hour is 0.97, about 8.5% below the RTAP benchmark, even though all treatment and planning is included. There is a difference between the private sector at 0.83 RTs per linac hour (21.7% below RTAP benchmark and the public sector at 1.08 RTs per linac hour (1.9% above RTAP benchmark).

[109] Australian Institute of Radiography Radiation Therapy Advisory Panel, July 2001, Radiation Therapy Staffing Model, The Radiographer, Vol 48, No 2, pp.79-83

There is considerable variation at the State level across the public sector with the median RTs per linac hour ranging from 0.91 in Victoria to 1.41 in the ACT. When the data are split into facilities which provide brachytherapy, the national median RTs per linac hour increases to 1.06 (1.11 public sector, 0.83 private sector) compared to facilities that do not provide brachytherapy at 0.91 RTs per linac hour (0.97 public sector, 0.84 private sector). Thus it is clear that brachytherapy has a considerable impact on the actual ratio of RTs per linac hour in the public sector, but no impact in the private sector.

Table 5.16 examines the ratio of ROMPs (excluding registrars) to linacs. For the public sector, it reveals a high degree of variation, with the median number of ROMPs per linac ranging from a high of 3.0 in SA down to 1.3 in Queensland and the ACT. For the rest of the public sector the States have values between 1.5 and 2.0 with an overall public sector median of 1.5 ROMPs per linac. As with ROs and RTs, the private sector adopts a significantly different staffing model with a median of 1.0 ROMPs per linac, compared to 1.5 in the public sector. Looking at the distributions, there is considerable variation between the highest and lowest in the private sector (0.5 and 2.5) and public sector (0.5 and 3.0), showing significant differences in staffing practices.

Table 5.16: ROMPs per linac (ex registrars), Australia, 2008

State/Territory	FTEs	Linacs	No of medical physicists per linac			
			Average	Lowest	Median	Highest
NSW public	62.1	33	1.8	1.3	1.9	2.5
Victoria public	30.4	23	1.2	0.5	1.5	2.0
Queensland public	21.5	15	1.5	1.1	1.3	2.3
WA public	8.8	5	1.8	1.8	1.8	1.8
SA public	12.0	4	3.0	3.0	3.0	3.0
Tasmania public	6.0	4	1.5	1.5	1.5	1.5
ACT public	3.8	3	1.3	1.3	1.3	1.3
Total Public	144.5	87	1.6	0.5	1.5	3.0
Private sector	39.7	43	1.0	0.5	1.0	2.5
Grand Total	**184.2**	**130**	**1.3**	**0.5**	**1.3**	**3.0**

Source: Radiotherapy facilities' survey, 2009

It is worth noting that the average number of ROMPS per linac in the public sector of 1.6 is close to the figure of 1.7 quoted in the Baume Inquiry, but the private sector figure is well below. In both sectors, the actual numbers are below the figure recommended by the ACPSEM of 1.7 qualified ROMPs per linac (plus 0.5 registrar/trainee) to model the total ROMP workforce needs in Australia. The ACPSEM further recommend the use of the "Formula 2000" to model individual facility needs based on workload. Use of Formula 2000 across all facilities and aggregation of the data results in national convergence to the figure of 2.2 ROMPs per linac (including 0.5 registrar)[110]. This study was conducted in 2000 and needs to be repeated to reflect the significant changes in technology, treatment complexity and increased treatment rates that have occurred since then.

5.5 WORKFORCE RECRUITMENT, RETENTION AND VACANCIES

The facilities survey asked the respective heads of ROs, RTs and medical physicists for data on turnover and vacancies. Table 5.17 presents the data for ROs showing workforce growth in 2008 with 22.9 FTE recruited against 13.3 FTE leaving. The SA public sector had the

[110] Oliver, L., Fitchew, R & Drew, J 2001, Requirements for radiation oncology physics in Australia and New Zealand, *Australasian Physical and Engineering Sciences in Medicine*, 24(1): pp. 1-18

largest turnover with 21.2% of the workforce leaving and 30.3% being recruited. These ratios are off a small base; the most significant attrition was 6.8 FTE leaving the public sector in Victoria (13.3% of the workforce) balanced off by the recruitment of 7.3 FTE (14.3% of the workforce). In the rest of the public sector, attrition was 4.5% in NSW and zero in Queensland, WA, Tasmania and the ACT. Overall attrition in the private sector at 3.8% was lower than the public sector at 6.8%.

Table 5.17: RO (ex registrars) workforce turnover and vacancies, Australia 2008

State/Territory	Average FTE in 2008	Left in 2008		Recruited in 2008		Number of vacancies at 31st December	Vacancy rate as at 31st December
		FTE	%	FTE	%		
NSW public	67.0	3.0	4.5%	9.0	13.4%	1.0	1.6%
Victoria public	51.1	6.8	13.3%	7.3	14.3%	2.4	6.8%
Queensland public	23.4	0.0	0.0%	0.0	0.0%	3.0	11.2%
WA public	5.9	0.0	0.0%	0.0	0.0%	1.0	15.6%
SA public	6.6	1.4	21.2%	2.0	30.3%	1.0	14.1%
Tasmania public	5.5	0.0	0.0%	1.0	18.3%	0.0	0.0%
ACT public	6.2	0.0	0.0%	1.6	25.8%	0.0	0.0%
Total Public	165.6	11.2	6.8%	20.9	12.6%	8.4	5.5%
Private sector	55.3	2.1	3.8%	2.0	3.6%	1.0	1.8%
Grand Total	**220.9**	**13.3**	**6.0%**	**22.9**	**10.4%**	**8.4**	**4.5%**

Source: Radiotherapy facilities' survey, 2009

Table 5.17 also shows that recruitment of ROs was significant in the public sector at 12.6% of the workforce, greater than the private sector at 3.6%. As at the 31st December 2008, vacancies did not seem to be a significant problem. The national vacancy rate was 4.5%, measured at 5.5% in the public sector and 1.8% in the private sector. For public sector facilities, WA, SA and Queensland had vacancy rates greater than 10%, but these numbers respectively reflect just one vacant position in WA and SA and three in Queensland (note that the vacancy rates are calculated using the number of vacancies divided by the total of filled plus vacant positions as at 31st December 2009). Taken across the country, the vacancy numbers describe natural movement of the workforce, and certainly do not indicate a shortage of ROs in 2008.

Table 5.18 presents the vacancy and turnover data for RTs (excluding PDYs) showing that, overall, the workforce grew in 2008 with 144.4 FTE being recruited to radiotherapy facilities against 112.0 FTE leaving. Closer examination of the figures in the public sector reveals significant turnover. Attrition in the ACT was 15.6% in 2008 balanced off by recruitment of 34.3% (albeit of a relatively low base). Turnover was also relatively high in WA with an attrition rate of 15.5% and recruitment rate of 17.4%. The recruitment rate was also strong in NSW at 36.4%, 15.9% in Queensland, and 10.6% in Tasmania resulting in an overall public sector average of 13.5%. Taken overall, the recruitment rates were considerably different with the public sector at 13.5% recruiting at more than twice the rate of the private sector at 6.0%. However, the attrition rates in the public sector (8.8%) and the private sector (9.3%) were very similar.

Table 5.18: RT (ex PDYs) workforce turnover and vacancies, Australia 2008

State/Territory	Average FTE in 2008	Left in 2008		Recruited in 2008		Number of vacancies at 31st December	Vacancy rate as at 31st December
		FTE	%	FTE	%		
NSW public	334.0	30.1	9.0%	54.8	16.4%	13.1	3.9%
Victoria public	250.5	12.0	4.8%	16.0	6.4%	0.4	0.1%
Queensland public	179.9	18.5	10.3%	28.6	15.9%	5.8	3.1%
WA public	51.7	8.0	15.5%	9.0	17.4%	0.0	0.0%
SA public	39.0	3.6	9.2%	1.0	2.6%	0.0	0.0%
Tasmania public	37.7	4.0	10.6%	4.0	10.6%	0.0	0.0%
ACT public	32.1	5.0	15.6%	11.0	34.3%	0.0	0.0%
Total Public	924.9	81.2	8.8%	124.4	13.5%	19.3	2.1%
Private sector	331.3	30.8	9.3%	20.0	6.0%	3.0	1.0%
Grand Total	**1256.1**	**112.0**	**8.9%**	**144.4**	**11.5%**	**22.3**	**1.8%**

Source: Radiotherapy facilities' survey, 2009

Thus, the overall workforce growth has occurred despite a contraction in the private sector, where 30.8 FTE left positions and only 20.0 FTE were recruited. The contraction is further evidenced by the private sector reporting only 3.0 FTE vacancies (1.0% vacancy rate) as at 31st December 2008. In contrast there was expansion in the public sector with 124.4 FTE RTs being recruited to facilities and only 81.2 FTE leaving. The vacancy rate of 2.1% (19.3 FTE positions) in the public sector as at 31st December 2008, was double that of the private sector but still very small. Taken together, these data strongly suggest that there was no shortage of RTs around Australia in 2008.

Table 5.19 shows the vacancy and turnover data for ROMPs (excluding registrars) revealing workforce growth in 2008 with 32.1 FTE recruited to radiotherapy facilities against 21.1 FTE leaving. Virtually all of the growth was in the public sector with 27.1 FTE recruited against 16.6 FTE leaving, compared to no real change in the private sector (5.0 FTE recruited against 4.5 FTE leaving). ROMP turnover was highest in the WA public sector with an attrition rate of 22.9% and a recruitment rate of 34.3%. The recruitment rate was also very high in the SA public sector at 41.7% (even though there was no attrition in SA) and high in the NSW, Queensland and Victoria public sectors at 17.3%, 16.3% and 15.8% respectively. In contrast there was no recruitment in the ACT even though there was an attrition rate of 26.3% in the ACT (reflects only one position). There was also no recruitment in Tasmania in 2008, but there was no attrition either.

Table 5.19: ROMP (ex registrars) workforce turnover and vacancies, Australia 2008

State/Territory	Average FTE in 2008	Left in 2008		Recruited in 2008		Number of vacancies at 31st December	Vacancy rate as at 31st December
		FTE	%	FTE	%		
NSW public	62.1	4.0	6.4%	10.8	17.3%	5.9	8.8%
Victoria public	30.4	5.6	18.4%	4.8	15.8%	1.8	6.3%
Queensland public	21.5	4.0	18.6%	3.5	16.3%	5.5	21.6%
WA public	8.8	2.0	22.9%	3.0	34.3%	4.0	36.4%
SA public	12.0	0.0	0.0%	5.0	41.7%	5.0	29.4%
Tasmania public	6.0	0.0	0.0%	0.0	0.0%	0.0	0.0%
ACT public	3.8	1.0	26.3%	0.0	0.0%	1.0	25.0%
Total Public	144.5	16.6	11.5%	27.1	18.7%	23.2	14.6%
Private sector	39.7	4.5	11.3%	5.0	12.6%	4.2	10.3%
Grand Total	**184.2**	**21.1**	**11.5%**	**32.1**	**17.4%**	**27.4**	**13.7%**

Source: Radiotherapy facilities' survey, 2009

Table 5.19 presents quite a different workforce picture for ROMP vacancies compared to ROs and RTs. The overall vacancy rate for ROMPs was 13.7% in 2008, compared to 4.5% for ROs and 1.8% for RTs. Vacancies were higher in the public sector (14.6% vacancy rate reflecting 23.2 positions) that the private sector (10.3% reflecting 4.2 positions). The highest vacancy rate was 36.4% for the public sector in WA (representing 4.0 positions), followed by the SA public sector at 29.4% (5.0 positions) and the Queensland public sector at 21.6% (5.5 positions). In contrast, the public sectors in the larger States were better positioned with vacancy rates of 8.8% in NSW and only 6.3% in Victoria. Overall, these data reflect the fact that there was a shortage of medical physicists in Australia in 2008.

Taken across the three professional groups, the number of vacant positions is an indicator of unmet demand for ROs, RTs and ROMPs. It is also the case that the number of vacant positions reflects the availability of funds and anecdotally, some stakeholders advised the project team that more positions are required but there are no funds available to allow recruitment. The impact of funding shortages cannot be quantified based on the study methodology (funding levels were not investigated), but the project team has measured the fact that current staffing levels are below the benchmarks promulgated by the AIR and ACPSEM, but consistent with the benchmarks promulgated by RANZCR.

5.6 WORKFORCE RECRUITMENT AND RETENTION ISSUES

The facilities survey also asked the respective heads of ROs, RTs and medical physicists for data about workforce recruitment and retention issues. Table 5.20 presents the reported issues for ROs, grouping facilities into regional and rural, as well as public and private. It shows that the most commonly reported issue (identified by half of the 48 facilities that responded to this question) was remuneration. The issue was slightly more commonly reported in regional facilities (60%) versus metro (47%), and also more commonly reported in private sector facilities (60%) versus public sector (41%). Service location was thought to be an issue by 35% of the facilities, with not surprisingly, regional facilities (50%) reporting location more often than metro (32%).

Table 5.20: Recruitment and retention issues for ROs by location and sector

Recruitment and retention issues	By Location				By Sector				Total	
	Metro		Regional		Public		Private			
	N	%[1]	N	%[2]	N	%[3]	N	%[4]	N	%[5]
Remuneration	18	47%	6	60%	12	41%	12	60%	24	50%
Location of service	12	32%	5	50%	10	34%	7	35%	17	35%
Career progression	5	13%	0	0%	4	14%	1	5%	5	10%
Collegial support	4	11%	2	20%	3	10%	3	15%	6	13%
Supply of trained professionals	12	32%	1	10%	10	34%	3	15%	13	27%
Training requirements	0	0%	1	10%	0	0%	1	5%	1	2%
Other	20	53%	2	20%	13	45%	9	45%	22	46%

[1] Based on 38 of the 42 metro facilities, as four did not respond; [2] Based on all 10 regional facilities; [3] Based on 28 of the 31 public facilities, as three did not respond; [4] Based on 20 of the 21 private facilities, as one did not respond [5] Based on 48 of the 52 facilities

Source: Radiotherapy facilities' survey, 2009

Nearly half of the facilities (46%) reported an issue under 'other'. The most commonly reported issues included budget restrictions (i.e. funds not available to recruit extra staff), freezes on recruitment to vacant positions; opportunities to use new technologies; access to funding for training registrars (private sector); access to research opportunities; absence of comprehensive regional cancer services; and inability to sub-specialise (small centres). Only

27% of facilities reported the supply of trained ROs as an issue. Surprisingly, there was more concern about this issue in metro than regional facilities (reported by 32% against 10%). More predictably, there was more concern about the supply of trained ROs in public rather than private facilities (reported by 34% against 15%). The relatively low concern about supply of trained ROs is consistent with the vacancy data (see Table 5.17).

Table 5.21: Recruitment and retention issues for RTs by location and sector

Recruitment and retention issues	By Location				By Sector				Total	
	Metro		Regional		Public		Private			
	N	%[1]	N	%[2]	N	%[3]	N	%[4]	N	%[5]
Remuneration	21	51%	6	60%	16	53%	11	52%	27	53%
Location of service	25	61%	7	70%	15	50%	17	81%	32	63%
Career progression	37	90%	5	50%	24	80%	18	86%	42	82%
Collegial support	3	7%	4	40%	7	23%	0	0%	7	14%
Supply of trained professionals	8	20%	1	10%	6	20%	3	14%	9	18%
Training requirements	2	5%	1	10%	2	7%	1	5%	3	6%
Other	17	41%	3	30%	10	33%	10	48%	20	39%

[1] Based on 41 of the 42 metro facilities, as one did not respond; [2] Based on all 10 regional facilities; [3] Based on 30 of the 31 public facilities, as one did not respond; [4] Based on all 21 private facilities; [5] Based on 51 of 52 facilities

Source: Radiotherapy facilities' survey, 2009

Table 5.21 presents the reported recruitment and retention issues for RTs, again grouping facilities into metro and regional, as well as public and private. It shows that the most commonly reported issue (by 82% of the 51 facilities that responded to the question) was career progression. The concern about career progression was uniform by sector (80% of public facilities and 86% private). In contrast, 50% of regional facilities considered career progression an issue compared to 90% of metro facilities. The next most commonly reported issues were service location (63% of facilities) and remuneration (53% of facilities). As might be expected service location was considered to be more important in regional facilities (reported by 70% of regional facilities against 61% metro), but it was also more important to private facilities (reported by 81% against 50% public). Regional facilities also considered remuneration more important than metro facilities (reported by 60% against 51%).

Table 5.21 also shows that some 39% of the facilities reported issues under 'other', which included budget restrictions (i.e. funds not available to recruit more staff), shortage of experienced RTs, opportunities to use new technologies; access to research opportunities; support for professional development; flexibility in hours worked; and limited scope of practice. Consistent with the vacancy data, only 18% of facilities considered supply of trained RTs to be an issue.

Table 5.22 presents the reported recruitment and retention issues for ROMPs. Consistent with the vacancy data, it shows that the most commonly reported issue (by 69% of the 49 facilities that responded to the question) was supply of trained professionals. The concern about ROMP supply was uniform by service location (69% of metro facilities and 70% regional). In contrast, 79% of public facilities considered ROMP supply an issue compared to 55% of private facilities. These data further support the proposition that there was a shortage of trained ROMPs in Australia in 2008.

Table 5.22: Recruitment and retention issues for ROMPs by location and sector

Recruitment and retention issues	By Location				By Sector				Total	
	Metro		Regional		Public		Private			
	N	%[1]	N	%[2]	N	%[3]	N	%[4]	N	%[5]
Remuneration	24	62%	5	50%	17	59%	12	60%	29	59%
Location of service	15	38%	6	60%	16	55%	5	25%	21	43%
Career progression	16	41%	4	40%	15	52%	5	25%	20	41%
Collegial support	5	13%	1	10%	4	14%	2	10%	6	12%
Supply of trained professionals	27	69%	7	70%	23	79%	11	55%	34	69%
Training requirements	6	15%	2	20%	7	24%	1	5%	8	16%
Other	16	41%	5	50%	14	48%	7	35%	21	43%

[1] Based on 39 of the 42 metro facilities, as three did not respond; [2] Based on all 10 regional centres; [3] Based on 29 of the 31 public facilities, as two did not respond; [4] Based on 20 of the 21 private facilities, as one did not respond; [5] Based on 49 of the 52 facilities,
Source: Radiotherapy facilities' survey, 2009

Table 5.22 also shows that the next most commonly reported issues were remuneration (59% of facilities), service location 43% and career progression (41%). The concern about remuneration was uniform across public (59%) and private (60%) facilities, compared to it being more commonly reported by metro (62%) rather than regional (50%) facilities. As with RTs, service location was considered to be more important in regional facilities (reported by 60% of regional facilities against 38% metro), but in contrast to RTs, it was also more important to public facilities (reported by 55% against 25% private). Career progression was considered to be more important to public facilities (reported by 52%) rather than private (reported by 25%), but it was not differentiated by metro and regional facilities (reported by 41% and 40% respectively).

Finally, some 43% of the facilities reported an issue under 'other'. The most commonly reported issues included excessive workload due to shortage of qualified staff; high rates of pay offered in NSW; budget restrictions (i.e. funds not available to recruit extra staff); difficulties in obtaining approval to recruit to vacant positions; technological challenges; inadequate number of training positions; access to research opportunities; support for professional development; professional recognition; and professional isolation.

6

Analysis of ROs Survey

This Chapter presents descriptive analyses on the RO workforce (including registrars) derived from the professions survey which collected detailed information on qualifications, experience, employment status, hours worked and future working intentions. The aim is to describe the RO workforce in terms of age/sex profile, location and movement into and out of practice. Total workforce is described therefore registrars are included in many of the analyses presented. All references to ROs include registrars and affiliates of the RANZCR unless otherwise indicated.

6.1 SURVEY RESPONSE RATE

In May 2009, there were 357 ROs (Fellows, Registrars or Affiliates) on the RANZCR mailing list that was used as the basis for the survey. Table 6.1 shows the number of survey respondents and response rate by jurisdiction, and the estimated number of working ROs (including registrars) from the facilities survey. Note, that five respondents were working overseas at the time of the survey; this number has been used to make a crude estimate (nine) of the number of ROs working overseas who have retained current membership or affiliation with RANZCR, and these nine have been removed from the total of 357 for the purposes of estimating survey response rates by state/territory.

Table 6.1: Professions survey - ROs (inc registrars) response rate

State/ Territory	Males				Females				Total			
	Registered#	Working*	Responded	Response rate (%)	Registered#	Working*	Responded	Response rate (%)	Registered#	Working*	Responded	Response rate (%)
NSW	86	84	45	52.3	42	41	22	52.4	128	125	67	52.3
Vic	63	61	31	49.2	41	40	20	48.8	104	101	51	49.0
Qld	34	33	19	55.9	27	26	15	55.6	61	59	34	55.7
WA	14	13	8	57.1	7	7	4	57.1	21	20	12	57.1
SA	17	17	10	58.8	2	2	1	50.0	19	19	11	57.9
Tas	3	3	2	66.7	3	3	2	66.7	6	6	4	66.7
ACT	5	5	3	60.0	5	4	3	60.0	9	9	6	66.7
NT	0	0	0	n/a	0	0	0	n/a	0	0	0	n/a
Other+	2	0	1	55.6	7	0	4	57.1	9	0	5	55.6
Total	224	216	119	53.2	133	123	71	53.4	357	339	190	53.2

* Estimated from facilities survey; # Based on the total number of RANZCR members and affiliates; + Refers to five respondents working overseas; state/territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

Table 6.1 shows that 190 ROs responded to the survey. The five respondents who were working overseas at the time of the survey have been deleted from all analyses of the Australian workforce (subsequent tables are based on 185 respondents). Response rates were highest in Tasmania and ACT (66.7%) and lowest in Victoria (49.0%). Overall the response rates were fairly uniform across the states/territories and comparable for females (53.4%) and males (53.2%) suggesting that the results can be interpreted with confidence (not dominated by respondents from particular states or one gender group). It can also be concluded that, given the accurate estimates of the number of practising ROs produced by the facilities survey, the national 53.2% response is sufficient for describing the characteristics of working ROs for the purpose of formulating the workforce projections model.

6.2 AGE DISTRIBUTION OF ROs

The professions survey asked respondents for their year of birth, which has been used to estimate the age profile of ROs currently practising in Australia in Table 6.2. The data show that males practising as ROs are roughly evenly spread across the four five-year age cohorts from 35 to 54. Females are a little more concentrated in the younger age groups 30-34 and 35-39, with less than 20% of females practising as ROs being more than 50 years of age. The average age for males (45 years) is higher than that for females (41 years) with the overall average age being 44 years.

Table 6.2: Practising ROs (inc registrars) by age and gender, 2008

Age cohort	Survey respondents*						Total working#					
	Male		Female		Total		Male		Female		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
25-29	7	5.9	8	11.9	15	8.1	13	6.0	15	12.2	28	8.3
30-34	11	9.3	13	19.4	24	13.0	20	9.3	24	19.5	44	13.0
35-39	22	18.6	13	19.4	35	18.9	40	18.5	24	19.5	64	18.9
40-44	18	15.3	11	16.4	29	15.7	33	15.3	20	16.3	53	15.6
45-49	19	16.1	9	13.4	28	15.1	35	16.2	16	13.0	51	15.0
50-54	17	14.4	6	9.0	23	12.4	31	14.4	11	8.9	42	12.4
55-59	11	9.3	6	9.0	17	9.2	20	9.3	11	8.9	31	9.1
60-64	8	6.8	1	1.5	9	4.9	15	6.9	2	1.6	17	5.0
65+	3	2.5	0	0.0	3	1.6	5	2.3	0	0.0	5	1.5
Not stated	2	1.7	0	0.0	2	1.1	4	1.9	0	0.0	4	1.2
Total	**118**	**100.0**	**67**	**100.0**	**185**	**100.0**	**216**	**100.0**	**123**	**100.0**	**339**	**100.0**

* Only 185 survey respondents working in Australia; # Scaled to facilities survey estimate of 339 working ROs; state/territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population.

6.3 WORKING HOURS AND WORKLOAD OF ROs

The weekly average hours worked reported by respondents has been used to estimate the working hours profile for ROs in Table 6.3. The data show that the majority (55.1%) of males practising as ROs work between 40 and 49 hours per week. The most reported category for females is also 40 to 49 hours per week although it represents a smaller proportion (32.5%) of the workforce than males. As might be expected there are many more females than males working less than 40 hours per week. Correspondingly, the weekly average hours worked by males (48.3 hours) is higher than that for females (42.1 hours) with the overall weekly average hours worked being 46.1.

Table 6.3: Practising ROs (inc registrars) by hours worked and gender, 2008

Average weekly hours worked	Male		Female		Total	
	N	%	N	%	N	%
10-19	0	0.0	4	3.3	4	1.2
20-29	0	0.0	20	16.3	20	5.9
30-39	4	1.9	13	10.6	17	5.0
40-49	119	55.1	40	32.5	159	46.9
50-59	51	23.6	22	17.9	73	21.5
60-69	15	6.9	5	4.1	20	5.9
70+	9	4.2	6	4.9	15	4.4
Not stated	18	8.3	13	10.6	31	9.1
Total	**216**	**100.0**	**123**	**100.0**	**339**	**100.0**

Based on survey responses scaled to the estimate of 339 ROs working in Australia derived from the facilities survey. Table may contain rounding errors due to scaling of responses to population.

Table 6.4 further explores the working hours issue by examining work location. Review of the data suggests that the highest proportions of ROs working more than 50 hours per week are in South Australia (45.5% compared to the national average of 31.8%). At the other end of the spectrum, the lowest proportion of ROs working more than 50 hours per week is in Queensland (26.5%). These trends are reflected in the average weekly working hours at the state/territory level which range from 40.3 in Tasmania through to 48.6 in SA, which compare to the national average of 46.1.

Table 6.4: Practising ROs (inc registrars) by average hours worked and location, 2008

Average weekly hours worked	Current work location - State/Territory														Total	
	NSW		Victoria		Queensland		WA		SA		Tasmania		ACT			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
10-19	0	0.0	4	3.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	1.2
20-29	6	4.5	6	5.9	5	8.8	2	8.3	0	0.0	1	16.7	0	0.0	20	5.9
30-39	7	6.0	6	5.9	0	0.0	2	8.3	0	0.0	0	0.0	2	22.2	17	5.0
40-49	62	49.3	44	43.1	33	55.9	10	50.0	9	45.5	1	16.7	1	11.1	159	46.9
50-59	22	17.9	28	27.5	7	11.8	5	25.0	7	36.4	2	33.3	3	33.3	73	21.5
60-69	6	4.5	6	5.9	5	8.8	2	8.3	2	9.1	0	0.0	0	0.0	20	5.9
70+	7	6.0	4	3.9	3	5.9	0	0.0	0	0.0	0	0.0	0	0.0	15	4.4
Not stated	15	11.9	4	3.9	5	8.8	0	0.0	2	9.1	2	33.3	3	33.3	31	9.1
Total	**125**	**100.0**	**101**	**100.0**	**59**	**100.0**	**20**	**100.0**	**19**	**100.0**	**6**	**100.0**	**9**	**100.0**	**339**	**100.0**

Based on survey responses scaled to the estimate of 339 ROs working in Australia derived from the facilities survey.
Table may contain rounding errors due to scaling of responses to population.

Using data from the facilities survey, it is possible to compare average hours worked by ROs to the number of new cases seen per annum by state/territory as shown in Table 6.5. This input time and workload comparison is best done excluding registrars as there is always a consultant RO responsible for a patient's case. Review of the data shows that the average hours worked by ROs in independent practice is 45.8, which compares to 46.1 including registrars indicating that, on average, registrars work slightly longer hours. When only ROs working full time (defined to be working 40 hours or more) are included in the calculation the average increases to 49.4 with the median being 48.0. Interestingly, the average and the median working hours are close in most states/territories except for NSW and Queensland where a few ROs reported very long hours which has inflated the averages slightly.

Table 6.5: Practising ROs (ex registrars) by average hours worked and new cases, 2008

State/Territory	ROs weekly hours worked			New cases per RO per year
	Average	Average (FT only)	Median (FT only)	
NSW	46.7	49.3	47.0	206.8
Victoria	44.5	49.4	48.0	235.9
Queensland	46.4	49.5	46.5	249.8
WA	45.8	51.8	51.0	458.6
SA	48.6	48.6	47.5	295.6
Tasmania	40.3	47.0	47.0	221.3
ACT	44.8	49.7	50.0	155.6
Total	**45.8**	**49.4**	**48.0**	**241.6**

Hours worked from professions survey; New cases from facilities survey; state/territory refers to current work location, not residence.

Also from Table 6.5 it can be seen that ROs in WA reported the longest working hours (average 51.8 for full time RO) in the professions survey and the facilities survey indicated that they see the highest number of new cases per annum (average 458.6). At the low end the shortest average working hours (average 47.0 for full time radiation oncologist) was reported in Tasmania, whereas the lowest number of new case per RO (155.6) was reported in the ACT (Tasmania was the third lowest at 221.3 new cases per year for a full-time RO).

Overall, the variation in the average (or median) working hours of ROs is small (low 47.0 hours in Tasmania to high of 51.8 in WA, or between 95.3% and 105.1% of the average), whereas the variation in the number of new cases per ROs is very large (low 155.6 in the ACT to high of 458.6 in WA or between 64.4% and 189.8% of average). These data are difficult to interpret, although it seems the WA situation represents an outlier case as the new cases per full time RO are in a much narrower range if the WA data are removed. The case studies did not reveal any significant differences in RO practices across the states/territories so it is difficult to identify the reasons for the apparently significant difference in workload without more detailed study.

An important part of understanding the workload of ROs going forward is to assess the impact of technology. Survey respondents were asked to “estimate in percentage terms, ignoring the short term impact that is typically associated with professionals learning and becoming proficient in a new technology”, the ongoing impact of a range of technologies on ROs workload. Table 6.6 sets out the responses in terms of the proportion of respondents that commented on a particular technology and the impact on workload they reported. Note that the question specifically asked respondents to answer only if they had “direct experience in working with the specified technology”.

Table 6.6: Assessment by RO (ex registrars) of impact of technology on workload

Technology	Estimated impact on workload					
	Increase		Decrease		No change	Don’t know
	% Respondents	Average increase	% Respondents	Average decrease		
Intensity Modulated Radiotherapy (IMRT)	64.0%	14.3%	0.0%	0.0%	28.0%	8.0%
Brachytherapy – HDR	42.0%	13.0%	1.4%	10.0%	43.5%	13.0%
Brachytherapy – LDR	18.9%	15.0%	1.9%	10.0%	62.3%	17.0%
Brachytherapy – seed	31.1%	16.8%	0.0%	0.0%	54.1%	14.8%
Modulated arc therapy	17.3%	7.1%	0.0%	0.0%	67.3%	15.4%
Stereotactic radiosurgery/radiotherapy	25.5%	13.0%	0.0%	0.0%	58.2%	16.4%
Image fusion for treatment planning	73.6%	11.3%	8.5%	11.3%	17.0%	0.9%
Treatment verification imaging	61.1%	10.8%	8.4%	10.0%	29.5%	1.1%
Gated delivery	9.8%	9.0%	0.0%	0.0%	70.6%	19.6%
Four-dimensional computerised tomography	20.0%	9.0%	3.6%	5.5%	60.0%	16.4%
Adaptive planning and treatment (including IGRT)	46.3%	11.0%	1.5%	10.0%	44.8%	7.5%

Source: ROs professions’ survey 2009

Table 6.6 suggests that ‘image fusion for treatment planning’, ‘IMRT’ and ‘treatment verification imaging’ have had/will have the largest impact on ROs with 73.6%, 64.0% and 61.1% of respondents respectively reporting an increase in workload. The average reported impacts were respectively 11.3%, 14.3% and 10.8% increase in hours. Interestingly, ‘image fusion for treatment planning’, and ‘treatment verification imaging’ were also the two most frequently reported technologies that would decrease workload, although by a much smaller proportion of respondents, 8.5% and 8.4% respectively. The averages of the reported reduction in hours at 11.3% and 10.0% were almost identical to the average reported increases by those respondents who considered these technologies would increase workload.

These data are difficult to interpret. For all but three of the listed technologies the majority of respondents reported either no change in workload or don’t know. Looking closely at the data it would seem that the majority view is that ‘image fusion for treatment planning’, ‘IMRT’, ‘treatment verification imaging’, and ‘possibly adaptive planning and treatment’ will increase workload for ROs. The amount of the increase is too difficult to determine with any confidence, as is the extent of any counter-balancing savings from other changes to work practices. It is fair to report that in the interviews conducted with ROs, there was a general agreement that these new technologies would add to treatment planning time, but there also seemed to be a view that the increased time could be offset by making other changes to work practices.

6.4 RECRUITMENT, CHANGES IN WORK, AND RETIREMENT

The professions survey asked a series of questions in order to examine the issues of entry to the workforce, the changes in working arrangements of current workforce participants and retirements from the workforce. Table 6.7 examines for ROs in independent practice in 2008, the year they entered independent practice in Australia, and the place where they obtained their RO qualification. The data show that of the estimate of 231 ROs practising independently in Australia in 2008, 86.6% qualified in Australia (assuming the nine non-respondents to this question have similar qualification profiles to respondents). The data also show that Queensland has the highest proportion (28.6%) of ROs who qualified overseas whereas NSW has the lowest (4.6%). Note, due to the estimation process and the small numbers involved, the data for the smaller states/territories will have some inaccuracies (this problem has little impact on the national level data).

Table 6.7: ROs (ex registrars) workforce entry year and place of qualification, by state/territory

State/	2009-2005			2004-2000			1999 and before			Total respondents			Not	Grand
Territory	Aust	Overseas	% Aust	Aust	Overseas	% Aust	Aust	Overseas	% Aust	Aust	Overseas	% Aust	stated	Total
NSW	21	2	92.3	14	0	100.0	40	2	95.8	75.0	3	96.4	5	83
Vic	16	3	83.3	9	2	82.4	33	3	91.3	58	8	88.0	2	67
Qld	9	6	60.0	6	2	80.0	14	5	75.0	30	12	71.4	0	42
WA	5	0	100.0	3	0	100.0	3	2	66.7	11	2	84.6	0	13
SA	2	0	100.0	2	0	100.0	8	3	71.4	11	3	78.6	0	14
Tas	3	0	100.0	0	0	0.0	2	2	50.0	5	1	83.3	0	6
ACT	1	0	100.0	1	0	100.0	2	0	100.0	4	0	100.0	2	6
Total	**56**	**11**	**83.9**	**35**	**4**	**92.1**	**100**	**16**	**86.3**	**192**	**30**	**86.6**	**9**	**231**

Based on professions survey responses scaled to the estimate of 231 ROs in independent practice derived from the facilities survey; State/territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

Table 6.7 also allows examination of the RO workforce entrance profile by five-year cohorts. It shows that in the five years 2005 to 2009, it is estimated that 11 of the 67 (16.4%) new entrants to independent practice as ROs in Australia qualified overseas. This figure is increased from the previous five year period 2000 to 2004 where it is estimated that only 4 of the 39 (10.3%) of new entrants to ROs independent practice qualified overseas. Of those working in 2008, who started independent practice in Australia in 1999 or before, it is estimated that 13.8% of them qualified overseas. These numbers indicate that Australia has a high degree of self sufficiency in training ROs. Taken overall, the data show that between one and two ROs who qualified overseas enter independent practice in Australia each year.

The professions survey also asked working ROs about any intended short term changes to working arrangements. Table 6.8 reports the responses to this question for ROs in independent practice. It reflects a high degree of stability in the RO workforce, with 78.8% reporting either no change or an increase in working hours in the next 12 months. Only 6.1% expect a decrease in working hours. Small numbers expect to either cease practice (0.9% report expect retirement or career change) or practice overseas (1.3%). A slightly larger number (2.6%) expect a pause in practice (these were all female respondents who were planning maternity leave) with the expected length of the break averaging 8.8 months.

Table 6.8: ROs (ex registrars) change in working arrangements by State

State/ Territory	None		Increased hours		Decreased hours		Pause in practice		Cease to practice		Practice overseas		Other		Not stated		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
NSW	45	54.2	16	18.8	3	4.2	3	4.2	0	0.0	0	0.0	9	10.4	7	8.3	83	100.0
Victoria	46	69.0	11	16.7	5	7.1	0	0.0	0	0.0	3	4.8	0	0.0	2	2.4	67	100.0
Queensland	23	53.6	15	35.7	2	3.6	2	3.6	0	0.0	0	0.0	2	3.6	0	0.0	42	100.0
WA	8	62.5	3	25.0	2	12.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	13	100.0
SA	3	22.2	6	44.4	2	11.1	0	0.0	2	11.1	0	0.0	0	0.0	2	11.1	14	100.0
Tasmania	2	25.0	3	50.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	25.0	6	100.0
ACT	1	16.7	1	16.7	1	16.7	1	16.7	0	0.0	0	0.0	1	16.7	1	16.7	6	100.0
Total	**127**	**55.0**	**55**	**23.8**	**14**	**6.1**	**6**	**2.6**	**2**	**0.9**	**3**	**1.3**	**11**	**4.8**	**13**	**5.6**	**231**	**100.0**

Based on professions survey responses scaled to the estimate of 231 ROs in independent practice derived from the facilities survey; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

To complete the picture, Table 6.9 describes the retirement intentions of ROs in independent practice (i.e. excluding registrars). Consistent with the relatively younger age profile of ROs, the data show that only 6.1% of the current workforce is expected to retire in the next five years, with a further 14.7% retiring in the five years after that. Assuming the 10.2% of the survey respondents who did not indicate their retirement intentions are distributed similarly to those that did, it can be concluded that around 21% of the current workforce will retire before 2019. Although the numbers are small, the survey data indicate that WA and NSW will have retirement rates below the national average and SA, Queensland, Tasmania, ACT and Victoria will be above the national average over the ten-year period.

Table 6.9: ROs (ex registrars) expected year of retirement by State

State/Territory	2009-2013		2014-2018		2019 and beyond		Not stated		Total	
	N	%	N	%	N	%	N	%	N	%
NSW	5	6.0	7	8.0	61	74.0	10	12.0	83	100.0
Victoria	3	4.9	15	22.0	47	70.7	2	2.4	67	100.0
Queensland	0	0.0	9	22.2	28	66.7	5	11.1	42	100.0
WA	0	0.0	2	12.5	11	87.5	0	0.0	13	100.0
SA	3	22.2	0	0.0	6	44.4	5	33.3	14	100.0
Tasmania	2	25.0	0	0.0	3	50.0	2	25.0	6	100.0
ACT	1	16.7	1	16.7	3	50.0	1	16.7	6	100.0
Total	**14**	**6.1**	**34**	**14.7**	**160**	**69.3**	**23**	**10.0**	**231**	**100.0**

Based on professions survey responses scaled to the estimate of 231 ROs in independent practice derived from the facilities survey; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

The estimated retirement numbers of 48 (adjusted for the number of 'not stated' respondents) over the next ten years suggest that an average of 4.8 ROs will retire each year. In addition, about three ROs will seek to practice overseas (see Table 6.8) giving a total workforce loss of 7 to 8 ROs per annum. Based on the fact that the facilities survey identified 108 registrars working in 2008, it is expected that there will be around 18-20 registrars completing their fellowship each year. Using the professions survey data, it is expected that 10-12 of these registrars will seek to do post-fellowship training overseas (based on the survey returns from registrars, about around 60% will pursue post-fellowship training overseas; most of whom will return to practice in Australia (as evidenced by the fact that the survey shows that about 40% of ROs that were working in Australia in 2008 had spent an average of four years practising overseas).

Taking these figures together, about 20 will obtain their fellowship each year. Of these about eight will look for a position in Australia and 12 will look for a position overseas. Additionally, about eight Australian qualified ROs will return to practice in Australia, and another two overseas qualified ROs will be recruited to work in Australia. Taken together, these streams will result in a net inflow of 18 qualified ROs per year. This balances against the outflow of 7-8 per year suggesting that there will still be net growth in the workforce at the rate of about 10 to 11 ROs in each of the next ten years.

7

Analysis of RTs Survey

This Chapter presents descriptive analyses on the RTs workforce (including those undertaking their professional development year, "PDYs") derived from the professions survey which collected detailed information on qualifications, experience, employment status, hours worked and future working intentions. The aim is to describe the RTs workforce in terms of age/sex profile, location and movement into and out of practice. Total workforce is described therefore PDYs are included in many of the analyses presented. All references to RTs include PDYs unless otherwise stated.

7.1 SURVEY RESPONSE RATE

By combining information derived from the AIR (they advised 1,050 RT members), the Medical Radiation and/or Licensing Boards in each State, and the facilities' survey it is estimated that there were 1,824 RTs in Australia in May 2009 who received the professions' survey. Table 7.1 shows the number of survey respondents and response rate by jurisdiction, and the estimated number of working RTs (including PDYs) from the facilities survey. According to the facilities survey there are 1,578 employed RTs in Australia. Note, that 11 respondents were working overseas at the time of the survey; this number has been used to make a crude estimate (22) of the number of RTs working overseas who have retained current membership of the AIR and/or Australian radiation practice license, and these 11 have been removed from the total of 920 for the purposes of estimating survey response rates by State.

Table 7.1: Professions survey – RT (inc PDYs) response rate

State/ Territory	Males				Females				Total			
	Registered#	Working*	Responded	Response rate (%)	Registered#	Working*	Responded	Response rate (%)	Registered#	Working*	Responded	Response rate (%)
NSW	142	125	57	40.1	450	393	180	40.0	592	518	237	40.0
Vic	110	96	72	65.5	379	332	248	65.4	489	428	320	65.4
Qld	112	98	55	49.1	249	218	122	49.0	361	316	177	49.0
WA	29	25	15	51.7	108	95	56	51.9	137	120	71	51.8
SA	27	24	14	51.9	95	83	49	51.6	122	107	63	51.6
Tas	28	24	14	50.0	29	26	15	51.7	57	50	29	50.9
ACT	4	3	1	25.0	40	36	11	27.5	44	39	12	27.3
NT	0	0	0	n/a	0	0	0	n/a	0	0	0	n/a
Other+	4	0	2	0.0	18	0	9	50.0	22	0	11	50.0
Total	456	396	230	50.5	1,368	1,182	690	50.4	1,824	1,578	920	50.4

* Estimated from facilities survey; # Based on the number of AIR members and radiation license holders; + Refers to 11 respondents working overseas; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

Table 7.1 shows that 920 RTs responded to the survey. The 11 respondents who were working overseas at the time of the survey have been deleted from all analyses of the Australian workforce (subsequent tables are based on 909 respondents). Response rates were highest in Victoria (65.4%) and lowest in the ACT (27.3%). Overall, apart from the ACT, the response rate was fairly uniform across the states and comparable for females (50.4%) and males (50.5%) suggesting that the results can be interpreted with confidence (not dominated by respondents from particular states or one gender group). It can also be concluded that, given the accurate estimates of the number of practising RTs produced by the facilities survey, the national 50.4% response is sufficient for describing the characteristics of working ROs for the purpose of formulating the workforce projections model.

7.2 AGE DISTRIBUTION OF RTS

The professions survey asked respondents for their year of birth, which has been used to estimate the age profile of RTs working in Australia in Table 7.2. The data show that the 25-29 age group accounts for more than one in five of the workforce (22.1%). There is a concentration of females in the age cohorts from 20 to 39 years, which together represent 63.9% of the workforce. This concentration is even more pronounced for males where the great majority (71.2%) are in the age cohorts from 20 to 39 with relatively fewer (11.1%) aged 50 or more years compared to females (19.5%). Correspondingly, the average age for females (37.0 years) is greater than for males (35.0 years) with the overall average age being 36.0 years.

Table 7.2: Working RTs (inc PDYs) by age and gender, 2008

Age cohort	Survey respondents*						Total working#					
	Male		Female		Total		Male		Female		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
20-24	29	12.7	103	15.1	132	14.5	50	12.8	179	15.1	229	14.5
25-29	43	18.9	151	22.2	194	21.3	75	19.2	262	22.1	337	21.4
30-34	46	20.2	82	12.0	128	14.1	80	20.5	142	12.0	222	14.1
35-39	42	18.4	101	14.8	143	15.7	73	18.7	175	14.7	248	15.7
40-44	22	9.6	54	7.9	76	8.4	38	9.7	94	7.9	132	8.4
45-49	18	7.9	45	6.6	63	6.9	31	7.9	78	6.6	109	6.9
50-54	14	6.1	77	11.3	91	10.0	24	6.2	134	11.3	158	10.0
55-59	4	1.8	43	6.3	47	5.2	7	1.8	75	6.3	82	5.2
60-64	7	3.1	13	1.9	20	2.2	12	3.1	23	1.9	35	2.2
65+	0	0.0	3	0.4	3	0.3	0	0.0	5	0.4	5	0.3
Not stated	3	1.3	9	1.3	12	1.3	5	1.3	16	1.3	21	1.3
Total	228	100.0	681	100.0	909	100.0	396	100.0	1,182	100.0	1,578	100.0

*Only the 909 RTs working in Australia #Scaled to facilities survey estimate of 1,578 working RTs
State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

Another interesting feature of the data is that the age cohorts from 40-49 years seem to be under-represented both in males (17.5%) and even more so in females (14.5%). These survey data are consistent with the advice we received during the case study process from Chief RTs who advised that there was no difficulty in recruiting to base grade RT positions (in fact in some States, we were advised that there is an oversupply in this area) but there were some issues in recruiting to senior positions (where many of successful applicants might be expected to be in the 40-49 year age groups).

7.3 WORKING HOURS AND WORKLOAD OF RTS

The weekly average hours worked reported by respondents has been used to estimate the working hours profile for RTs in Table 7.3. The data show that the majority (64.4%) of males working as RTs work between 30 and 39 hours per week. The most reported category for females is also 30 to 49 hours per week although it represents a smaller proportion (49.3%) of the workforce than males. As might be expected there are many more females (19.1%) than males (2%) working less than 30 hours per week. Correspondingly, the weekly average hours worked by males (39.6 hours) is higher than that for females (35.2 hours) with the overall weekly average hours worked being 36.3.

Table 7.3: Working RTs (inc PDYs) by hours worked and gender, 2008

Average weekly hours worked	Male		Female		Total	
	N	%	N	%	N	%
0-9	2	0.5	22	1.9	24	1.5
10-19	2	0.5	80	6.8	82	5.2
20-29	4	1.0	123	10.4	127	8.0
30-39	255	64.4	583	49.3	838	53.1
40-49	64	16.2	177	15.0	241	15.3
50-59	7	1.8	19	1.6	26	1.6
60-69	2	0.5	17	1.4	19	1.2
70+	15	3.8	25	2.1	40	2.5
Not stated	45	11.4	136	11.5	181	11.5
Total	396	100.0	1,182	100.0	1,578	100.0

Based on survey responses scaled to the estimate of 1,578 RTs working in Australia derived from the facilities survey
Table may contain rounding errors due to scaling of responses to population

Table 7.4 further explores the working hours issue by examining work location. Review of the data suggests that the highest proportions of RTs working more than 40 hours per week are in Tasmania and Queensland (41.3% and 36.2% compared to the national average of 20.6%). At the other end of the spectrum, the lowest proportions of RTs working more than 40 hours per week are in NSW and SA (8.2% and 11.2%). These trends are reflected in the average weekly working hours at the State level which range from 33.6 in NSW through to 42.0 in SA, which compare to the national average of 36.3.

Table 7.4: Working RTs (inc PDYs) by average hours worked and location, 2008

Average weekly hours worked	Current work location - State/Territory														Total	
	NSW		Vic		Qld		WA		SA		Tas		ACT			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0-9	4	0.8	11	2.5	4	1.1	0	0.0	2	1.6	0	0.0	3	8.3	24	1.5
10-19	31	5.9	23	5.3	11	3.4	7	5.6	8	7.9	2	3.4	0	0.0	82	5.2
20-29	50	9.7	40	9.4	5	1.7	14	11.3	12	11.1	3	6.9	0	0.0	127	8.0
30-39	317	61.2	222	51.9	154	48.6	56	46.5	56	52.4	21	41.4	26	66.7	838	53.1
40-49	20	3.8	59	13.8	104	32.8	32	26.8	2	1.6	12	24.1	3	8.3	241	15.3
50-59	4	0.8	5	1.3	9	2.8	2	1.4	3	3.2	2	3.4	0	0.0	26	1.6
60-69	7	1.3	5	1.3	0	0.0	2	1.4	3	3.2	0	0.0	3	8.3	19	1.2
70+	7	1.3	16	3.8	2	0.6	2	1.4	3	3.2	7	13.8	0	0.0	40	2.5
Not stated	79	15.2	47	10.9	29	9.0	7	5.6	17	15.9	3	6.9	3	8.3	181	11.5
Total	518	100.0	428	100.0	316	100.0	120	100.0	107	100.0	50	100.0	39	100.0	1,578	100.0

Based on survey responses scaled to the estimate of 1,578 RTs working in Australia derived from the facilities survey
Table may contain rounding errors due to scaling of responses to population

Using data from the facilities survey, it is possible to compare average hours worked by RTs to the number of attendances per linac day by State as shown in Table 7.5. This input time and workload comparison is best done excluding PDYs as, through the case study process, we were advised that the PDYs are supernumerary (i.e. not required to carry out the work). Review of the data shows that the average hours worked by qualified RTs is 35.2, which compares to 36.3 including PDYs indicating that, on average, PDYs work slightly longer hours. When only RTs working full time (defined to be working 38 hours or more) are included in the calculation the average increases to 43.4 with the median being 39.1. Table 7.5 also shows that except for Queensland and WA, the average is considerably greater than the median working hours in the other States, which indicates that there were a number of RTs in these States that reported very long hours which has measurably inflated the averages.

Table 7.5: Working RTs (ex PDYs) by average hours worked and new cases, 2008

State/Territory	RT weekly hours worked			Attendances per linac day
	Average	Average (FT only)	Median (FT only)	
NSW	33.4	47.9	40.0	31.2
Vic	36.5	42.3	38.0	30.1
Qld	37.8	39.8	38.0	36.1
WA	36.0	41.4	40.0	40.2
SA	34.8	42.5	38.0	38.5
Tas	30.4	44.2	40.0	34.3
ACT	37.3	45.8	40.0	33.7
Total	35.2	43.4	39.1	33.2

Hours worked from professions survey; Attendances per linac day from facilities survey; State/Territory refers to work location, not residence

Also from Table 7.5 it can be seen that RTs in NSW reported the longest working hours (average 47.9 for full time radiation therapist) in the professions survey yet WA reported the highest number of attendances per linac day. This finding is not surprising, given that linacs are often staffed with overlapping shifts of RTs, which allows a higher number of attendances per linac day. This practice seems to be most used in WA, which results in the highest number of attendances per linac day and aligns with the fact that the number of new case per RO is much greater than the national average.

Overall, the variation in the average (or median) working hours of RTs is small (low 39.8 hours in Tasmania to high of 47.9 in NSW, or between 91.7% and 110.4% of the average), whereas the variation in the number of attendances per linac day is larger (low 30.1 in Victoria to high of 40.2 in WA or between 90.7% and 121.18% of average). These data are difficult to interpret; it is clear that attendances per linac day is not the most appropriate measure of RT workload, however, better measures cannot be derived from the available data. A more detailed study that measured input costs against casemix (complexity) adjusted output measures could be undertaken to produce the required workload indictors.

An important part of assessing the future workload of RTs is to assess technology impact. RT survey respondents were asked to "estimate in percentage terms, ignoring the short term impact that is typically associated with professionals learning and becoming proficient in a new technology", the ongoing impact of a range of technologies on workload. Table 7.6 sets out the proportion of respondents that commented on a particular technology and the impact on workload they reported. Note that the question specifically asked respondents to answer only if they had "direct experience in working with the specified technology".

Table 7.6: Assessment by RTs (ex PDYs) of impact of technology on workload

Technology	Estimated impact on workload					
	Increase		Decrease		No change	Don't know
	% Respondents	Average increase	% Respondents	Average decrease		
Intensity Modulated Radiotherapy (IMRT)	61.5%	16.4%	1.2%	20.8%	24.6%	12.6%
Brachytherapy – HDR	21.3%	13.0%	1.3%	16.7%	51.9%	25.5%
Brachytherapy – LDR	8.9%	9.2%	0.0%	0.0%	58.1%	33.0%
Brachytherapy – seed	17.5%	14.0%	0.0%	0.0%	51.6%	30.9%
Modulated arc therapy	13.9%	12.5%	0.0%	0.0%	54.2%	31.8%
Stereotactic radiosurgery/radiotherapy	21.7%	10.9%	0.0%	0.0%	49.8%	28.6%
Image fusion for treatment planning	78.0%	10.8%	0.2%	5.0%	15.6%	6.3%
Treatment verification imaging	82.8%	15.9%	3.0%	13.0%	11.7%	2.5%
Gated delivery	25.1%	11.5%	0.0%	0.0%	44.3%	30.6%
Four-dimensional computerised tomography	32.2%	13.4%	1.7%	12.3%	38.9%	27.2%
Adaptive planning and treatment (including IGRT)	64.5%	14.9%	0.8%	15.7%	19.4%	15.2%

Source: RTs profession survey, HealthConsult 2009

Table 7.6 suggests that 'treatment verification imaging', 'image fusion for treatment planning, 'adaptive planning and treatment' and 'IMRT' have had/will have the largest impact on RTs with 82.8%, 78.0%, 64.5% and 61.5% of respondents respectively reporting an increase in workload. The average reported impacts were respectively a 15.9%, 10.8%, 14.9% and 16.4% increase in hours. Very few respondents considered that the listed technologies would result in a decreased workload. The four technologies that were identified as likely to result in an increased workload by RTs were also reported as the major influencers by ROs with similar workload impact in terms of hours, i.e. in the range of 10% to 15% increase.

Consistent with what was reported by with ROs, the majority of respondents reported either no change in workload or don't know for all but four of the listed technologies. The clear majority view is that 'treatment verification imaging', 'image fusion for treatment planning, 'adaptive planning and treatment' and 'IMRT' will increase workload for RTs. In the interviews conducted with RTs as part of the case studies, there was also general agreement that these new technologies would add to treatment planning time. There was also a view that a number of other technologies that were not listed because they were not treatment technologies (e.g. remote repositioning of patients during treatment) had resulted in time savings. As with ROs, the net impact is too difficult to determine with any confidence, in the absence of a detailed 'time and motions' study.

7.4 RECRUITMENT, CHANGES IN WORK, AND RETIREMENT

The professions survey asked a series of questions in order to examine the issues of entry to the workforce, the changes in working arrangements of current workforce participants and retirements from the workforce. Table 7.7 examines for qualified RTs working in 2008, the year they started working in Australia, and the place where they obtained their RT qualification. The data show that of the estimate of 1,401 qualified RTs working in Australia in 2008, 87.6% (compared to 86.6% of ROs) qualified in Australia (assuming the 146 non-respondents to this question have similar qualification profiles to respondents). The data also show that WA and the ACT have the highest proportions (34.9% and 25.0%) of RTs who qualified overseas whereas Queensland has the lowest (6.0%).

Table 7.7: RTs (ex PDYs) workforce entry year and place of qualification, by State

State/	2009-2005			2004-2000			1999 and before			Total respondents			Not	Grand
Territory	Aust	Overseas	% Aust	Aust	Overseas	% Aust	Aust	Overseas	% Aust	Aust	Overseas	% Aust	stated	Total
NSW	109	8	93.1	69	6	91.9	162	26	86.0	340	41	89.2	67	448
Vic	93	8	92.4	49	16	75.0	163	16	90.8	305	41	88.2	38	384
Qld	102	5	95.1	25	4	87.5	125	7	94.7	252	16	94.0	18	286
WA	34	11	75.0	2	13	11.1	34	13	72.4	69	37	65.1	3	109
SA	31	2	95.2	9	2	85.7	30	5	86.4	71	8	89.9	17	96
Tas	10	0	100.0	5	2	75.0	20	2	92.3	35	4	89.7	3	42
ACT	9	3	75.0	6	0	100.0	12	6	66.7	27	9	75.0	0	36
Total	388	37	91.2	165	43	79.6	547	75	88.0	1099	156	87.6	146	1401

Based on professions survey responses scaled to the estimate of 1,401 qualified RTs working in Australia derived from the facilities survey; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

Table 7.7 also allows examination of the RT workforce entrance profile by five-year cohorts. It shows that in the five years 2005 to 2009, it is estimated that 37 of the 425 (8.7%) newly qualified RTs in Australia qualified overseas. This figure decreased from the previous five year period 2000 to 2004 where it is estimated that 43 of the 208 (20.7%) of newly qualified RTs in Australia qualified overseas. These data reflect the outcomes of the RTs' recruitment drive that was undertaken to address the workforce shortages identified by the Baume Inquiry.

Of those working in 2008, who started working as qualified practitioners in Australia in 1999 or before, it is estimated that 12.6% of them qualified overseas. These numbers indicate that Australia now has a high degree of self sufficiency in training RTs, albeit that there was a considerable reliance in recruitment from overseas in the period from 2000 to 2004. Taken overall, the data show that between eight and ten RTs who qualified overseas start working in Australia each year.

The professions survey also asked working RTs about any intended short term changes to working arrangements. Table 7.8 reports the responses to this question for qualified RTs. It reflects a high degree of stability in the RT workforce, with 70.2% reporting either no change or an increase in working hours in the next 12 months. Only 2.1% expect a decrease in working hours. Small numbers expect to work overseas (1.9%) with a slightly larger number expecting to cease practice (4.1%, most of which (81.3%) are planning a career change, with the rest retiring). The largest number (8.1%) expect a pause in practice (93.0% of these were female respondents who were planning maternity leave) with the expected length of the break averaging 9.2 months.

Table 7.8: RTs (ex PDYs) change in working arrangements by State

State/ Territory	None		Increased hours		Decreased hours		Pause in practice		Cease to practice		Practice overseas		Other		Not stated		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
NSW	270	60.2	39	8.6	12	2.7	39	8.6	22	5.0	0	0.0	32	7.2	34	7.7	448	100.0
Vic	232	60.4	43	11.2	5	1.3	35	9.2	11	3.0	10	2.6	23	5.9	24	6.3	384	100.0
Qld	182	63.6	28	9.9	4	1.2	19	6.8	7	2.5	11	3.7	16	5.6	19	6.8	286	100.0
WA	79	72.1	6	5.9	2	1.5	3	2.9	2	1.5	5	4.4	8	7.4	5	4.4	109	100.0
SA	49	50.8	5	4.9	3	3.3	14	14.8	6	6.6	0	0.0	9	9.8	9	9.8	96	100.0
Tas	22	52.0	12	28.0	2	4.0	3	8.0	0	0.0	2	4.0	2	4.0	0	0.0	42	100.0
ACT	12	33.3	6	16.7	3	8.3	0	0.0	9	25.0	0	0.0	3	8.3	3	8.3	36	100.0
Total	**845**	**60.3**	**139**	**9.9**	**30**	**2.1**	**114**	**8.1**	**58**	**4.1**	**27**	**1.9**	**93**	**6.6**	**95**	**6.8**	**1,401**	**100.0**

Based on professions survey responses scaled to the estimate of 1,401 qualified RTs working in Australia derived from the facilities survey; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

To complete the picture, Table 7.9 describes the retirement intentions of qualified RTs (i.e. excluding PDYs). The data show that only 9.1% of the current workforce is expected to retire in the next five years, with a further 10.0% retiring in the five years after that. Assuming the 11.0% of the survey respondents who did not indicate their retirement intentions are distributed similarly to those that did, it can be concluded that around 19.1% of the current workforce will retire before 2019.

Table 7.9: RTs (ex PDYs) expected year of retirement by State

State/Territory	2009-2013		2014-2018		2019 and beyond		Not stated		Total	
	N	%	N	%	N	%	N	%	N	%
NSW	49	10.9	26	5.9	322	71.9	51	11.3	448	100.0
Vic	25	6.6	49	12.9	267	69.6	42	10.9	384	100.0
Qld	23	8.0	35	12.3	196	68.5	32	11.1	286	100.0
WA	6	5.9	13	11.8	75	69.1	14	13.2	109	100.0
SA	13	13.1	9	9.8	61	63.9	13	13.1	96	100.0
Tas	3	8.0	3	8.0	35	84.0	0	0.0	42	100.0
ACT	9	25.0	3	8.3	21	58.3	3	8.3	36	100.0
Total	**128**	**9.1**	**140**	**10.0**	**979**	**69.9**	**154**	**11.0**	**1,401**	**100.0**

Based on professions survey responses scaled to the estimate of 1,401 qualified RTs working in Australia derived from the facilities survey; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

The estimated retirement numbers of 268 (adjusted for the number of ‘not stated’ respondents) over the next ten years suggest that an average of 26.8 RTs will retire each year. In addition, based on Table 7.8, a further 38 will cease practice as a result of pursuing a career change. This suggests a workforce loss of around 65 per annum. On the other side, about 175 PDYs that are expected to complete their accreditation each year. Based on the survey responses virtually all these PDYs will be looking for a job in Australia once they have attained accreditation. Also, the outward migration rate (note that the survey shows that about 30% of RTs that were working in Australia in 2008 had spent time working overseas) is expected to be around 27 (Table 7.8) with the inward migration rate being around 10 (Table 7.7). These numbers suggest that there will still be net growth in the workforce at the rate of about 90 to 95 RTs in each of the next ten years.

8

Analysis of ROMPs Survey

This Chapter presents descriptive analyses on the ROMP workforce (ROMP, including registrars/trainees, “registrars”) derived from the professions survey which collected detailed information on qualifications, experience, employment status, hours worked and future working intentions. The aim is to describe the ROMP workforce in terms of age/sex profile, location and movement into and out of practice. Total workforce is described therefore registrars are included in many of the analyses presented. Accordingly, all references to ROMPs include registrars unless otherwise stated.

8.1 SURVEY RESPONSE RATE

In May 2009, there were 261 ROMPs (including registrars) on the ACPSEM mailing list that was used as the basis for the survey. Table 8.1 shows the number of survey respondents and response rate by jurisdiction, and the estimated number of ROMPs (including registrars) from the facilities survey. According to the facilities survey there are 250 employed ROMPs in Australia. Note, that nine respondents were working overseas at the time of the survey; this number has been used to make a crude estimate (11) of the number of ROMPs working overseas who have retained current membership of ACPSEM, and these 11 have been removed from the total of 209 for the purposes of estimating survey response rates by State.

Table 8.1: Professions survey – ROMPs (inc registrars) response rate

State/ Territory	Males				Females				Total			
	Registered#	Working*	Responded	Response rate (%)	Registered#	Working*	Responded	Response rate (%)	Registered#	Working*	Responded	Response rate (%)
NSW	75	74	57	76.0	33	33	25	75.8	108	107	82	75.9
Vic	35	36	33	94.3	18	18	17	94.4	54	54	50	92.6
Qld	26	26	22	84.6	15	15	13	86.7	41	41	35	85.4
WA	9	9	7	77.8	7	7	5	71.4	16	16	12	75.0
SA	14	14	7	50.0	6	6	3	50.0	20	20	10	50.0
Tas	5	5	4	80.0	1	1	1	100.0	6	6	5	83.3
ACT	5	5	5	100.0	1	1	1	100.0	6	6	6	100.0
Other+	7	0	6	85.7	4	0	3	75.0	11	0	9	81.8
Total	176	169	141	80.1	85	81	68	80.0	261	250	209	80.1

* Estimated from facilities survey; # Based on the number of ACPSEM members; + Refers to nine respondents working overseas; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

Table 8.1 shows that 209 ROMPs responded to the survey reflecting an estimated response rate of 80.1%. The nine respondents who were working overseas at the time of the survey have been deleted from all analyses of the Australian workforce (subsequent tables are based on 200 respondents). Response rates were highest in the ACT (100%) and lowest in SA (50.0%). Overall the response rates were fairly uniform across the states and comparable for females (80.0%) and males (80.1) suggesting that the results can be interpreted with confidence (not dominated by respondents from particular states or one gender group). It can also be concluded that, given the accurate estimates of the number of working ROMPs produced by the facilities’ survey, the national 80.1% response rate is an excellent basis for describing the characteristics of working ROMPs for the purpose of formulating the workforce projections model.

8.2 AGE DISTRIBUTION OF ROMPS

The professions survey asked respondents for their year of birth, which has been used to estimate the age profile of ROMPs working in Australia in Table 8.2. The data show that the 25-29 age group accounts for more than one in five of the workforce (22.4%). There is a concentration of females in the age cohorts from 25 to 34 years, which together represent 58.1% of the workforce. Males are more evenly spread across the age cohorts although there are relatively fewer males in the 30-34 age cohort (represents only 6.5% of males but 23.5% of females). Correspondingly, the average age for males (42 years) is greater than for females (35 years) with the overall average age being 40 years.

Table 8.2: Working ROMPs (inc registrars) by age and gender, 2008

Age cohort	Survey respondents*						Total working#					
	Male		Female		Total		Male		Female		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
20-24	5	3.7	3	4.6	8	4.0	6	3.6	4	4.9	10	4.0
25-29	22	16.3	22	33.8	44	22.0	28	16.6	28	34.6	56	22.4
30-34	9	6.7	15	23.1	24	12.0	11	6.5	19	23.5	30	12.0
35-39	27	20.0	5	7.7	32	16.0	34	20.1	6	7.4	40	16.0
40-44	14	10.4	6	9.2	20	10.0	18	10.7	7	8.6	25	10.0
45-49	17	12.6	9	13.8	26	13.0	21	12.4	11	13.6	32	12.8
50-54	19	14.1	2	3.1	21	10.5	24	14.2	3	3.7	27	10.8
55-59	7	5.2	2	3.1	9	4.5	9	5.3	2	2.5	11	4.4
60-64	6	4.4	0	0.0	6	3.0	7	4.1	0	0.0	7	2.8
65+	7	5.2	0	0.0	7	3.5	9	5.3	0	0.0	9	3.6
Not stated	2	1.5	1	1.5	3	1.5	2	1.2	1	1.2	3	1.2
Total	135	100.0	65	100.0	200	100.0	169	100.0	81	100.0	250	100.0

*Only the 200 ROMPs working in Australia #Scaled to facilities survey estimate of 250 working RTs
State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

There are two other interesting features of the data. First, the age cohorts from 20-34 years seem to be mostly female (53.1%) whereas the age cohorts from 35 years onwards are mostly male (80.8%). These data reflect a changing gender mix in the workforce which will have implications for average weekly hours worked, and possibly attrition rates from the ROMP workforce going forward. As a result, it might be expected that more ROMPs will be needed to fill the same number of positions in future years (i.e. the average FTE fraction will reduce). Second, it is estimated that 14.7% of the male workforce is aged 55 years or more compared to only 2.5% of the female workforce. This difference may well affect the age profile for retirement from the workforce in future years.

8.3 WORKING HOURS AND WORKLOAD OF ROMPS

The weekly average hours worked reported by respondents has been used to estimate the working hours profile for ROMPs in Table 8.3. The data show that the majority (52.1%) of males working as ROMPs work between 40 and 49 hours per week. The most reported category for females is also 40 to 49 hours per week although it represents a smaller proportion (38.3%) of the workforce than males. As might be expected there are more females (43.2%) than males (28.1%) working less than 40 hours per week. Correspondingly, the weekly average hours worked by males (40.6 hours) is higher than that for females (38.5 hours) with the overall weekly average hours worked being 39.9. These numbers mean that on average ROMPs work shorter average weekly hours than ROs (46.0) but longer hours than RTs (36.3).

Table 8.3: Working ROMPs (inc registrars) by hours worked and gender, 2008

Average weekly hours worked	Male		Female		Total	
	N	%	N	%	N	%
0-9	3	1.8	0	0.0	3	1.2
10-19	1	0.6	3	3.7	4	1.6
20-29	1	0.6	6	7.4	7	2.8
30-39	42	24.9	26	32.1	68	27.2
40-49	88	52.1	31	38.3	119	47.6
50-59	10	5.9	5	6.2	15	6.0
60-69	1	0.6	1	1.2	2	0.8
70+	0	0.0	0	0.0	0	0.0
Not stated	23	13.6	9	11.1	32	12.8
Total	169	100.0	81	100.0	250	100.0

Based on survey responses scaled to the estimate of 250 ROMPs working in Australia derived from the facilities survey
Table may contain rounding errors due to scaling of responses to population

Table 8.4 further explores the working hours issue by examining work location. Review of the data suggests that the highest proportions of ROMPs working more than 40 hours per week are in NSW and WA (59.7% and 58.3% compared to the national average of 54.4%). At the other end of the spectrum, the lowest proportions of ROMPs working more than 40 hours per week are in Tasmania and the ACT (33.3%%). Due to the number of ROMPs working less than 30 hour per week in NSW (9) and Victoria (5), the average working hours range from a high of 43.7 in WA (no-one working less than 30 hours per week) to 38.1 in Victoria (10% of workforce working less than 30 hours per week) which compare to the national average of 39.9 hours.

Table 8.4: Working ROMPs (inc registrars) by average hours worked and location, 2008

Average weekly hours worked	Current work location - State/Territory														Total	
	NSW		Vic		Qld		WA		SA		Tas		ACT			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0-9	3	2.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	1.2
10-19	3	2.4	1	2.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	1.6
20-29	3	2.4	4	8.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	2.8
30-39	27	25.6	15	28.0	12	28.6	1	8.3	8	40.0	2	33.3	4	66.7	68	27.2
40-49	55	51.2	27	50.0	20	48.6	8	50.0	6	30.0	2	33.3	2	33.3	119	47.6
50-59	9	8.5	1	2.0	4	8.6	1	8.3	0	0.0	0	0.0	0	0.0	15	6.0
60-69	0	0.0	1	2.0	0	0.0	0	0.0	2	10.0	0	0.0	0	0.0	2	0.8
70+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Not stated	8	7.3	4	7.4	6	14.3	5	33.3	4	20.0	2	33.3	0	0.0	32	12.8
Total	107	100.0	54	100.0	41	100.0	16	100.0	20	100.0	6	100.0	6	100.0	250	100.0

Based on survey responses scaled to the estimate of 250 ROMPs working in Australia derived from the facilities survey
Table may contain rounding errors due to scaling of responses to population

Using data from the facilities survey, it is possible to compare average hours worked by ROMPs to the number of ROMPs per linac day by State as shown in Table 8.5. This input time and workload comparison is best done for qualified staff. Review of the data shows that the average hours worked by qualified ROMPs is 40.0, which compares to 39.9 including registrars indicating that, on average, there is no difference between the working hours of qualified and registrar ROMPs. When only ROMPs working full time (defined to be working 38 hours or more) are included in the calculation the average increases to 42.8 with the median being 40.0. Table 8.5 also shows that the average is considerably greater than the median in SA and Victoria, which indicates that there were a number of ROMPs in these

States that reported very long hours which has measurably inflated the averages. Interestingly the situation is reversed in WA (i.e. median greater than average, meaning that more than half the ROMPs work 45 or more hours per week).

Table 8.5: Working ROMPs (ex registrars) by average hours worked and new cases, 2008

State/Territory	ROMP weekly hours worked			ROMPs per linac (FTEs)
	Average	Average (FT only)	Median (FT only)	
NSW	39.9	43.2	42.0	1.7
Vic	38.0	42.1	40.0	1.1
Qld	41.6	42.3	41.0	1.0
WA	43.5	45.0	45.5	1.3
SA	41.8	44.2	40.0	2.0
Tas	40.0	40.0	40.0	1.5
ACT	39.0	41.3	40.0	1.3
Total	40.0	42.8	40.0	1.3

Hours worked from professions survey; ROMPs per linac day from facilities survey; State/Territory refers to work location, not residence

Also from Table 8.5 it can be seen that ROMPs in WA reported the longest working hours (average 45.0 for full time ROMP) in the professions survey yet the lowest number of qualified ROMPs per linac is in Queensland (the WA ratio equals the national average at 1.3 ROMPs per linac). Overall, the variation in the average (or median) working hours of full-time ROMPs is small (low 40.0 hours in Tasmania to high of 45.0 in NSW, or between 93.5% and 105.1% of the average), whereas the variation in the number of ROMPs per linac is larger (low 1.0 in Queensland to high of 2.0 in SA or between 76.9% and 153.8% of average).

It is clear that there is little correlation between ROMP input hours and the number of ROMPs per linac. Although qualified ROMPS per linac tends to be used as the benchmark staffing measure, it seems that its value varies in a wide range without affecting input hours required. There need to be better measures of ROMP workload particularly as the complexity (i.e. additional features) of the linacs appears to be increasing. As with the ROs and RTs it is not possible to derive better measures from the available data. A more detailed study that measured ROMP input time against complexity adjusted output measures (for ROMP work) could be undertaken to produce the required workload indictors.

An important part of understanding the workload of ROMPs going forward is to assess the impact of technology. Survey respondents were asked to “estimate in percentage terms, ignoring the short term impact that is typically associated with professionals learning and becoming proficient in a new technology”, the ongoing impact of a range of technologies on RTs workload. Table 8.6 sets out the responses in terms of the proportion of respondents that commented on a particular technology and the impact on workload they reported. Note that the question specifically asked respondents to answer only if they had “direct experience in working with the specified technology”.

Table 8.6: Assessment by ROMPs (ex registrars) of impact of technology on workload

Technology	Estimated impact on workload					
	Increase		Decrease		No change	Don't know
	% Respondents	Average increase	% Respondents	Average decrease		
Intensity Modulated Radiotherapy (IMRT)	82.4%	15.5%	0.0%	0.0%	9.4%	8.2%
Brachytherapy – HDR	65.7%	14.7%	1.5%	5.0%	25.4%	7.5%
Brachytherapy – LDR	20.7%	8.8%	3.4%	0.1%	48.3%	27.6%
Brachytherapy – seed	56.9%	15.5%	0.0%	0.0%	29.4%	13.7%
Modulated arc therapy	47.1%	9.4%	0.0%	0.0%	20.6%	32.4%
Stereotactic radiosurgery/radiotherapy	55.3%	11.2%	0.0%	0.0%	27.7%	17.0%
Image fusion for treatment planning	70.5%	6.4%	1.6%	0.0%	21.3%	6.6%
Treatment verification imaging	81.6%	9.5%	0.0%	0.0%	13.2%	5.3%
Gated delivery	37.1%	6.9%	0.0%	0.0%	28.6%	34.3%
Four-dimensional computerised tomography	37.1%	7.3%	0.0%	0.0%	37.1%	25.7%
Adaptive planning and treatment (including IGRT)	66.7%	10.6%	0.0%	0.0%	21.1%	12.3%

Source: ROMP profession survey, HealthConsult 2009

Table 8.6 suggests that 'IMRT' , 'treatment verification imaging', 'image fusion for treatment planning', and 'adaptive planning and treatment' have had/will have the largest impact on ROMPs with 82.4%, 81.6%, 70.5% and 66.7% of respondents respectively reporting an increase in workload. The average reported impacts were respectively a 15.5%, 9.5%, 6.4% and 10.6% increase in hours. Virtually no respondents considered that the listed technologies would result in a decreased workload. The same four technologies were also the most frequently reported by ROs and RTs as being likely to result in an increased workload. ROMPs consider that 'treatment verification imaging', and 'image fusion for treatment planning' will have a smaller impact (in terms of increased hours) than by ROs and RTs.

One clear point of difference between ROMPs and the other two professional groups is the frequency with which brachytherapy (HDR and seed) was reported as a major influence. More than 50% of ROMPs considered that these therapies would increase workload by an average of 14.7% (HDR) and 15.5% (seed). Stereotactic radiosurgery/radiotherapy was also reported by more than 50% of ROMPs as a factor that would increase workload with an average increase in hours of 11.2%. Based on the survey returns and the information obtained through the case study process, a number of the new technologies/therapies will result in increased workload for ROMPs. It is not clear what efficiencies (productivity gains) might be possible to offset the increase, so as with ROs and RTs, the net impact is too difficult to determine with any confidence in the absence of a detailed 'time and motions' study.

8.4 RECRUITMENT, CHANGES IN WORK, AND RETIREMENT

The professions survey asked a series of questions in order to examine the issues of entry to the workforce, the changes in working arrangements of current workforce participants and retirements from the workforce. Table 8.7 examines for qualified ROMPs working in 2008, the year they started working in Australia, and the place where they obtained their ROMP qualification. The data show that of the estimate of 193 qualified medical physicists working in Australia in 2008, 60.0% (compared to 86.6% of ROs and 87.6% of RTs) qualified in Australia (assuming the 20 non-respondents to this question have similar qualification profiles to respondents). At the State level, the data also show that more than half of the ROMPs in Tasmania, SA, ACT, and WA qualified overseas (note that due to the estimation process and the small numbers involved the data for the smaller States will have some inaccuracies (this problem has little impact on the national level data)).

Table 8.7: ROMPs (ex registrars) workforce entry year and place of qualification, by State

State/ Territory	2009-2005			2004-2000			1999 and before			Total respondents			Not stated	Grand Total
	Aust	Overseas	% Aust	Aust	Overseas	% Aust	Aust	Overseas	% Aust	Aust	Overseas	% Aust		
NSW	12	2	83.3	9	7	53.8	24	16	59.4	45	26	63.2	6	77
Vic	7	10	40.0	6	4	55.6	10	6	64.3	22	20	52.6	2	44
Qld	4	1	75.0	7	1	83.3	12	1	90.0	23	4	85.0	3	30
WA	2	3	33.3	0	0	0.0	2	2	50.0	3	5	40.0	6	14
SA	3	5	33.3	3	3	50.0	3	3	50.0	8	10	42.9	0	18
Tas	0	0	0.0	0	1	0.0	1	1	50.0	1	2	33.3	2	6
ACT	2	1	66.7	0	1	0.0	0	1	0.0	2	2	40.0	0	4
Total	**29**	**22**	**56.2**	**24**	**18**	**58.0**	**51**	**29**	**63.6**	**104**	**69**	**60.0**	**20**	**193**

Based on professions survey responses scaled to the estimate of 193 qualified ROMPs working in Australia derived from the facilities survey; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

Table 8.7 also allows examination of the ROMP workforce entrance profile by five-year cohorts. It shows that in the five years 2005 to 2009, it is estimated that 22 of the 51 (43.1%) newly qualified ROMPs in Australia qualified overseas. This figure is almost identical to the previous five year period 2000 to 2004 where it is estimated that 18 of the 42 (42.9%) of newly qualified ROMPs in Australia qualified overseas. These data reflect a heavy reliance on overseas recruitment to address Australia's ROMP workforce needs. Interestingly, the situation seems to have marginally deteriorated in the last decade as, of the ROMPs working in 2008, who started working as qualified practitioners in Australia in 1999 or before, it is estimated that 36.3% of them qualified overseas. These numbers indicate that Australia needs to put in place ROMP workforce training, recruitment and retention initiatives if the goal is to increase self sufficiency in training ROMPs. There is currently heavy reliance on recruitment from overseas, reflected by the fact that about four overseas qualified ROMPs start working in Australia each year (nearly half the new workforce entrants).

The professions survey also asked working ROMPs about any intended short term changes to working arrangements. Table 8.8 reports the responses to this question for qualified ROMPs by State. As with the ROs and RTs, the data reflect a high degree of stability in the ROMP workforce, with 77.2% reporting either no change or an increase in working hours in the next 12 months. Only 1.6% expect a decrease in working hours. Small numbers (1.6%) expect a pause in practice with the expected length of the break averaging 9.0 months. Larger numbers plan to cease practice (6.2% most of which (55.5%) are retiring with the rest planning a career change), and practice overseas (3.6%, 71.4% of these are overseas qualified ROMPs returning to work overseas). At the State level, the numbers are reasonably consistently spread, although there does appear likely to be less short-term stability in the ROMP workforces of the ACT and WA (these numbers should be interpreted with some caution as they are from smaller States).

Table 8.8: ROMPs (ex registrars) change in working arrangements by State

State/ Territory	None		Increased hours		Decreased hours		Pause in practice		Cease to practice		Practice overseas		Other		Not stated		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
NSW	31	40.3	30	38.7	2	3.2	1	1.6	5	6.5	1	1.6	2	3.2	4	4.8	77	100.0
Vic	25	57.5	7	15.0	1	2.5	1	2.5	1	2.5	3	7.5	3	7.5	2	5.0	44	100.0
Qld	15	50.0	8	27.3	0	0.0	0	0.0	1	4.5	1	4.5	1	4.5	3	9.1	30	100.0
WA	8	55.6	2	11.1	0	0.0	0	0.0	3	22.2	2	11.1	0	0.0	0	0.0	14	100.0
SA	5	28.6	10	57.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	14.3	18	100.0
Tas	4	60.0	1	20.0	0	0.0	0	0.0	1	20.0	0	0.0	0	0.0	0	0.0	6	100.0
ACT	1	20.0	2	40.0	0	0.0	1	20.0	0	0.0	0	0.0	1	20.0	0	0.0	4	100.0
Total	**89**	**46.1**	**60**	**31.1**	**3**	**1.6**	**3**	**1.6**	**12**	**6.2**	**7**	**3.6**	**7**	**3.6**	**12**	**6.2**	**193**	**100.0**

Based on professions survey responses scaled to the estimate of 193 qualified RTs working in Australia derived from the facilities survey; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

To complete the picture, Table 8.9 describes the retirement intentions of qualified ROMPs (i.e. excluding registrars) by State. The data show that only 7.4% of the current workforce is expected to retire in the next five years, with a further 9.0% retiring in the five years after that. Assuming the 11.0% of the survey respondents who did not indicate their retirement intentions are distributed similarly to those that did, it can be concluded that around 16.4% of the current workforce will retire before 2019. At the State level, it would appear that Tasmania and the ACT face significant short term issues with a significant proportion of their respective ROMP workforces planning to retire in the next five years (again caution in interpreting the numbers from smaller States is advised).

Table 8.9: ROMPs (ex registrars) expected year of retirement by State

State/Territory	2009-2013		2014-2018		2019 and beyond		Not stated		Total	
	N	%	N	%	N	%	N	%	N	%
NSW	4	5.2	4	5.2	63	81.8	6	7.8	77	100.0
Vic	1	2.5	4	10.0	35	80.0	3	7.5	44	100.0
Qld	3	10.0	5	16.7	18	60.0	4	13.3	30	100.0
WA	3	22.2	2	11.1	9	66.7	0	0.0	14	100.0
SA	0	0.0	3	14.3	13	71.4	3	14.3	18	100.0
Tas	4	66.7	0	0.0	2	33.3	0	0.0	6	100.0
ACT	1	25.0	0	0.0	3	75.0	0	0.0	4	100.0
Total	**16**	**8.3**	**18**	**9.3**	**143**	**74.1**	**16**	**8.3**	**193**	**100.0**

Based on professions survey responses scaled to the estimate of 193 qualified RTs working in Australia derived from the facilities survey; State/Territory refers to current work location, not residence; Table may contain rounding errors due to scaling of responses to population

The estimated retirement numbers of 34 (adjusted for the number of 'not stated' respondents) over the next ten years suggest that an average of 3.4 ROMPs will retire each year. In addition, based on Table 8.8, a further 5 per annum will cease practice as a result of pursuing a career change. This suggests a workforce loss of 8 to 9 per annum. On the other side, based on the 57 working ROMP registrars identified in the facilities survey, about 15 ROMPs are expected to complete their accreditation each year. Also, the outward migration rate (note that the survey shows that about 30% of ROMPs that were working in Australia in 2008 had spent time working overseas) is expected to be around 7, about 5 of which are likely to be overseas qualified ROMPs returning to work overseas (Table 8.8) with the inward migration rate being around 4 (Table 8.7).

These data need careful interpretation as, unlike ROs and RTs in vocational training, many of the ROMP registrars are already employed in permanent positions. In fact, of the 57 registrars, it is estimated that all but 20 of them already occupy permanent positions as, due to the shortage of qualified ROMPS, Chief Physicists have chosen to 'grow their own' by appointing trainees to permanent positions. Discussions with ACPSEM representatives suggest that this practice will not continue (i.e. when the registrars currently occupying permanent positions gain their accreditation, subsequent vacancies will be used for recruiting qualified staff, not registrars). Should this change of practice eventuate, more than the current number of 20 designated registrar positions will be required to maintain an influx of qualified ROMPs at the rate of 15 per annum.

Taking this issue into consideration, and assuming that the number of designated registrar positions will continue to grow (ACPSEM representatives advised that the number grew from 20 to 30 positions in the period from January to July 2009) it is estimated that the there will be net growth in the workforce at the rate of about 4 to 5 qualified ROMPs in each of the next ten years. This figure is derived from an estimated outflow from the workforce of 8 to 9 due to retirement and withdrawal from practice plus 6 to 7 going overseas (i.e. 14 to 16 going out) against an inflow of 15 registrars completing accreditation plus 4 to 5 qualified ROMPS coming from overseas to work in Australia (i.e. 19 to 20 coming in).

9

Case study analysis

This Chapter provides a thematic analysis of the information collected from the visits to 20 radiation oncology services around Australia. The focus of the case studies was on workforce recruitment and retention issues and strategies; as well as gaining information about possible changes in workload that may affect workforce needs in the near future. As part of the thematic analysis information from public sector sites was compared to private sector sites; and metropolitan sites were compared to regional sites. Where differences were identified the themes and patterns have been presented separately.

9.1 CURRENT WORKFORCE SITUATION

This section presents stakeholder views (in relatively raw form) about the current workforce issues, and strategies that have been developed to address the issues. It starts by presenting the general issues and then those that are specific to public metropolitan, public regional and private facilities (there were not sufficient private regional facilities case studies to separate private sector views into metropolitan and regional). A summary of the findings is provided following presentation of the stakeholders' comments.

9.1.1 Comments common to all radiation oncology services

Commonly expressed workforce recruitment and retention strategies included:

- flexible working arrangements (including study leave, nine day fortnights, four day working weeks, conference leave and leave without pay) are highly valued by staff (although management stated this flexibility makes roster scheduling difficult);
- providing staff with opportunities to train on, and apply, the latest technologies is important for effective recruitment and retention;
- a good training environment assists in attracting staff to facilities;
- supporting conference attendance and continuing professional development activities assists in retaining staff (i.e. conference and training allowances as part of package); and
- supporting staff to participate in research and clinical trials increases job satisfaction.

Commonly expressed workforce recruitment and retention issues included:

- additional positions and time are needed to commission, and train staff to use, new technology; most facilities only have the workforce to do the minimum (i.e. service delivery), which can be very frustrating for staff;
- there is a shortage of experienced staff (particularly RTs and ROMPs) which means more work for staff in senior positions;
- public and private facilities compete for the same workforce, this creates particular difficulties in some areas of Australia;
- many facilities have purchased linacs with various advanced capabilities e.g. cone beam CT, however the funds are not available to commission and use the technology;

- there should be more cross disciplinary training (i.e. all three professions coming together in a conference/training setting) to encourage networking and better collaboration;
- it is difficult to recruit ROs and ROMPs to regional areas, it is a location issue, they feel professional isolation in regional areas; and
- there is a common perception that regional facilities have smaller staff numbers; more basic technology; fewer career opportunities; less support to maintain skills and work longer hours which creates a barrier to recruitment.

Some of the workforce recruitment and retention strategies and issues were specific to particular disciplines. The common themes by professional discipline are summarised below.

Workforce recruitment and retention strategies specific to ROs include:

- smaller states and regional areas find that the best way to recruit ROs is by training locally (i.e. getting accredited registrars positions) – they do not tend to get applicants from interstate unless these are for senior positions; and
- ensuring collegial support to prevent professional isolation (e.g. by developing collaborative arrangements with larger facilities).

Workforce recruitment and retention issues specific to ROs include:

- the work of a RO does not get much exposure; it does not feature much on the medical curriculum, which makes it more difficult to attract registrars;
- there is a need for more registrar positions; there are enough new cancer cases to train more ROs, however more funds are required; and
- often there are no vacancies purely because there is no funding for positions.

Workforce recruitment and retention strategies specific to RTs include:

- the option to take leave without pay is attractive to RTs, however this practice creates more temporary positions and temporary positions are harder to fill;
- the ability to be able to work part time particularly when returning from maternity leave assists in retaining staff;
- shift work has an effect on retention, as mainly the younger and more senior staff are not interested in working shifts, however it is liked by many part time staff;
- diversification of RTs role (i.e. role expansion opportunities) whether it includes more responsibility or sub-specialisation makes the RT career more attractive; and
- retention is linked to challenging staff, particularly the younger generation.

Workforce recruitment and retention issues specific to RTs include:

- at present, in general, it is not difficult to recruit RTs; there are enough experienced RTs and junior RTs but the middle age group is under-represented in the profession;
- there are more RTs than jobs in major cities, but they are not willing to go to regional areas or smaller states;
- there is difficulty in managing part time RTs, particularly those with considerable experience who leave full time positions (e.g. maternity leave) and come back part time;
- there is a current shortage of permanent RT positions to recruit to, which is an outcome of a high proportion of staff taking leave (mainly maternity leave);
- there is little opportunity for RTs to move into senior management; career progression is limited and RTs are being lost to other professions as a result;

- some facilities are having trouble dealing with the career expectations of ambitious junior RTs and as a consequence they are being lost to other professions;
- a lack of professional identity creates a retention problem; there is no avenue to pursue specialised RT roles;
- unable to retain PDYs after their training year unless temporary contracts of varying lengths can be offered; and
- Sydney University dropping its undergraduate RT program will impact on the workforce.

Workforce recruitment and retention strategies specific to ROMPs include:

- overseas recruitment is used to deal with ROMP shortages in Australia;
- the main recruitment drawcard for ROMPs is technology; having access to PET, CT, MRI and a modern linac is attractive to ROMPs;
- competency based career progression, matched to better remuneration has improved the ROMP career pathway;
- a good training environment is an important component of retaining ROMPs; and
- the introduction of the TEAP program and ROMP registrars has bought more ROMPs into the profession.

Workforce recruitment and retention issues specific to ROMPs include:

- machines run with less than required ROMPs across the public and private sector, where the average number of physicists per linac is below the benchmark of 1.7;
- it is difficult to recruit senior ROMPs at the moment but registrars and base grades are easier to recruit;
- recruitment, particularly from overseas, can be difficult and lengthy;
- ROMPs are not on the list for 'occupations in need' – changing this would speed up overseas recruitment;
- Australia is losing staff overseas due to better technology and remuneration (e.g. Canada);
- the amount of 'out of hours' work that is required is not attractive to ROMPs;
- on the job training is expensive;
- the NSW award does not impact on junior staff, but impacts on the ability to recruit senior staff to locations outside NSW, a national award is needed;
- facilities cannot afford to have inexperienced staff with sophisticated equipment; and
- individuals who have completed a PhD in physics are still expected to complete TEAP including the Masters which prevents some senior physicists from entering the profession.

9.1.2 Comments from public metropolitan facilities

Workforce recruitment and retention issues specific to public metropolitan facilities include:

- staff prefer to work in a city location because there is the perception of better access to technology; collegial support; access to training; and education; and
- a number of facilities indicated a preference for a national award, particularly for RTs and ROMPs.

Workforce recruitment and retention strategies specific to ROs working in public metropolitan facilities include:

- ROs are attracted to work in academic departments; and
- the ability to sub-specialise, even in smaller, centres is attractive to ROs.

Workforce recruitment and retention issues that are specific to RTs working in public metropolitan facilities include:

- not enough funding for educator and research positions;
- there is more scope for role diversification and specialisation in larger facilities; and
- there is a currently an oversupply of RTs in large metropolitan areas; if the number being trained increases then there needs to be places to put them in post-training.

Workforce recruitment and retention strategies that are specific to ROMPs working in public metropolitan facilities include:

- smaller states train their own staff then try to retain them; and
- additional remuneration from retention payments helps smaller states attract staff.

9.1.3 Comments from public regional facilities

There were a number of workforce and retention strategies and issues that specifically impact on public facilities located in regional areas.

Workforce recruitment and retention strategies specific to regional public facilities include:

- more opportunities for role diversification in regional relative to metropolitan facilities, e.g. RTs do more quality assessment work (i.e. role of ROMP) or treatment review (i.e. role of ROs);
- facilities have found that incentives (e.g. rent and/or relocation allowance, conference allowance, taxation incentives) assist in recruiting staff; and
- it is easier to find work in regional facilities as there is a lot of competition for positions in the metropolitan facilities.

Workforce and retention issues specific to regional public facilities include:

- regional facilities often work with a small number of staff and consequently staff are usually under more workload pressure;
- research and professional development activities attract staff, however it is harder to find time to do research in regional areas, particularly due to smaller/inadequate staff numbers;
- funding is not sufficient to attract staff to regional areas; and
- it is hard to recruit experienced staff to regional facilities unless salaries are at a very competitive level.

Workforce recruitment and retention issues specific to ROs in public regional facilities include:

- the location of a facility is often a big draw card for ROs, therefore it can be difficult to recruit them to regional areas;
- regional ROs spend a lot of time travelling;
- registrars add to an already tight workload in regional areas; and
- professional isolation is a problem for ROs working in regional areas

Workforce recruitment and retention issues specific to RTs in public regional facilities include:

- younger staff find the remuneration too low – not an incentive;

- location of the facility plays a big part in being able to recruit staff; generally RTs want city jobs so as soon as a city job is advertised they leave regional areas;
- many consider that remuneration is not the issue in regional areas, rather the desirability of working in the location is the issue; and
- in regional areas there is a large proportion of junior RTs, meaning that more responsibility falls to those with less experience.

Workforce recruitment and retention strategies specific to ROMPs in public regional facilities include:

- there is considerable value with having the service tied to a university, PhD and Masters students come and study at the facility and some end up working there;
- development of special training programs and scholarships for rural students;
- linking of regional facilities with a larger metropolitan service (collegial and back fill support provided from larger centres);
- funding for ROMPs from other centres to provide independent dosimetry audits; and
- funding for rural ROMPs to rotate with other centres to gain experience in using new equipment or introducing new techniques.

Workforce recruitment and retention issues that were specific to ROMPs in public regional facilities include:

- there is a shortage of ROMPs and recruitment to regional and isolated regions is even more difficult; and
- in regional facilities there is no time for ROMPs to do research; therefore they have to be generalist which influences recruitment and also limits the ability of the service to implement new technology.

9.1.4 Comments from private facilities

Workforce recruitment and retention strategies specific to private facilities include:

- the private sector has a strong culture of performance management which assists with delivering an efficient service and providing feedback to staff; and
- there is less bureaucracy in the private sector which is very attractive to some staff.

Workforce recruitment and retention issues specific to private facilities include:

- the private facility workload pressure is greater than in public facilities, there is more pressure to treat a certain number of patients per day;
- development of a paperless, efficient system would provide more time for research and continuing professional development;
- income in private sector is only derived from the Medicare Benefits Schedule (MBS) and MBS fees are not calculated to include CPD and other costs;
- the MBS does not accurately reflect the cost of providing radiation oncology treatment which means private facilities are restricted in terms of what they can offer to staff;
- public sector funding is extremely generous, the resourcing and the career options in the public sector have an impact on private recruitment options, particularly in regional areas;
- there needs to be big incentives to draw professionals to private facilities in regional areas including, new technologies, access to research, CPD training, flexible working hours, competitive remuneration, and rental/relocation allowances; and

- the private sector loses some staff because they cannot access research opportunities.

Workforce recruitment and retention strategies specific to ROs in private facilities include;

- providing ample opportunities for direct patient contact and a good mix of technology assists in recruiting and retaining staff;
- working in a team orientated way, with collaboration across the three professions; and
- offering sabbaticals to retain staff.

Workforce recruitment and retention issues specific to ROs in private facilities include:

- remuneration in the public sector is better than in the private sector;
- unlike the public facilities, the private facilities are not funded to train staff and most ROs enjoy training;
- more city positions are required to keep ROs in Australia; and
- having a registrar in private practice is difficult as patients expect to see the consultant; the registrar slows down the consultant; and complications arise when it comes to billing – if registrars could raise bills then it would just be about educating the patients.

Workforce recruitment and retention strategies specific to RTs in private facilities include:

- RTs take on more responsibility in the private sector, with more role sharing;
- there is more flexibility with part time arrangements in the private sector compared to the public sector; and
- the planning department is seen as the ‘prime work’ and rotating staff through planning is essential.

Workforce recruitment and retention issues specific to RTs in private facilities include:

- to train staff properly they need to be taken offline which is costly to the private sector;
- PDYs are generally not super numerary in the private sector and funding for the positions is limited, although the Commonwealth funding assists; and
- there is a mix of experience at facilities with staff at senior levels and entry levels with a gap in the middle, which puts more pressure on senior staff and raises concerns as to who will fill the senior positions when senior staff retire.

Workforce recruitment and retention strategies specific to ROMPs in private facilities include:

- private facilities offer good exposure for ROMPs, they are able to work more independently and take on more responsibility; and
- Commonwealth funding for registrar positions in the private sector is greatly appreciated.

Workforce recruitment and retention issues specific to ROMPs in private facilities include:

- once a ROMP is experienced working in a public hospital becomes more attractive due to better remuneration;
- ROMPs working in private facilities will be doing more and more out of hours work – this may detract physicists from coming into the profession;
- the TEAP training program is five years and this is considered long, after three years ROMPs are likely to have enough experience to work independently; and
- private facilities find it difficult to bear the cost of training positions; they need to be better funded.

9.1.5 Workforce recruitment and retention strategies and issues summary

An overall consensus, based on the 20 site visits is that there are no current shortages of ROs and RTs in Australia. However, regional facilities and some facilities in small states often comment that it can be difficult to recruit staff to these locations. With regard to ROMPs, there is a current shortage of qualified ROMPs, however facilities are not having problems recruiting ROMP registrars. The concern lies in being able to adequately train the registrars given current shortfalls in experienced ROMPs.

Across both private and public facilities there is a sense that services have the workforce to achieve only service delivery leaving little or no time particularly for research, training and CPD; this issue is particularly prevalent in private facilities. Additional funded positions would allow facilities to commission and implement new technologies and offer staff time to undertake research, training and CPD, all of which lead to continued service improvements and advancements. It is clear from our consultation that all three professions highly value opportunities to access new technologies and research, having these built into the service model makes the facility attractive and aids in both recruitment and retention.

In general ROs, RTs and ROMPs have a preference for working in a city location. There is a perception of better access to technology, collegial support and better research and training opportunities. Staff in regional centres argue that the workforce pressures are greater due to a smaller workforce (the facilities are always smaller in regional areas). However, the smaller staffing base does provide the opportunity for role expansion, where for example, RTs have reported being able to take on more responsibility in regional locations.

Stakeholders always stated that it is imperative that regional centres offer attractive salary packages to attract qualified staff, particularly for ROs and ROMPs who are harder to recruit to non-city areas. We found that many regional centres currently offer attractive remuneration packages with additional incentives such as relocation, rental or retention allowances. We also found that remuneration is not the only drawcard and access to technology, research and other CPD opportunities are highly valued.

9.2 LOCAL WORKFORCE BENCHMARKING AND PLANNING APPROACHES

The information from the case studies showed that local approaches to workforce planning centre around the benchmark recommendations from the relevant professional bodies. There were different opinions regarding the suitability of the benchmarks. This section presents the views of stakeholders in regards to workforce planning initiatives they suggested have, or will impact, on workforce planning. Again stakeholder views are presented in relatively raw form followed by a summary of findings.

9.2.1 Comments from public metropolitan facilities

The benchmarks which the majority of public metropolitan facilities are working towards or currently attain were:

- the RANZCR recommendation of 250 new patients per RO per annum – even though some facilities have not attained the benchmark most are working towards it;

- the AIR RT staffing model (1.06 RTs per linac hour) plus research and teaching positions – most facilities stated that this model is outdated as it does not take into account recent changes in technology and changes in the role and responsibility of RTs; and
- the 1.7 ROMPs per linac benchmark derived from the ACPSEM's Formula 2000 is aspired to by most public facilities, however ROMP workforce shortages and/or budget constraints usually prevent attainment.

Workforce planning initiatives suggested by public metropolitan facilities included:

- the introduction of a medical physics elective in the year 11 syllabus helps with giving the profession exposure and an increasing number of students are choosing this elective;
- developing good networking relationships with other departments, as well as developing good relationships with the universities and taking on undergraduate students for clinical placements and work experience;
- a strong commitment to radiation oncology research and academic excellence and allocating either specific staff or specific staff time to these functions;
- creation of more RTs educator and research positions; and
- taking account of the increasing proportions of females (particularly in ROs and ROMPs) in determining future workforce requirements including the number of training positions.

9.2.2 Comments from public regional facilities

The common radiation oncology benchmarks for workforce planning in public regional facilities were:

- the majority use the RANZCR recommendation of 250 new patients per RO per year although some facilities indicated that they plan around two ROs per linac with a caseload of 450 courses per linac per annum;
- the AIR RT staffing model (1.06 RTs per linac hour) plus research and teaching positions was generally accepted as an appropriate benchmark; and
- facilities try to implement the ACPSEM's Formula 2000 with ROMPs per linac ranging from 1.5 – 2.0 FTE although there was a view that Formula 2000 may overstate needs.

Workforce planning initiatives suggested by public regional facilities included:

- further consideration of the opportunities for role sharing across the three professions when planning the workforce;
- better remuneration, research capability and collegial support need to be factored into workforce planning;
- increasing the number of supernumerary ROMP registrar positions;
- streamlining the processes for immigration of experienced medical physicists;
- better recognition of the importance of appropriate levels of qualified physics staffing in a radiation oncology department and how it relates to equipment complexity;
- joint appointments (metropolitan and regional) for RO registrar positions;
- opportunities for research and development built into staffing levels, with less emphasis on pure patient throughput;
- staffing levels should be set based on a better recognition of the increased complexity of treatments; the need for research, trials and ongoing development activities; plus the need to maintain activity levels and minimise waiting lists; and

- staffing levels should also be set recognising jurisdictional service delivery requirements which vary and lead to differences in work practice that result in major disparities in the number of staff required for each profession.

9.2.3 Comments from private facilities

The common radiation oncology benchmarks for workforce planning in private metropolitan facilities were:

- private sector ROs set their benchmarks higher than those in the public sector – benchmarks vary between the private operators from 400 new patients per FTE per annum to 400-450 initial consultations per annum to 300-350 new patients per annum;
- the AIR benchmark is referred to for workforce planning across most sites with the common view being that it is too high; most facilities work with less than the recommended 1.06 RTs per linac hour; and
- most private facilities work on between 1.0-1.5 FTE qualified ROMP per linac, most commonly closer to 1.0 FTE, including brachytherapy where applicable.

Suggested workforce planning initiatives included:

- using medical engineers to do some medical physics work;
- taking on more PDYs to try and deal with high attrition rate from the profession;
- the development of better leave and funding support for teaching, education activities and time for conducting research;
- making medical registrars more accessible to private radiation oncology practices;
- the establishment of local teaching programs provided by practising clinical professionals;
- full Commonwealth funding of PDY positions in private facilities;
- more flexibility with the RANZCR registrar training program, particularly by reducing the training ratios in regional settings where current ratios are very difficult to achieve; and
- developing a grade of physicists that are pre-TEAP i.e. a technical officer, for facilities that find meeting the training requirements difficult.

9.2.4 Workforce benchmarking and planning approaches summary

There is reasonable support in the public sector for the existing workforce benchmarks but there is also a widespread view that they do not accurately reflect the current service environment. Clearly with the introduction of a number of new technologies simple linac benchmarks will be less useful. Feedback from the 20 facilities highlighted the different staffing practices in the public and private sector, which was also reflected in the facilities survey results (Chapter 5). In general private facilities see more patients with fewer staff compared to public facilities, whereas public facilities tend to have more opportunities for research and development and less emphasis on patient throughput.

Public facilities have a bigger focus on research and have funding for more training positions (medical registrars, ROMP registrars and PDY positions) compared to private facilities. Public facility initiatives have involved the establishment of educator and research positions, where private facilities have been more inclined to share educator and research related work amongst the staff. Public regional centres and private facilities are more inclined to role share between the three professions, something that is not as common in public metropolitan facilities. This may partly be a reflection of private facilities deriving efficiency gains from role sharing and regional facilities role sharing as a result of a smaller staff base.

Most facilities recognise that treatment and planning has increased in complexity, which requires that more training, more development and more research time needs to be factored into workforce benchmarking and planning approaches. Workforce benchmarks would be better set using a denominator that was casemix adjusted (rather than simply a linac, or a new patient). There have been some attempts in this regard with the development of BTEs, but this system is not widely used and it needs to be updated to reflect current practices. Development of better workforce benchmarks is an important area for further work.

9.3 CHANGES TO THE SERVICE MODEL

The case study site visits included asking facility staff to identify ways in which the radiotherapy service model might change in the future including planned developments in services at the facility (i.e. additional linacs, additional features on existing linacs, additional staff recruited in key disciplines, role substitution amongst staff in key disciplines, etc.). This section presents the views of stakeholders in regards to service model changes that they suggested have, or will, impact on workforce planning. Again stakeholder views are presented in relatively raw form followed by a summary of findings.

9.3.1 Comments on cancer incidence and treatment changes that impact on radiotherapy

Stakeholder comments relating to changes in cancer incidence and changes in the proportion of patients which specific cancers who are treated with radiotherapy included:

- there will be more demand for radiation oncology services over the next 10 years as a result of population ageing;
- the provision of radiotherapy services will increase in the future, therefore more of the three key professions will be needed – at present there is an oversupply of RTs but this will not be the case in two to three years;
- more facilities are considering brachytherapy suites in the future, this will increase the work required by all three professions;
- with the continued early diagnosis of cancers, radiotherapy will only increase;
- mesothelioma is increasing which will add to demand for radiotherapy;
- facilities will see more and more metastasis as people are living longer and radiotherapy is currently being underutilised;
- more patients are having curative surgery or being treated by combining modalities (i.e. surgery and radiotherapy or chemotherapy and radiotherapy) so adjuvant radiotherapy is more often prescribed;
- the number of older patients coming through will increase – older patients require multiple fields and are generally a lot more complicated;
- the decrease in cervical cancer will have an impact on workload i.e. the 52.3% treatment benchmark will likely come down over time;
- radiation for palliation will decrease because now treating with curative intent;
- there will be a decrease in cervical cancer, decrease in lung cancer, decrease in breast cancer (more surgical) and a decrease in prostate cancer (more surgical) treatments;
- a breakthrough in treatment would not be expected in the next 10 years, but an improvement in access will occur;
- there is a trend towards greater use of brachytherapy seeds for prostate as it delivers much more dose with reduced side effects; and

- the viability of brachytherapy HDR is questioned, particularly given that the main targets are cervix and prostate - cervical cancer cases are decreasing and seed implants and robotic surgery are being increasingly used for prostate, decreasing the need for HDR.

9.3.2 Comments on service model changes that will impact on workforce needs

Stakeholder comments on service model changes that will impact on staffing needs include:

- the number of breast treatments has decreased as a result of requiring fewer fractions (i.e. 16 instead of 30);
- if the number of fractions decreases for prostate cancer (trial using hypo-fractionation is in progress comparing four week treatments against eight week treatments) the number of patients that are treated will increase;
- hypo-fractionation allows fewer fractions, meaning less visits but longer time on bed – will result in the RO spending more time in the treatment/planning area;
- if the results of overseas studies using intraoperative radiotherapy are positive there will be a large impact on the workforce e.g. moving from four to six weeks of radiotherapy treatment for breast cancer to one intra-operative treatment;
- if more stressors are introduced i.e. new machines, new technology, more patients, then current staffing levels will not be sufficient;
- future RTs will need to be skilled in image review and advanced practitioner roles;
- the sophistication and complexity of both planning and treatment delivery systems in radiotherapy now require recognition of a need for specific consultant/specialist RT skills – there should be provision for these types of positions;
- there is a perception that junior new RTs are more taken with the technology than patient contact, this will have an influence on how the profession evolves in the future;
- with technology developing so rapidly there is a need for research ROMPs positions; and
- RTs are developing more information technology skills as new technology bring with it complicated software and so skills in managing IT in radiotherapy is required;
- more and more machine automation will change how work is done at facilities; and
- the increased need and demand for good data management and IT skills and employing people with appropriate skills to manage these systems will be required.

9.3.3 Cancer incidence and service model changes summary

Based on feedback from the 20 facilities the radiation oncology service model is evolving and changing in response to a number of key factors. This increase in cancer incidence means that there is pressure on services to treat more patients. Also, a number of stakeholders argued that there is further scope for the use of radiotherapy as curative and palliative treatment for patients with cancer. There are some specific cancers where early detection and/or reduced incidence have reduced the demand for radiotherapy (e.g. gynaecological cancers). Also there are mixed views in a number of areas e.g. some stakeholders thought there would be a reduction in radiotherapy need for prostate cancer patients (more patients would have surgery) whereas others considered that brachytherapy would become the treatment of choice.

In respect of the service model, the potential for major changes as a result of intra operative radiotherapy and hypo-fractionation were highlighted, but there is insufficient evidence at this stage to predict that there will be a short-term impact on workforce. Most service model changes in the short term will be around the routine and more frequent use of imaging technologies as part of the process of radiotherapy treatment. This trend has implications in terms of the skills required in the workforce as well as the number of professionals in each of the three key disciplines to deal with the processes of capturing and using the images as part of planning and treatment. Related to this trend, there is an increasing need for the workforce to have improved information technology and data management skills.

9.4 EMERGING TECHNOLOGIES AND THE IMPACT ON WORKFORCE

Stakeholders at the case study site visits were asked their views on emerging radiation oncology technologies and the impact that they will have on workforce requirements in the key disciplines. This section presents the views of stakeholders in regards technology changes that they suggested have, or will, impact on workforce planning. Again stakeholder views are presented in relatively raw form followed by a summary of findings.

9.4.1 General comments on technology and the associated workforce impact

Stakeholder comments about the impact of new technologies include:

- there is increasing pressure to implement new technologies – patients want the best treatment and staff want to work with the best technology;
- it is well understood that new technologies tend not to increase patient survival rates, but increase patient quality of life, that is new technologies reduce toxicity and allow for better symptom control;
- inexperience with new technologies means it is difficult to estimate accurately how long it will take to implement and what issues will arise;
- a barrier to implementing new technology is the number of staff – even though new equipment has been purchased there are not enough staff to commission and train the remaining staff so new technology is not utilised;
- imaging has been the biggest change in radiation oncology and these skills need to be maintained and taught across all three professions;
- the need for servicing of linacs is increasing because there are more parts to a modern linac, so there is more down time as new machines tend to require more part replacements; and
- technology advancements will create more work for the three professions, they may not affect (or they may even reduce) patient treatment time, but they increase indirect time (i.e. non patient contact) required to meet the increasing demand for services.

9.4.2 Comments about technology advances which increase staff workload

The nature of the consultative process is that stakeholder comments about the impact of new technologies on workload tend to be mainly about increases. Comments included:

- new linacs have more capabilities including using more fields which means that the amount of new work done per case has gone up, the time spent contouring, planning, and doing QA has doubled, resulting in increased workload;
- new technologies increase time, mainly in planning time which has already, and will continue to, increase thereby placing more time pressure on all three key professions; unless more staff are recruited in each profession at each facility;
- IMRT has a huge start up process, but offers a big saving in the long run (as experience grows planning time will be reduced) – it is generally considered to be a good therapy, however it is very time consuming and at least initially is very labour intensive;

- keeping up to date with the latest technologies and techniques keeps professionals interested but more resources and time needs to be allocated to implementing new technology, training staff and conducting research;
- when implementing new technology it is important to appreciate that documentation, application software and interfaces tend to be less well developed than the mature product, so good supplier support, strong links to other users of technology, adequate staffing levels and time to support implementation are needed;
- there has been exponential change in workload in the last 12 months as a result of technology change (e.g. IGRT, IMRT (brain lab and rapid arc)) which has increased training requirements e.g. for cone beam CT staff need to be competent to interpret the image (radiobiologist), this requires training;
- IGRT, Exactrac (patient positioning verification system) and Cone Beam CT are compulsory in this day and age;
- gated delivery will increase treatment time as the machine needs to be stopped for different respiratory flows;
- growth in molecular imaging will have an impact on the radiation oncology workload – there will need to be more interaction between nuclear imaging and radiation oncology, and ROMPs will need to have more input into radiology and nuclear medicine;
- VMAT, CyberKnife and Rapid Arc offer more accuracy and customised treatment and will increase throughput, as well as increasing QA and planning, which will result in increasing the workload intensity for professionals, particularly ROMPs; and
- the technological change that will have the biggest impact will be the move to robotics – facilities need to plan to change and increase education to staff and everyone will need to be moved up in their roles.

9.4.3 Comments about technology advances which decrease staff workload

There were a few stakeholder comments about technologies that created efficiencies (i.e. reduced workload). Comments included:

- there is software and hardware available that can inform RTs if the patient is not correctly positioned – patients can be moved automatically (instead of manually) which decreases patient treatment time (as RTs do not need to re-enter the bunker for re-positioning);
- radiation oncology facilities software systems can be integrated with the hospitals within which they were based in and/or with the imaging software to improve efficiency (e.g. time saved by not needed to locate patient files or films);
- multi-leaf collimators is an example of an efficient technology, it saves time and also improves the quality of outcomes;
- cone beam CT might slightly reduce time taken to treat patients;
- some facilities will not be implementing IMRT as they are willing to wait for Rapid Arc which will have shorter treatment time compared to both IMRT and conventional treatment modalities;
- the efficiency gains from Rapid Arc are generally considered to be high – the initial QA required will increase dramatically for ROMPS, partly for RTs and ROs, but in the long run there will be efficiency gains; and
- there is growing interest in Tomotherapy as it is more efficient than IMRT; it has benefits for surrounding structures, and it goes well with stereotactic IGRT – Tomotherapy would increase treatment quality and potentially throughput.

9.4.4 Impact of emerging technologies of workforce summary

Overall the view amongst professionals was that new technology, although it results in better patient outcomes, and may save patient contact time, generally requires more planning time (by ROs and RTs) and more quality assessment time (by ROMPs or RTs). Stakeholders' views about the impact of technological advancements on staff workload were mixed. Some stakeholders argued that even though there are efficiency gains on the time taken to treat a patient, there is an increase in time taken for planning and QA processes leading to an overall increase in required time. Other stakeholders argued that over time the planning and QA processes will be more efficient and the net effect will be no net change in the required time but a better outcome for the patient.

Many stakeholders expressed the concern that Australia's uptake of new technology is slow. It was argued that Australia is slow at looking for it, slow at implementing it and slow at funding it. Students are being taught about the new technologies and their capabilities but unable to use it in Australia as it has not been implemented. For this reason Australian trained ROMPs are seeking employment in more technological advanced countries. According to stakeholders the cause of the slow uptake of technology is MSAC, which wants evidence before equipment is funded. Stakeholders argued that there is not time for this evidence to be accumulated in Australia, so we are heavily reliant on overseas trials, meaning that Australia always follows not leads even though there is local expertise. Some stakeholders stated that Australia is 10 years behind the rest of the world with regard to the implementation of IMRT.

9.5 DESIRED RADIATION ONCOLOGY SERVICE MODEL

Stakeholders at the case study site visits were asked their views on the desired service model in terms of linear accelerators and staffing levels for the service, and its feasibility and affordability in the location. This section presents the views of stakeholders in regards to the desired service model. Consistent with previous sections, stakeholder views are presented in relatively raw form followed by a summary of findings.

9.5.1 Comments from public facilities

Stakeholder comments about the desired service model in public facilities included:

- resources are needed to develop non-clinical roles/positions for RTs and ROMPs e.g. research positions, educator positions, sub-speciality positions, role expansion and practitioner roles – the RT role should evolve and for ROMPs if research roles are not available research and development time needs to be included in the service model;
- the ancillary needs of the department need to be met i.e. IT support, radiotherapy information system software, application specialists, data managers, clinical trials personnel, nursing, allied health and clerical/administration support;
- there is a need for improved information systems – in the past funding has been given to centres to improve their software which was very helpful, however it needs to be provided on a more consistent basis – more IT support is required, time is wasted troubleshooting so an IT administrator and IT support needs to be factored into the service model;
- planning equipment needs to be aligned with the number of machines, technology and staff – having too few planning computers slows throughput;
- there needs to be better access to PET and MRI;
- BTE needs to be used across all facilities;

- there should always be an extra machine installed that is not dedicated to treatment, but is used for planning and research;
- there needs to be consistency in the provision of staff across services, based on what services are providing;
- facilities should be built with a minimum of two bunkers; and
- the best way to bridge the gap (i.e. to reach 52.3%) is to take treatment to the people by adding services in regional centres – location is an issue if you need treatment every day – many new machines are going into the cities resulting in the cities being over serviced.

Comments about the desired RO service model from public facilities were;

- no more than 250 new patients per RO as time for training and research is required in the public sector; and
- a locum service for ROs would be ideal to help deal with people taking leave as ROs build up annual leave because there is no relief – funding a locum position would take the pressure off many ROs.

Comments about the desired RT service model from public facilities were;

- super numerary funded PDY positions in all facilities;
- a better system to cope with maternity leave; and
- the AIR benchmark of 1.06 RTs per linac hour is a dated, it should be 1.3.

Comments about the desired ROMP service model from public facilities were;

- some facilities would like to see most ROMPs with conjoint appointments, there is currently no mechanism for this;
- there needs to be enough ROMPs to ensure the burden of out of hours work is shared;
- there should be a minimum 1.7 FTE ROMPs per linac; and
- facilities need quality managers who provide a high level of assurance and are able to explain all procedures (also supports training and quality intervention).

9.5.2 Comments from private facilities

Stakeholder comments about the desired service model in private facilities included:

- the private sector needs to be embraced and supported in training all three disciplines – there is Commonwealth funding to support training but not state funding, meaning there are always salary shortfalls;
- there needs to be a revision of the guidelines for RT and ROMP staffing levels, modern machinery is now considerably less labour intensive and far more automated;
- there is a need for more highly specialised professionals;
- a national baseline level of QA that the physics community agrees on needs to be developed;
- BTE is considered to be a waste of time – staff requirements should be based on machine hours and patient numbers;
- radiation oncology facilities should be in outer metropolitan areas (population growth areas), they should be one stop shops as its likely patients are on more than one treatment;
- new regional centres need easy access to PET and MRI facilities; and
- MBS item numbers need to be reviewed – the MBS should more accurately reflect what is done and what it costs.

Comments about the desired RO service model from private facilities were;

- between 300-350 new patients per radiation oncologist; and
- at least one medical registrar in each private radiation oncology facility (which sees a minimum volume of new patients).

Comments about the desired RT service model from private facilities were;

- three-four RTs per linac (treatment only) with overall ratio lower than the AIR recommendation of 1.06 RTs per linac hour;
- more funding to assist in training PDYs;
- funding to train staff in using new technology; and
- a national system for accreditation, registration, training and education of RTs.

Comments about the desired ROMP service model from private facilities were;

- 1.0 – 1.5 FTE ROMPs per linac is the desired staffing ratio.

9.5.3 Desired service and staffing model summary

There is a sense across both public and private facilities that staffing levels and benchmarks for all three professions need to be revised to reflect the current nature of the profession. Also, further consideration needs to be given to the evolving roles of RTs and ROMPs and how changes in their roles will be factored into the service model. Both public and private facilities make comments regarding the need for more centres to be located in outer-metropolitan or regional areas in order to provide better access for patients.

Some key differences exist between the public and private facilities regarding the desired staffing model. Public facilities desire that ROs see no more than 250 new patients per year whereas private facilities generally work on a basis of about 300-350 new patients per year. Similarly the desired RT and ROMP staffing ratios are higher for public facilities relative to private facilities; this divergence partly reflects the variation in the mix of work in the two groups (both groups treat patients, but there is more emphasis on teaching, training and research in the public sector) and partly reflects the difference in organisational culture in the two sectors.

The key conclusion is that although it might be possible to set one staffing benchmark for each of the professional groups, the benchmarks will be interpreted differently in the public and private sector. Should there be initiatives to distribute the teaching, training and research workloads more evenly between the two sectors (specific funding to the private sector for these activities would probably be required to make any significant changes to the current take up of teaching, training and research activities in the private sector) then a common set of workload benchmarks for the public and private sectors would be more relevant.

10

Projecting the radiation oncology workforce

This chapter describes the RO, RT and ROMP workforce projections models and the key assumptions used to develop them. It is important to note that the models project the entire workforce, which includes the fully qualified workforce plus those in vocational training (i.e. RO registrars, RT PDYs, and ROMP registrars). The models are developed at the national level, and given the relatively small RO, RT and ROMP workforces, use of the models at jurisdiction level is not recommended. No jurisdiction-specific data have been used to develop the models. This chapter also presents the results of using the models to project national workforce supply and demand for 2014 and 2019 and the related sensitivity analyses.

10.1 OVERVIEW OF SUPPLY SIDE WORKFORCE MODELS

This section describes the key data sources and assumptions used to develop the three supply side workforce projections models. All three supply side models are based primarily on the data collected using the professions' surveys of the RO, RT, and ROMP workforces undertaken for this project.

10.1.1 Overall workforce numbers and age distribution

The professions' survey data provide a range of workforce characteristics including age distribution, working hours, year obtained qualifications, and retirement/workforce exit intentions as described in chapters 6, 7 and 8. Although the response rates to the professions' surveys were high, they were not 100% and therefore a separate estimate of the number of professionals in the workforce was required. For this purpose, the facilities' survey data was used to "gross up" the professions survey figures and thereby provide a representation of the whole workforce assuming that the distribution of non non-respondents' characteristics (e.g. age) would have been similar to the distribution for respondents.

10.1.2 Attrition from the workforce

For all the workforce groups the professions' surveys also provided data on the number of practitioners planning on leaving the workforce (e.g. maternity leave, leaving the profession, or travelling overseas). The relevant question on the professions' survey was about the respondent's intentions to change their work arrangements over the next 12 months. Being only for 12 months, the numbers were multiplied by five to represent each of the five year future time periods projected. These data were used to estimate attrition for persons aged under 45 years of age for RTs and ROMPs[111,112]. For ROs, the professions' survey data showed that the number of ROs planning to leave the Australian workforce was about equal to

[111] For RTs it was assumed that 95% of those planning on taking maternity leave or extended travel within the next 12 months would return within five years. For those who went to work overseas, it was assumed that two out of three would return within five years - based on the short duration most predicted they would be travelling in the professions' survey.

[112] For ROMPs, three professions' survey respondents reported that they would be going on maternity leave/extended overseas travel, but they were offset by two who reported returning from maternity leave, thus no net gain or loss was assumed for maternity leave/extended overseas travel. For those ROMPs who responded that they planned to move overseas to work, it was assumed they did not return as a large proportion of them were returning to their country of origin.

the number of inward migrants so a net zero impact was modelled over five and 10 years for maternity leave and/or extended travel and/or overseas work.

The ROMPs professions' survey was also used to estimate the number of retirees because there was no other suitable longitudinal data available. For RTs and ROs, ABS Census data and AIHW medical workforce survey data were used to estimate attrition from the workforce through retirement for persons aged 45 years and over[113]. This option was chosen mainly because expected retirement (as gauged by the responses to the professions' survey) can be very different to actual retirement over a 10 year period. This difference is due to factors leading to early unplanned retirement such as a practitioner's own ill health or death, the ill health of a family member or a need to work longer for financial or other reasons as retirement approaches.

ABS Census data was used for the RT workforce and attrition was calculated over the five yearly period that the data were available (this was a new occupation group added to later ABS Census surveys so 10 year data were not available, as they were for ROs). It was assumed that retirement rates would be the same as the available data in the following five years except that respondents would then be in an age group five years older. For ROs, the AIHW medical workforce survey data for radiologists was used as there is no separate RO category (included in radiologists) but they have a similar age/sex distribution to radiologists and they train in the same College, thereby justifying the use of the radiologist's data.

Attrition rates were calculated as the percentage reduction in each age cohort over the previous five years. Retirement rates after five years and 10 years were calculated for each five year age cohort. Net attrition[114] is the sum of the attrition for all previous periods. The calculation of cumulative attrition rates is as follows:

$$NAR = 1-N_{t(i)}/N_{t(1)}$$

where: NAR = net attrition rate;
N = number in workforce;
$t_{(i)}$ = projection time period (i = 5 at 2014 and i = 10 at 2019); and
$t_{(1)}$ = the first year of data in series (in this case 2009)

10.1.3 Entrants to the workforce

New entrants to the workforce were modelled in a way that reflected the differences in arrangements for training the respective professionals groups. For ROs, the RANZCR provided data on current registrars that indicated that there were 108 registrars in training in 2009. This number exactly matched the facility survey estimate of 108 medical registrar positions. The data were used, along with the age/sex profile of respondents to the professions survey to derive an estimate of 21 new medical registrars per year with an associated age distribution in five year cohorts and an assumption that 53% would be female.

For RT, the relevant Universities provided a projection of the number of new graduates, which was used to estimate that about 155 students each year would be looking for a RT position. This number compared favourably to the estimated number of PDY positions in 2008 of 177, as through the case studies we became aware that a lower number of PDY

[113] The professions' surveys designed for this project are cross-sectional and therefore do not provide data on the historical pattern of actual retirement rates.
[114] Net attrition accounts for movement both in and out of the workforce.

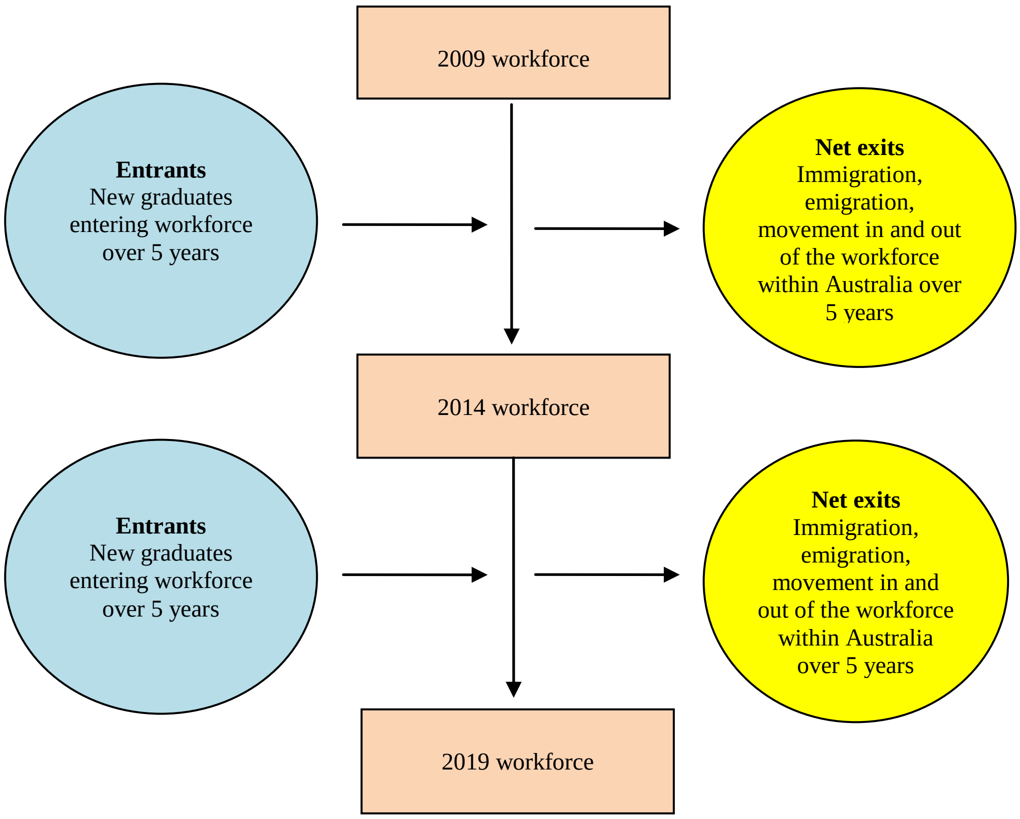
positions was likely in 2009. For ROMPs, the training situation is similar to RO registrars so the number of ROMP registrar positions was used. This number was estimated at around 15 per year from the facilities' survey, but as discussed in Chapter 8, some of these positions were for qualified ROMPS but had been filled by registrars due to difficulties in recruiting a qualified person. As this scenario may not continue, 15 new ROMP registrars per annum has been used in the base model but a scenario with only 10 new registrars per annum is included in the sensitivity analysis.

Finally, the professions' survey was used to estimate the number of overseas migrants into the Australian workforce. For ROs and RTs, there was little net impact from immigration, but the number of ROMPs recruited from overseas was significant and the model assumes an incoming number of four to five each year.

10.1.4 Summary of supply modelling

The supply model taking account of the 2009 workforce and entrants and exits from the workforce over two five year periods to 20014 and 2019 is summarised in Figure 10.1.

Figure 10.1: Overview of flow through the supply model

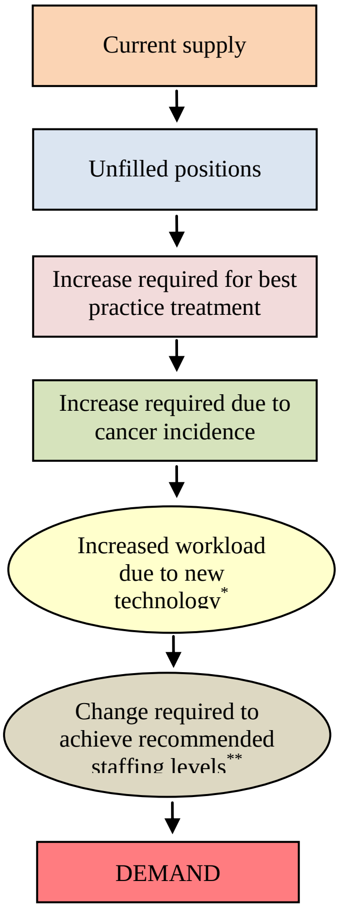


10.2 OVERVIEW OF DEMAND SIDE WORKFORCE MODELS

This section describes the key data sources and assumptions used to develop the three demand side workforce projections models. Demand was based on an estimated head count for each of the RO, RT and ROMP workforces and the number of hours worked to provide the current level of radiotherapy services (i.e. at the baseline, current average staffing levels were used as the starting point for future staffing levels). Average hours worked per week were reported by each of the respondents in the professions' surveys.

The demand model is incremental as summarised in Figure 10.2. It is assumed that the current level of radiotherapy provision is a baseline and there is additional demand generated by a number of factors (some of which are known, but most of which need to be estimated).

Figure 10.2: Overview of flow through the demand model



* Not in base model, but included as 5% and 10% impact in sensitivity analysis ** Not in base model but included in sensitivity analysis

Figure 10.2 shows that the first source of additional demand is the number of unfilled positions reported in the facilities' survey. Vacant positions represent existing demand that is not met, and the number is significant for ROMPs. The second factor is the workforce increase that would be required to provide the number of services to achieve the target of 52.3% of patients with cancer receiving radiotherapy treatment[115]. Recall from Table 4.2 that this study has found that the best estimate of the current treatment ratio is 38.1% meaning that a further 14.2% of patients with cancer would benefit from radiotherapy treatment representing a further capacity requirement of 37% (14.2/38.1). Naturally, a corresponding number of new facilities (and/or and increase in operating hours of existing facilities) would be required from which to deliver these services[116].

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[115] Delaney G, Jacob S, Featherstone C and Barton M (2005). The role of radiotherapy in cancer treatment: estimating optimal utilization from a review of evidence-based clinical guidelines. Cancer, Volume 104, Issue 6.

[116] Note that workforce required for new facilities has not been modelled directly as to model an increase in the radiotherapy treatment rate and the number of new facilities would be to double count the required workforce.

The third factor is the annual rise in cancer incidence − this figure implicitly accounts for population growth and ageing and the base model uses the figure of a 2.5% increase in new cases per year as advised by DoHA (the impact of variations is examined in the sensitivity analysis). The fourth factor estimates the largely unknown impact of new technology. Data from the professions survey suggested that new technologies may require an increase in hours of up to 15% (note that this is likely to be an overestimate as the new technologies will not be suitable for/used on all patients) and data from the case studies suggested that there might be some offsetting efficiencies. For this reason, zero impact has been assumed in the base model but 5% and 10% increased capacity scenarios are included in the sensitivity analysis.

The fifth factor is the increase/decrease in workforce that would be required to staff facilities at the recommended benchmark levels. This study found a reasonable degree of support (mainly in the public sector) for the benchmarks promulgated by the RANCR, AIR and ACPSEM (although there was an acknowledgment that they need to be reviewed to more closely reflect current practice). Thus, the fifth factor uses the 250 new patients per RO per annum, the 1.06 RTs per linac hour and the 1.7 ROMPs per linac the sensitivity analysis to examine the workforce impact of achieving the recommended staffing ratios. The adjustment is made by comparing the estimated values of the benchmark ratios (using the national median), derived from the facility surveys with the recommended threshold levels and calculating a scaling factor (recommended/actual, inverted for ROs as actual numbers are higher than recommended) as shown in Table 10.1.

Table 10.1: Calculation of scaling factors to professional body recommended workforce benchmarks

Benchmark ratio	Estimated baseline value	Recommended value	Scaling factor
New cases per RO	214.5	250	0.86
RTs per linac hour	0.97	1.06	1.09
ROMPs per linac	1.3	1.7	1.31

It should be noted that this process will only produce a rough estimate, as the benchmarks need to be calculated at the level of each facility, not overall. Also, the actual value of the RO benchmark is only an estimate as most facilities did not directly measure the number of new patients. The same is true of the RT benchmark as the project methodology did not provide for the direct measurement of the time required to carry out excluded activities (e.g. brachytherapy, IMRT and SRS planning, etc.). Thus, this aspect of the sensitivity analysis should be regarded as indicative of what might be required to move to professional body recommended staffing levels, but not definitive.

10.3 RO WORKFORCE PROJECTIONS TO 2019

This section presents the RO workforce projections for 2014 and 2019 using the base model assumptions (sensitivity analysis is in section 10.6).

10.3.1 ROs workforce supply projections

From the facilities' survey it was estimated that there were 339 ROs in 2009 (note that the estimate of the number of ROs in the workforce as at 31st December, 2008 was taken as the 2009 base number for the workforce planning model). Using the professions' survey data, it is estimated that 44% of the ROs were aged 45 years and over, with six ROs continuing to work over the age of 65 years; and that 62% of ROs were men.

Table 10.2: Base model RO workforce supply projections to 2019

Age at 2009			**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**Total**
ROs 2009			28	46	64	53	52	42	31	17	4	0	2	339
Age at 2014		**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**80+**	**Total**
ROs remaining 2014		56	56	54	77	52	45	45	33	11	2	0	0	431
2009-14 entrants - 5 years		56	28	8	13									105
2009-14 attrition - 5 years						-2	-6	2	1	-6	-1	0	-1	-13
Age at 2019	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**80-84**	**85+**	**Total**
ROs remaining 2019	56	85	63	67	75	51	47	30	14	5	1	0	0	495
2014-19 entrants - 5 years	56	28	8	13										105
2014-19 attrition - 5 years					-2	-1	1	-14	-18	-5	-2	0	0	-41

Note: Figures may not sum due to rounding

Table 10.3: Base model RO workforce demand projections to 2019

Demand factor	**2014**	**2019**
Average hours per week worked	**46**	**46**
ROs 2009	339	339
Total hours per week worked	**15,594**	**15,594**
Unfilled positions 2009	14	14
Total unfilled hours per week worked	**644**	**644**
Increase in capacity required to achieve best practice (treatment rate)	37%	37%
Extra positions needed to achieve best practice (treatment rate))	126	126
Best practice hours per week worked	**5.812**	**5.812**
Trend increase in cancer incidence per annum	2.5%	2.5%
Extra positions needed due to increase in cancer incidence	61	130
Total additional hours per week required due to increase in cancer incidence	**2,813**	**5,995**
Total demand for ROs	**540**	**610**
Total demand for RO (hours per week)	**24,863**	**28,045**
Projected supply of ROs	**431**	**495**
Shortfall of ROs	**109**	**115**

Using the base model assumptions, by 2014, it is projected that there will be 431 ROs. Over the five years from 2009, it is estimated that there will be about 105 new entrants and 13 retirees (Table 10.2). By 2019, it is projected that there will be 495 ROs. Over the five years from 2015, there will be about 105 new entrants and 41 retirees. The greater number of retirees in this second five-year period reflects the larger size of the cohort aged 45 – 54 years in 2009 compared to the older cohort aged 55 to 64 years.

The supply of ROs may be reduced both by feminisation of the workforce and because, like other medical professions, younger male ROs tend to work fewer hours than their older counterparts (cannot be determined without longitudinal data). It is known from the professions' survey for ROs that women aged under 40 years work about 39 hours per week compared to men in the same age group who work about 45 hours per week (compared to men 40 years and over who work 48 hours per week on average). The cohort aged 25-34 years is likely to be replaced by a cohort that is just over 50% female − currently this age cohort represents about 20% of the RO workforce. This change suggests the possibility of about a 2% decrease in radiation oncology total hours worked each decade, although without trend data this figure remains uncertain (it has not been modelled).

10.3.2 ROs workforce demand projections

Again using the base model assumptions, it was estimated (Table 10.3) that demand would grow to about 540 ROs by 2014 and 610 ROs by 2019 (about 24,863 hours per week by 2014 and 28,045 by 2019, based on the current average of 46 hours worked per week). This is 109 positions above the number of ROs projected to be available in 2014 and 115 above the available number in 2019.

There are several sources of measurable unmet demand. There are currently 14 unfilled positions (about 644 hours per week). The additional positions that would be required to deliver best practice treatment radiotherapy rates, an increase of 37%, would be 126 ROs (about 5,812 hours per week). An extra 61 RO positions are needed by 2014 due to growth in cancer incidence (2.5% annually) and a total of 130 ROs by 2019 (about 2,813 hours per week worked by 2,014 and 5,995 by 2019), the largest factor driving future demand.

10.4 RT WORKFORCE PROJECTIONS TO 2019

This section presents the RTs workforce projections for 2014 and 2019 using the base model assumptions (sensitivity analysis is in section 10.6).

10.4.1 RTs workforce supply projections

From the facilities' survey it was estimated that there were 1,578 RTs in 2009 (note that the estimate of the number of RTs in the workforce as at 31st December, 2008 was taken as the 2009 base number for the workforce planning model). The professions' survey data shows that RTs are a relatively young workforce with only 25% aged 45 years and over, and only four RTs continuing to work over the age of 65 years. Radiation therapy is a largely female profession with 75% of RTs being women.

Table 10.4: Base model RTs workforce supply projections to 2019

Age at 2009			**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**Total**
RTs 2009			232	341	225	252	134	111	162	83	35	4	1,578
Age at 2014		**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**Total**
RTs remaining 2014		**528**	**213**	**357**	**195**	**242**	**111**	**72**	**65**	**50**	**0**	**0**	1,836
2009-14 entrants - 5 years		642	48	32	24								746
2009-14 attrition - 5 years		-114	-67	-16	-54	-10	-23	-38	-97	-33	-35	-4	-490
Age at 2019	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**Total**
RTs remaining 2019	554	511	231	329	186	219	73	29	39	0	0	0	2,171
2014-19 entrants - 5 years	668	50	33	25									776
2014-19 attrition - 5 years	-114	-67	-16	-54	-10	-23	-38	-43	-26	-50	0	0	-440

Note: Figures may not sum due to rounding

Table 10.5: Base model RTs workforce demand projections to 2019

Demand factor	**2014**	**2019**
Average hours per week worked	**36**	**36**
RTs 2009	1,578	1,578
Total hours per week worked	**56,808**	**56,808**
Unfilled positions 2009	31	31
Total unfilled hours per week worked	**1,116**	**1,116**
Increase in capacity required to achieve best practice (treatment rate)	37%	37%
Extra positions needed to achieve best practice (treatment rate))	557	557
Best practice hours per week worked	**20,057**	**20,057**
Trend increase in cancer incidence per annum	2.5%	2.5%
Extra positions needed due to increase in cancer incidence	281	598
Total additional hours per week required due to increase in cancer incidence	**10,100**	**21,529**
Total demand for RTs	**2,447**	**2,764**
Total demand for RTs (hours per week)	**88,081**	**99,509**
Projected supply of RTs	**1,835**	**2,171**
Shortfall of RTs	**612**	**593**

Using the base model assumptions, by 2014, it is projected that there will be 1,836 RTs. Over the five years from 2009, it is estimated that there will be about 746 new entrants and 490 RTs leaving the profession (Table 10.4). There were large numbers of professions' survey respondents indicating that they planned to leave the profession, move overseas, take maternity leave or undertake extended travel overseas[117] in addition to retirees. Decisions by individuals to change career is the main driver of loss to the radiation therapy workforce. By 2019, it was projected that there would be 2,171 RTs. Over the five years from 2015, there would be about 776 new entrants and 440 exits from the RT workforce.

10.4.2 RTs workforce demand projections

Again using the base model assumptions, it was estimated (Table 10.5) that demand would grow to about 2,447 RTs by 2014 and to 2,764 by 2019 (about 88,081 hours per week by 2014 and 99,509 by 2019 based on the current average of 36 hours worked per week). This is 612 positions above the number of RTs projected to be available in 2014, and 593 positions in 2019. Despite this apparent gap, there were a notable number of respondents who were uncertain about their contracts being renewed or whether they would be able to continue to find employment as a radiation therapist. The main reason for the emerging apparent gap appears to be the very large proportion of the radiation therapy workforce that leave the profession at a relatively young age.

There are several sources of measurable unmet demand. There are 31 unfilled positions (about 1,116 hours per week). The increase that would be required to deliver best practice care, an increase of 37%, was 557 RTs (about 20,057 hours per week). The growth in cancer incidence (2.5% annually) generates an increase in demand of 281 RTs by 2014 and 598 RTs by 2019 (about 10,100 hours per week by 2014 and 21,529 hours per week by 2019), the largest factor estimated in driving future demand.

10.5 ROMP WORKFORCE PROJECTIONS TO 2019

This section presents the ROMPs workforce projections for 2014 and 2019 using the base model assumptions (sensitivity analysis is in section 10.6).

10.5.1 ROMP workforce supply projections

From the facilities' survey it was estimated that there were 250 ROMPs in 2009 (the estimate of the number of ROMPs in the workforce as at 31st December, 2008 was taken as the 2009 base number for the workforce planning model). The professions' survey data shows that 35% were aged 45 years and over, with nine ROMPs continuing to work after the age of 65 years. It also shows that 67% of ROMPs are male.

[117] It was assumed that 95% of those taking maternity leave or extended travel would return within five years.

Table 10.6: Base model; ROMP workforce supply projections to 2019

Age at 2009			**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**Total**
ROMPs 2009			10	56	30	43	25	33	26	11	8	8	1	250
Age at 2014		**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**Total**
ROMPs remaining 2014		5	78	62	35	51	28	34	21	6	1	0	0	319
2009-14 entrants - 5 years		5	68	5	5	8	3	1	1	1	0	0	0	97
2009-14 attrition - 5 years									-6	-6	-6	-8	-1	-28
Age at 2019	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**80-84**	**Total**
ROMPs remaining 2019	5	73	83	66	43	53	29	28	15	0	0	0	0	396
2014-19 entrants - 5 years	5	68	5	5	8	3	1	1	1	0	0	0	0	97
2014-19 attrition - 5 years								-6	-6	-6	-1	0	0	-19

Note: Figures may not sum due to rounding

Table 10.7 Base model ROMP workforce demand projections to 2019

Demand factor	**2014**	**2019**
Average hours per week worked	**40**	**40**
ROMPs 2009	250	250
Total hours per week worked	**10,000**	**10,000**
Unfilled positions 2009	35	35
Total unfilled hours per week worked	**1,400**	**1,400**
Increase in capacity required to achieve best practice (treatment rate)	37%	37%
Extra positions needed to achieve best practice (treatment rate))	93	93
Best practice hours per week worked	**3,727**	**3,727**
Trend increase in cancer incidence per annum	2.5%	2.5%
Extra positions needed due to increase in cancer incidence	45	96
Total additional hours per week required due to increase in cancer incidence	**1,804**	**3,845**
Total demand for ROMPs	**423**	**474**
Total demand for ROMPs (hours per week)	**16,931**	**18,972**
Projected supply of ROMPs	**319**	**396**
Shortfall of ROMPs	**104**	**78**

Using the base model assumptions, by 2014, it was projected that there would be 319 ROMPs. Over the five years from 2009, it is estimated that there will be about 97 new entrants (including migrants entering the Australian workforce net of those planning on leaving the Australian workforce[118]) and 28 retirees[119] (Table 10.6). By 2019, it was projected that there would be 396 ROMPs. Over the five years from 2015, it was estimated that there would be about 97 new entrants and 19 retirees. These figures assume that the number of ROMPs migrating from overseas to Australia will be maintained.

10.5.2 ROMP workforce demand projections

Again using the base model assumptions, it was estimated (Table 10.7) that demand would grow to about 423 ROMPs by 2014 and 474 by 2019 (about 16,931 hours per week in 2014 and 18,972 in 2019 based on the current average of 40 hours worked per week) (Table 9.4). By 2014, this is 104 positions above the number of ROMPS that is projected to be available and 78 positions in 2019.

There are several sources of measurable unmet demand. There are currently a number of unfilled ROMP positions, 35 in all (about 1,400 hours per week) or about 15%, the highest proportion of any of the three professions included in this study. The increase that would be required to deliver best practice care, an increase of 37% over current provision of radiation oncology, accounts for a further 93 positions. The growth in cancer incidence (2.5% annually) is projected to result in an increase in demand of 45 ROMPs by 2014 and 96 ROMPs by 2019, the largest factor estimated in driving future demand.

10.6 SENSITIVITY ANALYSIS

The workforce model is designed to allow the impact of varying a number of assumptions to be tested. In so doing, it is important to note that some factors were modelled as one off changes to current practice. These factors include changes to best practice treatment rates, impacts of new technology, and changes to recommended staffing levels. This is the correct treatment of such factors as once staffing levels have been adjusted to absorb the one-off impact then the models project staffing needs going forward from the new base. That is the impact of the factor does not compound each year, like say the growth in cancer incidence.

Using the models, we found that the estimates of demand were particularly sensitive to the rate of growth in cancer incidence. Table 10.8 shows that an increase of 0.5% over the base estimate of 2.5% per annum to 3.0% per annum would result in an additional workforce demand for 13 ROs, 59 RTs and 10 ROMPs over five years and 29 ROs, 136 RTs, and 22 ROMPs over the ten years when compared to the base scenario. A decrease of 0.5% to 2% per annum would reduce workforce demand by 12 ROs, 59 RTs and nine ROMPs and 29 ROs, 130 RTs, and 21 ROMPs over 10 years.

[118] The impacts of policy changes such as priority on the immigration list would depend on the number, timing and the age of the immigrants.

[119] It is likely that the number of ROMPs indicating in the professions survey that they would retire in the 12 months from 2009 is slightly higher than the annual average. Projecting these figures forward suggests that by 2019 all ROMPs over the age of 65 years would have retired when there would have been expected to have been about 10-15 in this age group still in the workforce based on the 2009 age distribution. As a result, total supply in 2019 may be underestimated by about 10-15 ROMPs. However, if the high rate of migration of ROMPs was to decline this potential underestimate would be would quickly offset.

Table 10.8: Workforce model sensitivity analysis impacts to 2019

Scenario	2014		2019	
	Projection	Difference from base	Projection	Difference from base
ROs – demand				
Base projection	540		610	
Cancer increase - 3% pa	553	13	639	29
Cancer increase - 2% pa	528	-12	581	-29
Demand due to technology - 5% increase	564	24	633	23
Demand due to technology - 10% increase	587	47	656	46
RANZCR recommended staffing levels*	492	-48	562	-48
RTs – demand				
Base projection	2,447		2,764	
Cancer increase -3% pa	2,506	59	2,900	136
Cancer increase -2% pa	2,388	-59	2,634	-130
Demand due to technology - 5% increase	2,553	106	2,871	107
Demand due to technology - 10% increase	2,660	213	2,978	214
AIR recommended staffing levels*	2,589	142	2,906	142
ROMPs –supply				
Base projection	319		396	
Registrar numbers – 10 per annum	294	-25	346	-50
ROMPs – demand				
Base projection (demand)	423		474	
Cancer increase - 3% pa	433	10	496	22
Cancer increase - 2% pa	414	-9	453	-21
Demand due to technology - 5% increase	440	17	491	17
Demand due to technology - 10% increase	458	35	509	35
ACPSEM recommended staffing levels*	501	78	552	78

*Based on a ratio relative to current staffing of 0.86 for ROs, 1.09 for RTs and 1.31 for ROMPs; Note: figures may not sum due to rounding

Having regard to the difficulty in predicting the workload impact of new technologies, 5% and 10% increase in workload scenarios were modelled. The model shows that if new technology required a 5% increase in hours to treat the same number of patients, an additional workforce demand of about 24 ROs, 106 RTs, and 17 ROMPs would be created in 2014. A 10% increase in hours to treat the same number of patients due to new technology would lead to an additional workforce demand in 2014 of 47 ROs, 213 RTs and 35 ROMPs. Note that there is no difference in the projected impact of new technology over 5-10 years because the impact is modelled a one off change to the base staffing numbers.

The sensitivity analysis also examined what would be required to staff facilities at the levels currently recommended by the respective professional bodies. Given the limitations of the facilities' and professions' surveys, this estimate could only be made at the national level (public and private facilities combined) by applying a ratio to the current practice benchmarks derived in chapter 5 (see Table 10.1). Using this approach, if facilities were staffed at a level recommended by the professional bodies, there would be a decrease in demand of 48 ROs and an increase in demand of 142 RTs and 78 ROMPs in 2014. Again there is no difference in the projected impact of recommended practice staffing over 5-10 years because the impact is modelled a one off change to the base staffing numbers.

As discussed in Chapter 9, the number of ROMPs entering the workforce depended on funding for registrar positions. Because there is some doubt as to the continuity of registrar training at current levels (i.e. some ROMP registrars currently occupy qualified staff positions and it is argued that this situation will not be repeated), a lower scenario of 10 new ROMP registrars per year was also modelled. At this level, the ROMP supply would fall to 294 in 214, 25 fewer than if there were 15 new ROMP registrars per year and 346 ROMPs in 2019, 50 fewer than if there were 15 new ROMP registrars per year. Clearly, this outcome would accentuate the already severe shortage of ROMPs that is predicted by the workforce model (i.e. moving from a shortage of 74 ROMPs in 2014 in the base model to a shortage of 99 ROMPs in 2014, i.e. 25% less than what is required).

11

Conclusions and opportunities for workforce development

This chapter sets out our conclusions and identifies a number of opportunities to address the workforce planning issues identified in the study consistent with the requirements set out in the project terms of reference. Key findings are summarised, and opportunities identified (O1, O2, etc.) for further developing radiation oncology workforce planning.

11.1 MONITORING RADIATION ONCOLOGY WORKFORCE AND UTILISATION

By combining the data derived from the facilities' and professions' surveys, this project has produced estimates of 339 ROs (231 specialists and 108 registrars), 1,578 RTs (1,401 qualified and 177 PDYs) and 250 ROMPs (193 qualified and 57 registrars) working in Australia as at 31st December 2008. The study has also produced details of key workforce characteristics such as age and gender profile, working hours, range and mix of professional qualifications, numbers of working professionals recruited from overseas, and working intentions (including retirement intentions). It is vital that the professions' and facilities' surveys be repeated at regular intervals both for the purposes of ongoing workforce monitoring, and to allow refinements of the workforce projections model (regular 'snapshots' of the workforce allow longitudinal data to be imputed).

O1: Repeat the professions' surveys at least every two years by working with the relevant professional bodies.

Also, it is clear from this study that there is an ongoing need for information about the utilisation of radiotherapy services in Australia. NSW Health has developed the Radiotherapy Management Information System that has been operational for nearly 20 years which collects data from public and private facilities in that State. DHS Victoria has recently commenced collection of a similar data set for public sector facilities. There do not appear to be similar developments in other states/territories. Given the ongoing need to monitor radiotherapy services, particularly if attainment of the benchmark treatment rate of 52.3% is pursued, a nationally consistent radiotherapy data collection will be required. As a minimum the facilities' survey developed for this project (or near equivalent) should be repeated annually to form the basis of a national data collection.

O2: Repeat the facilities' survey annually and consolidate the results as the basis of a national radiotherapy services data collection.

11.2 CURRENT RADIATION ONCOLOGY STAFFING PRACTICES

A key component of the project was to analyse current radiation oncology staffing practices. Table 11.1 uses the data from the facilities' survey to produce a consolidated picture of current staffing practices by presenting the averages for the calculated workforce ratios (including, as required by the contract, the number of ROs, RTs, and ROMPs per linac).

Table 11.1: Radiation oncology workforce ratios (ex trainees) by state/territory, Australia, 2008

State/Territory	Average ROs per linac	Average new patients per RO	Average RTs per linac	Average RTs per linac hour	Average ROMPS per linac
NSW public	2.1	165.4	10.2	1.13	1.8
Victoria public	2.0	196.6	10.2	1.01	1.2
Queensland public	1.5	292.6	11.7	1.18	1.5
WA public	1.2	420.3	10.3	1.06	1.8
SA public	1.7	231.4	9.8	1.02	3.0
Tasmania public	1.4	221.3	9.4	1.01	1.5
ACT public	2.1	155.6	10.7	1.41	1.3
Total Public	1.9	204.5	10.4	1.09	1.6
Total Private	1.3	269.7	7.5	0.85	1.0
Grand Total	**1.7**	**230.1**	**9.3**	**1.00**	**1.3**

Source: Radiotherapy facilities survey, 2009

The actual values of the workforce planning ratios and their distribution across state/territory and sector have been extensively discussed. The key point is that there are considerable differences between current staffing practices and the benchmarks promulgated by the professional bodies. There are likely to be a variety of reasons for the differences, some of which may be related to the fact that the benchmarks were developed before much of the currently used radiotherapy technology came into widespread practice. For this reason, given the fact that the workforce ratios are widely used in practice, it is timely to review and redevelop the threshold levels for the existing benchmarks.

The data generated by this study should inform the review process however, use of these data must have regard to the fact that the RO and RT benchmarks for each facility could not be accurately measured. With respect to the RO benchmark, many facilities estimated, rather than measured, the number of new patients. Also, use of the RT benchmark requires direct timing of excluded tasks (e.g. brachytherapy, SRS and IMRT planning), which was beyond the scope of this study. A review of threshold levels for the current benchmarks will be, at best, of short term value. In the mid-term, better benchmarks are required which are not as simplistic as having the number of linacs or the number of new patients as the denominator.

O3: Review, in the short term, the current threshold levels for the existing widely used workforce benchmarks (new patients per RO, RTs per linac hour, and ROMPs per linac) and reset them, as necessary, to make them relevant to current practice.

The study found key differences exist between the public and private facilities regarding the desired staffing model. Based on the information gathered through the case studies, public facilities aim for ROs to see no more than 250 new patients per year whereas private facilities generally work on a basis of 300-350 new patients per year. Similarly, the desired RT and ROMP staffing levels are higher for public facilities relative to private facilities; this divergence partly reflects the variation in the mix of work in the two groups (both groups treat patients, but there is more emphasis on teaching, training and research in the public sector) and partly reflects the differences in organisational culture between the two sectors.

For these reasons, in the short term, it is better to have separate benchmarks for the public and private sectors until the workload of facilities is more closely aligned. Again, based on the information gathered in the case studies, it seems that that the patient treatment processes are similar in the two sectors (there may be differences in casemix, which could not be measured in the study as there is no agreed measure of patient complexity), but the teaching, training and research workload is significantly greater in the public sector. Until workload benchmarks are developed that can take these differences into account in the formulae, separate thresholds for the existing workforce benchmarks would be most appropriate when considering the number of staff required for a facility.

O4: Develop, in the short term, separate public and private sector threshold levels for the existing widely used workforce benchmarks (new patients per RO, RTs per linac hour, and ROMPs per linac), pending the development of new benchmarks that take account of the differences in service delivery (casemix), teaching, training and research workloads in the two sectors.

11.3 METHODS FOR PROJECTING RADIATION ONCOLOGY WORKFORCE

The 20 case studies of radiotherapy facilities and consultations with other stakeholders identified current approaches to staffing facilities and planning for the future workforce. At the State/Territory Health authority level, workforce planning has been addressed as part of the development of radiotherapy service plans (development of such plans was an initiative that flowed from implementation of the Baume Inquiry). Not all states/territories have completed these plans and not all are in the public domain, but for those that the project team has had the opportunity to review it is clear that there is a propensity, in the public sector, to adopt the RANZCR, AIR and ACPSEM workforce planning benchmarks of 250 new patients per RO, 1.06 RTs per linac hour and 1.7 ROMPS per linac.

Operators of private sector facilities are aware of the professional body benchmarks but based on the information derived from the cases studies, they make little use of them. They set staffing levels based on what they consider financially sustainable given the revenue stream generated from the MBS and patients. The general private sector view was that staffing to the level recommended by the professional bodies was not financially sustainable nor was it desirable. However, representatives of private sector facilities consistently stated that if specific funding to support teaching, training and research activities was provided more staff would be taken on to carry out these activities (hence moving private sector staffing levels closer to the professional body benchmarks).

O5: Review the role of the private sector in teaching, training and research activities relating to radiation oncology services and assess the need for a specific source of funds (in addition to current Commonwealth and state/territory government initiatives to partly fund RT PDY and ROMP registrar positions) to support further private sector participation in teaching training and research work.

11.4 IDEAL RADIATION ONCOLOGY WORKFORCE AND AFFORDABILITY

The project brief requested a determination of "the 'ideal' supply of each profession to operate existing linacs, including the basis for determination and an assessment of its affordability". Determining the 'ideal' workforce level normally requires a set of data that reflect a normative or best practice approach to carrying out the work. Typically, the work would be broken down into tasks and the time required to complete each task would be determined (either by direct measurement of a set of actual times leading to the determination of the 'efficient time' or by convening a focus group of practitioners to estimate the 'efficient time' using a process known as 'magnitude estimation[120,121]'). 'Ideal' staffing levels would then be calculated by measuring the number of times each task needs to be carried out in the radiation oncology facility, multiplying by the time required for each task, and aggregating to obtain total time. However, the study methodology did not provide for either direct timing or magnitude estimation so this methodology could not be followed.

The study only measured actual staffing levels and obtained a range of stakeholder opinion as to what is 'ideal'. As has been reported, actual staffing levels vary considerably, as do stakeholder views on the level of staff required to operate a radiation oncology facility. Certainly, it is possible to conclude that the current staffing levels are not 'ideal' as there is widespread agreement that more ROMPs would be recruited if qualified applicants were available. This fact is reflected by the 13.7% vacancy rate as at 31st December 2008. The situation is less clear for the RTs and ROs. The study has determined that, apart from problems in recruiting to some regional areas, overall, there is no current shortage of ROs and RTs (given current radiotherapy treatment rates). This does not, however, mean that the current RT and RO workforce is 'ideal', there may be other reasons (e.g. available funds) that better account for staffing levels.

It is also considered that the benchmarks promulgated by the professional bodies do not reflect 'ideal' staffing levels (even though they are often used as a reference point in the public sector). The benchmarks are out-of-date. For the RT and ROMP benchmarks, the project team reviewed the supporting papers which revealed that the threshold levels reflect radiotherapy practice in the late 1990's. Consequently, the RT and ROMP benchmarks are not considered to represent the 'ideal' workforce levels. Despite repeated attempts through liaison with RANZCR, a paper describing the basis for the RO benchmark could not be found. However, it is also considered that the benchmark is out-of-date and stakeholder opinion is that it certainly does not reflect the additional work required of a RO as a result of the introduction of a range of therapies that require much more sophisticated treatment planning.

To address this problem, a comprehensive review of workforce benchmarks is needed. This review would start by developing casemix adjusted measures of workloads that can be used in the benchmarks. Due to the emergence of brachytherapy (not linac based) as a treatment modality, and the wider range of radiotherapy delivery methods on the linacs (with their associated differences in workload), simple benchmarks that use linacs (undifferentiated) as the denominator are not adequate. Given the systematic differences in staffing practices between the public and private sector for all three professional groups, any future analysis of workforce needs to be based on benchmarks that reflect the mix of work, as well as patient and treatment complexity (otherwise different thresholds need to be developed for the two sectors, as has been suggested in the short term).

O6: Develop new workforce benchmarks ratios for ROs, RTs and ROMPs that incorporate a casemix adjusted measure of workload in the denominator which reflects both patient and treatment complexity.

The project objectives also required investigation of the issue of 'affordability' of the 'ideal' staffing models. The question of affordability cannot be addressed without an assessment of

[120] Hsiao WC, Yntema D, Braun P, Dunn D and Spencer C (1988). Measurement and analysis of intraservice work. *Journal of the American Medical Association*. Vol 260, (16), 2361-2370.
[121] National Centre for Classification in Health (2000). Review of the literature on relative values carried out by NCCH in 1998 to inform the PRS. Resource material C. Prepared for Medicare Schedule Review Board.

capacity to pay, which was not provided for in the project methodology. In the public sector affordability can be interpreted as the capacity of governments to invest in radiotherapy services relative to the other potential uses of public monies. By definition, the current staffing models are affordable because they are funded. However, for the reasons already discussed, the current staffing levels are not considered to be 'ideal'. Also the current staffing levels result in a treatment rate of 38.1% whereas the project brief states that 'RORIC has established that 52% of cancer patients will need and/or benefit from radiotherapy and that about a quarter of these patients are not accessing treatment within the recommended timeframes'. The workforce modelling has provided information on the staffing numbers that would be required to deliver a 52.3% treatment rate, but governments will need to determine whether these staffing levels are affordable.

In the private sector, affordability can be measured by the capacity of the facility to hire staff to provide quality services whilst generating a commercial return for shareholders. Currently, this equation results in lower staffing levels for private radiotherapy facilities relative to public. Based on data derived from the facilities' survey these staffing levels, in turn, result in a lower capacity of private services to bear the teaching, training and research workload. Again, the current private sector staffing levels are 'affordable', but they are not considered 'ideal'. A full costing study of radiotherapy services would be required to determine what is possible in terms of the mix of treatment services, teaching, training and research that can be sustained at a given level of revenue for private facilities. The revenue level is a matter for both government (through setting the MBS fee) and private providers (through policies on co-payments, and required rate of return on investment). It is important to note that such a costing study could also be used to develop casemix adjusted measures of workload.

O7: Undertake a full costing study of radiation oncology services to develop a better basis for measuring radiation oncology services workload, which can be used to design revised workforce benchmarks; and to develop a better understanding of the need and basis for funding services.

11.5 CURRENT RADIATION ONCOLOGY WORKFORCE VACANCIES

The terms of reference also required the presentation of data on vacancy rates. The facilities' survey asked the respective heads of ROs, RTs and ROMPs for these data. Table 11.2 presents the data showing a 4.5% vacancy rate for ROs, 1.8% for RTs and 13.7% for ROMPS. In all three professions, vacancy rates are higher in the public sector than the private sector.

Table 11.2: Radiation oncology workforce (ex trainees) vacancies by state/territory, 31st December 2008

State/Territory	ROs		RTs		ROMPs	
	Number FTE	Vacancy Rate	Number FTE	Vacancy Rate	Number FTE	Vacancy Rate
NSW public	1.0	1.6%	13.1	3.9%	5.9	8.8%
Victoria public	2.4	6.8%	0.4	0.1%	1.8	6.3%
Queensland public	3.0	11.2%	5.8	3.1%	5.5	21.6%
WA public	1.0	15.6%	0.0	0.0%	4.0	36.4%
SA public	1.0	14.1%	0.0	0.0%	5.0	29.4%
Tasmania public	0.0	0.0%	0.0	0.0%	0.0	0.0%
ACT public	0.0	0.0%	0.0	0.0%	1.0	25.0%
Total Public	8.4	5.5%	19.3	2.1%	23.2	14.6%
Private Sector	1.0	1.8%	3.0	1.0%	4.2	10.3%
Grand Total	**8.4**	**4.5%**	**22.3**	**1.8%**	**27.4**	**13.7%**

Source: Radiotherapy facilities survey, 2009

Overall, the vacancy rates for ROs and RTs reflect natural turnover in the workforce (the RT vacancy rate reflects a very tight employment market). These measurements are consistent with the qualitative information that consistently highlighted that there was very little difficulty in recruiting to RO and RT positions (there were some exceptions to this general rule in regional areas). It was identified through the professions' surveys that there were qualified ROs and RTs looking for work in Australia. However for ROMPS, the vacancy rate reflects a workforce shortage, a finding that is consistent with information provided by stakeholders who highlighted difficulties in recruiting qualified ROMPs to vacant positions.

In all three professional groups, the number of vacant positions is an indicator of unmet workforce demand. It is also the case that the number of vacant positions may reflect the availability of funds, and it might be that more positions are required but there are no funds to allow recruitment. Anecdotally, feedback from case study site visits supports the claim that funding shortages, rather than the lack of need, restrict the number of positions. However, the impact of funding shortages cannot be determined using the study methodology. The study has shown that current staffing levels are below the benchmarks promulgated by the AIR and ACPSEM, but consistent with the benchmarks promulgated by RANZCR. However, these benchmarks are not considered to represent the 'ideal' level of workforce.

11.6 IMPACT OF NEW TECHNOLOGIES ON WORKFORCE

The consultative process identified that radiotherapy practice is changing rapidly with new technologies regularly emerging. A number of technologies, 'IMRT' 'image fusion for treatment planning, 'treatment verification imaging' and 'adaptive planning and treatment' were consistently reported by large proportions of each professional group as generating an increased workload. The average impacts were almost uniformly reported as being between 10% and 15% increase in hours (i.e. 10% to 15% more hours would be required to treat the same number of patients). These data are difficult to interpret, particularly as the rate of penetration of the new technologies is unknown.

However, it seems clear that the more frequent and sophisticated use of technology (particularly imaging technology) in radiotherapy will impact on workload. The most common stakeholder view was that technology advances increase the workload of the three professions, particularly with regard to increases in non patient contact time i.e. planning and QA processes required to treat patients. The amount of the increase is too difficult to determine with any confidence, as is the extent of any counter-balancing savings from other technologies (e.g. paperless medical records) or changes to work practices. Compensating changes in work practice and/or time saving technologies need to be explored so as to ensure that a severe workforce shortage does not emerge (particularly for ROMPs).

The potential impact of technology is so significant that a further detailed study is warranted. There is a history of such studies in radiation oncology, for example the establishment and evaluation of trials of facilities with a single machine. Similar studies could be set up to evaluate the impact on workload of the various emerging radiotherapy technologies. Such studies could be at multiple sites and there could be a bias to involving facilities in regional areas to provide an opportunity for staff to participate in research and development activities. As necessary and appropriate the studies could have a broader focus, and include evaluation of treatment outcomes (not a pre-requisite as studying workload impact alone would be challenging, particularly establishing suitable baseline measures).

O8: Establish studies to evaluate the impact of emerging imaging technologies on workload, initially focusing on ‘intensity modulated radiotherapy’, ‘image fusion for treatment planning’, ‘treatment verification imaging’, and ‘adaptive planning and treatment’.

O9: Include a significant number of regional radiotherapy services in the ‘impact of emerging technologies on workload studies’ to provide an additional opportunity for staff of these services to be involved in research and development activities.

11.7 IMPACT OF NEW SERVICE MODELS ON WORKFORCE

The case studies also examined the issue of the role of radiotherapy in cancer treatment and how that might change over time. The majority stakeholder view was that radiotherapy would continue to be an important component of cancer treatment and care. The pace of evolution in clinical practice will determine the future role of radiotherapy in cancer treatment but, based on the consultations carried out for this study, the goal of 52.3% of cancer patients receiving radiotherapy treatment for either curative or palliative purposes at some stage in their cancer journey remains relevant and should guide the development of radiotherapy facilities and workforce for at least the next five years.

At the level of individual cancers, stakeholders cited the reduced incidence of gynaecological cancers as a factor that may reduce radiotherapy workload and the increased detection and treatment of prostate cancer was cited as a factor that could increase workload. There is insufficient evidence to determine whether there will be a net effect, but stakeholders consistently advised the number of patients needing radiotherapy treatment will not decrease (either in absolute terms or as a proportion of patients diagnosed with cancer). Newer service model developments such as intra-operative radiotherapy (one dose applied intra-operatively as substitute for a course applied over 20 fractions) and hypo-fractionation (larger doses in each fraction, thereby reducing the number of fractions) were seen as potential sources of workload reductions but it is too early to be definitive about potential workforce impact. These developments should be monitored.

O10: Monitor developments in radiotherapy service delivery models such as hypo-fractionation and intra-operative radiotherapy to determine their impact on workload and hence the required workforce.

11.8 SHORT-TERM WORKFORCE REQUIRED TO SUPPORT NEW FACILITIES

There are two aspects to considering the workforce situation going forward. The first is the short term situation, which is best examined by projecting the workforce requirements by profession based on the estimated number of linacs that will be commissioned (drawn from the information provided by stakeholders). Table 11.3 presents the workforce requirements by sector based on the medians of the distributions derived from the facilities’ survey of ROs per linac, RTs per linac, and ROMPs per linac calculated separately for the public and private sectors and then totalled. It should be noted that this analysis is based on current staffing practice, which is not considered to be ‘ideal’, particularly in the case of ROMPs.

Table 11.3: Radiation oncology workforce required (FTE) to additional staff linacs 2009 -2014

Sector	2009	2010	2011	2012	2013	2014
Public						
- linacs	7	6	5	7	3	2
- ROs (2.0 per linac)	14.0	12.0	10.0	14.0	6.0	4.0
- RTs ((10.3 per linac)	72.1	61.8	51.5	72.1	30.9	20.6
- ROMPs (1.5 per linac)	10.5	9	7.5	10.5	4.5	3
Private						
- linacs	5	6	5	2	6	0
- ROs (1.1 per linac)	5.5	6.6	5.5	2.2	6.6	0
- RTs (7.8 per linac)	39.0	46.8	39.0	15.6	46.8	0
- ROMPs (1.0 per linac)	5.0	6	5	2	6	0
Total						
- linacs	12	12	10	9	9	2
- ROs	19.5	18.6	15.5	16.2	12.6	4
- RTs	111.1	108.6	90.5	87.7	77.7	20.6
- ROMPs	15.5	15	12.5	12.5	10.5	3

Source: Radiotherapy facilities' survey and stakeholder consultations, 2009

Using this approach, Table 11.3 shows that significant growth in the workforce will be required over the next six years. Note that the nature of this analysis, given that the number of linacs beyond 2011 is very uncertain, is that only the years 2009, 2010 and 2011 should be considered in any detail. To put this growth into context Table 11.4 matches the projected need for the radiotherapy workforce by discipline against the expected supply, based on the current workforce planning parameters (note that these data do not come from the workforce projections model (it is not possible to do so, as due to small numbers in each profession, the model results are only robust at five year intervals, single year forecasts are not meaningful)). Rather, the workforce supply figures are derived from a simple extrapolation of the data obtained from the profession's surveys which predict net growth of 10.5 ROs per year (see section 6.4), 92.5 RTs per year (see section 7.4) and 4.5 ROMPs per year (see section 8.4).

Table 11.4: Radiation oncology workforce supply and demand 2009 - 2014

Profession	2009	2010	2011	2012	2013	2014
ROs						
- net growth	10.5	10.5	10.5	10.5	10.5	10.5
- required	19.5	18.6	15.5	16.2	12.6	4
Surplus (deficit)	(9.0)	(7.1)	(5.5)	(5.7)	(2.1)	6.5
RTs						
- net growth	92.5	92.5	92.5	92.5	92.5	92.5
- required	111.1	108.6	90.5	87.7	77.7	20.6
Surplus (deficit)	(18.6)	(16.1)	2.5	4.8	14.8	71.9
- ROMPs						
- net growth	4.5	4.5	4.5	4.5	4.5	4.5
- required	15.5	15	12.5	12.5	10.5	3
Surplus (deficit)	(11.0)	(10.5)	(8.5)	(8.5)	(6.0)	1.5

Source: Radiotherapy facilities' and professions' surveys, and stakeholder consultations, 2009

Review of Table 11.4 suggests that there will be significant workforce shortages for ROMPs (consistent with all the other analyses in this report) and smaller shortages for ROs and RTs based on current practice and workforce flows. In interpreting these data it must be noted that the linac acquisition schedule (Table 11.3) is based on information reported by stakeholders, therefore it may be somewhat optimistic. Linacs usually take longer to acquire and commission than is predicted, so with only relatively small delays to the acquisition schedule the shortfalls in respect of ROs and RTs could be fairly easily managed (particularly for RTs, where there are currently qualified staff looking for work). Notwithstanding this initial conclusion, Table 11.4 should be interpreted cautiously, as there has been no attempt to project linacs (the linacs shown are those advised to the project team by stakeholders).

O11: Closely monitor the pace of development and commissioning of new facilities over the next three years to ensure that there are sufficient ROs, RTs and, in particular, ROMPs to staff the new facilities.

11.9 WORKFORCE PROJECTIONS MODEL

The detailed workforce projections model allows a comparison of supply and demand for all three professions, taking account of the current age profile of the workforce, expected new entrants, and estimated attrition rates. Table 11.5 summarises the supply side projections for ROs, RTs and ROMPs using the base workforce planning model.

Table 11.5: Workforce supply projections by profession using the base model

Profession	2009	2014				2019			
	Supply	Entrants	Attrition	Growth	Supply	Entrants	Attrition	Growth	Supply
RO	339	105	13	92	431	105	41	64	495
RT	1,578	746	490	256	1,836	776	440	336	2,171
ROMP	250	97	28	69	319	97	19	78	396

Note: figures may not sum due to rounding

Review of the data highlights that there is a significant problem with attrition of RTs. The numbers projected to leave the profession are extremely high, and the professions' survey data show that the great majority are not leaving due to retirement, but due to a decision to pursue an alternative career. This situation is similar to that reported for the UK where a four tier skills mix model was developed and work was carried out to improve the training experience to reduce the high attrition rates for RTs (see section 2.5.1). It is clear that similar work is required in Australia, otherwise the high attrition rates will continue and the benefits of investing in training additional RTs will be diminished.

O12: Undertake a study of the reasons for the high attrition rates from the RT profession. The study should examine the career progression opportunities for RTs and develop strategies for how they might be improved. The UK work on developing the four tier skills mix model for RTs should be used as a reference.

Anecdotally, on a related matter, representatives of the relevant Universities advised that student numbers in radiation therapy courses have decreased and dropout rates from the same courses have increased because student RTs perceive that there is considerable difficulty in finding employment and/or dissatisfaction with the opportunities afforded by career as an RT. Again, this situation needs to be closely examined to ensure that there is an appropriate return on the investment in training RTs. There would be value in surveying students who have recently withdrawn from RT courses to determine their reasons and to formulate strategies for limiting the attrition rates.

O13: Undertake a study of RT students to determine the reasons for the high drop-out rate from university training programs. The study should formulate strategies for reducing the attrition rates.

The supply of the workforce can be best put into context by comparing with demand. Table 11.6 compares the workforce supply projections with demand projections for the best practice treatment rate (52.3% as in the base model), a treatment rate of 45.0% (i.e. move towards best practice) and the current treatment rate (38.1%). New facilities were not used as a demand indicator in the workforce projections model because it is impossible to be definitive about how many there will be in the 10 year projection period. Also, capacity can be increased by adding facilities or by working the equipment in existing facilities harder (e.g. by using shift work). For the purposes of workforce planning the difference in approach is not important, all that needs to be forecast is how many staff are needed to deliver services to the required number of patients.

Table 11.6: Workforce supply and demand by profession based at 52.3% and 38.1% treatment rates

Profession	2014							2019						
	Supply	Treatment rate						Supply	Treatment rate					
		52.3%		45.0%		38.1%			52.3%		45.0%		38.1%	
		Demand	Diff	Demand	Diff	Demand	Diff		Demand	Diff	Demand	Diff	Demand	Diff
RO	431	540	-109	467	-36	398	34	495	610	-115	527	-31	448	47
RT	1,836	2,447	-612	2,105	-270	1,781	53	2,171	2,764	-593	2,377	-206	2,011	159
ROMP	319	423	-104	369	-50	318	1	396	474	-78	413	-17	355	41

Note: figures may not sum due to rounding

Review of the data shows that there will be very large shortages in all three professions relative to what is required to attain the 52.3% best practice treatment rate in five and 10 years time. Even if an interim target treatment rate of 45.0% is adopted, there will still be considerable shortages at five years with the situation improving at 10 years. By way of comparison, at the current treatment rate of 38.1%, only the ROMPs present a problem at five years, and there should be no shortages at 10 years. Note that the 38.1% treatment rate scenario is somewhat artificial as based on what is happening with RTs at present, training in the professions will become unattractive if no jobs are available so student numbers and hence workforce supply will reduce. The real issue is to put in place strategies to ensure that the projected shortfalls relative to benchmark treatment rate are ameliorated.

It is most important to ensure that the supply side training issue is addressed. The base model assumes 21 new RO registrars, 155 new RT PDYs and 15 new ROMP registrars per year. There must be sufficient training positions to support at least this level of entry into the workforce. However, Table 11.6 shows that even at these levels there will be considerable shortages in all professions at 2014 and 2019 at benchmark treatment rate (52.3%) and even at 45.0% treatment rate. To generate the workforce required to achieve the 52.3% treatment rate in 10 years annual targets of 32 new RO registrars, 205 new RT PDYs and 23 new ROMP registrars should be adopted. If the aim is to achieve a treatment rate of 45.0% in ten years then annual targets of 24 new RO registrars, 175 new RT PDYs and 17 new ROMP registrars should be adopted to generate the required workforce. These targets assume that there will be no significant change in net overseas migration.

O14: Adopt targets of 32 new RO registrars, 205 new RT PDYs and 23 new ROMP registrars for each of the next ten years if the aim is to achieve a 52.3% treatment

rate in 2019 or targets of 24 new RO registrars, 175 new RT PDYs and 17 new ROMP registrars for each of the next ten years if the aim is to achieve a 45.0% treatment rate in 2019.

Related targets will need to be adopted for graduates from radiation therapy and medical physics programs to ensure that there are sufficient graduates to fill the vocational training places. There should be few problems for ROs as medical school intakes have already been increased in Australia and additional medical graduates are expected annually from 2011 onwards, thereby provided a source for filling the extra radiation oncology registrar positions. To generate the graduates to fill the vocational training positions required to achieve the 52.3% treatment rate in 10 years annual targets of 250 radiation therapy students and 70 medical physics students. If the aim is to achieve a treatment rate of 45.0% in ten years then annual targets of 210 radiation therapy students and 52 medical physics students should be adopted to generate the graduates necessary to fill the vocational training positions.

O15 Adopt targets of 250 new radiation therapy students and 70 new medical physics students (masters level) for each of the next ten years, if the aim is achieve a 52.3% treatment rate or 210 new radiation therapy students and 52 medical physics students for each of the next ten years if the aim is to achieve a 45.0% treatment rate, allowing for the fact that not all students will graduate and not all will pursue careers in radiation oncology services in Australia.

It should be noted that shortages forecast above are based on current staffing practices, which are not considered ‘ideal’. Also, any workload increase generated by new technology has not been taken into account. Inclusion of these factors would only make what are predicted to be severe workforce shortages even more severe. While current staffing practice may suffice in the short term, it must change as a result of the development of better workforce benchmarks (as has been suggested). The problem is most acute for ROMPs where current staffing practice appears to be inadequate to keep pace with the required work. The gap will only widen as new and more complicated technologies are introduced into radiotherapy service delivery. Thus, the suggested studies of technology impact on workload would also provide an important input into the workforce planning process.

11.10 WORKFORCE DEVELOPMENT INITIATIVES

The workforce planning model demonstrates that there will be significant workforce shortages of ROs, RTs and ROMPs if an increase in the radiotherapy treatment beyond the current level of 38.1% is pursued. The position is best illustrated by the prediction that, if the current workforce planning parameters are maintained, Australia will be 109 ROs, 612 RTs and 104 ROMPs short of achieving the 52.3% treatment rate in 2014, with no significant improvement in the situation by 2019. Should the lower treatment rate of 45.0% be adopted as the target, Australia will still be 36 ROs, 270 RTs and 50 ROMPs short in 2014 based on the current workforce planning parameters. Immediate action on workforce development is required if any increase in treatment rate is to be achieved within a reasonable time period.

The case study process and discussions with other stakeholders identified a range of existing workforce development initiatives. These initiatives have been successful in alleviating the critical shortages identified by the Baume Inquiry in ROs and RTs and somewhat less successful in respect of ROMPs. Many of these initiatives should be continued, however new initiatives are also required to generate the workforce necessary to increase the radiotherapy treatment rate. Table 11.7 summarises the issues, the strategies used to address them to date, and the opportunities to take further action based on the information gathered from case study process. To facilitate consideration of implementation actions, opportunities are grouped into short-term and mid-term.

Of the initiatives identified in Table 11.7, it is most important to carry forward the opportunities that sustain and expand the existing vocational training infrastructure, as additional ROs, RTs and ROMPS will need to be trained every year to increase the radiotherapy treatment rate. Currently, much of the funding for vocational training positions for RT PDYs and ROMP registrars is short term (i.e. non-recurrent). This funding should be put onto a recurrent basis to ensure that there will be an appropriate number of RTs and ROMPs (much of the funding for medical registrar positions in the public sector is already recurrent; funding of medical registrar positions in the private sector should be further explored) to deliver radiotherapy services at the requires rate in the future.

O16: Imbed the funding for vocational training positions for RT PDYs and ROMP registrars into the staffing structures of public radiotherapy facilities. The current situation where most funding for PDYs and ROMP registrars is provided on a limited term basis creates uncertainty, and given that there will be a continuing need to vocationally train RTs and ROMPs, recurrent funding would provide facilities with a better opportunity to manage and plan their workforce.

O17: Determine, through a process of DoHA working with state/territory health authorities, how best to support the private sector to participate in vocational training for ROs, RTs and ROMPs having regard to the current, largely Commonwealth government funded initiatives (see related opportunity 5).

An important part of the vocational training infrastructure is support positions such as clinical placement coordinators, tutors/educators, and preceptors. Funding for these positions has been provided by the DoHA and state/territory health authorities. This funding should continue. Similarly DoHA has provided funding to support universities to attract students to programs in radiation therapy and medical physics. The results of the workforce projections model demonstrate that it is important that these student numbers be maintained so this support should also continue.

O18: Continue to sustain the vocational training support infrastructure by DoHA and state/territory health authorities funding positions such as clinical placement coordinators, tutors/educators, and preceptors in radiation oncology facilities.

O19: Attract additional students to radiation therapy and medical physics programs by DoHA continuing to provide funding support to Universities offering radiation therapy and medical physicist undergraduate and postgraduate programs.

Notwithstanding the suggested investment in training positions and related infrastructure, the workforce planning model shows that there will be a continuing requirement for recruitment of ROMPs from overseas at the current level or greater for at least five years. Accordingly the overseas recruitment process should be investigated and arrangements made to ensure that ROMPs are allocated the highest priority for obtaining working visas so that any unnecessary delays in overseas qualified ROMPs taking up positions in Australia are eliminated.

Table 11.7: Workforce development initiatives identified through case study process and opportunities for further development

Workforce issue	Application							Existing workforce development strategies	Workforce development opportunity	
	Profession			Pub facilities		Priv facilities				
	RO	RT	ROMP	Metro	Reg	Metro	Reg		Short term	Mid term
Working hours		X	X	X	X	X	X	Most employers public and private offer a range of flexible working arrangements including nine day working fortnight (RTs); time off in lieu of additional hours worked; access to overtime payments; access to part time work; maternity leave; and access to leave without pay (e.g. to pursue overseas work).	Facilities to continue with local initiatives that best meet needs, no need for system level action.	
Remuneration		X	X	X	X	X	X	Many employers have modified standard remuneration arrangements to attract and retain qualified RTs and ROMPs. In a number of cases (e.g. ROMPs in NSW) there have been significant salary increases. In other cases, public sector remuneration arrangements have included special allowances or retention payments to allow employers to compete at market rates for labour. In the private sector many employers routinely offer a pre-determined add-on to the local public sector award remuneration package to attract and retain staff.	Jurisdictions to consider reviewing relevant Awards with the objective of moving towards national parity of pay and conditions for ROMPs across Australia.	Consider the development of nationally consistent pay and conditions for RTs and ROMPs.
Overseas recruitment			X	X	X	X	X	Many employers have looked overseas to find qualified staff to fill positions, historically for ROs, RTs and ROMPs but currently mainly for ROMPs. Overseas applicants have been offered support by way of funding for travel to Australia to assess the working environment. Many stakeholders made the point that immigration requirements make the process of recruiting from overseas slow and often frustrating..	Change immigration requirements to allocate the highest entry priority level to qualified ROMPs who wish to work in Australia	
Vocational training program for ROMPs			X	X	X	X	X	The Commonwealth government, some state/territory health authorities and ACPSEM worked together to develop the TEAP program, that has provided structured vocational training for ROMPs. This program, which is widely regarded as having been successful, has created a clear pathway for ROMPs to enter and progress through the workforce.	Continue development of TEAP	Review length of the TEAP for candidates who hold Masters or PhD level qualifications in physics, but not medical physics
Vocational training positions		X	X	X	X	X	X	The Commonwealth government has provided support for funding (part salary) PDY trainee positions for RTs and registrar positions for ROMPs. A number of state/territory health authorities have directly matched this funding (i.e. separate to the budget allocated to the radiotherapy facility). Also, many private facilities have supplemented the Commonwealth funding to take on trainees.	Continue existing funding of vocational training positions;	Imbed funding of vocational training positions into budgets of public facilities. Consider further funding to support vocational training positions in private facilities
Vocational training and continuing education infrastructure	X	X	X	X	X	X	X	The Commonwealth government and often the state/territory health authorities have provided funding for positions such as clinical placement coordinators, tutors/educators, and preceptors, to put in place staffing infrastructure that allows effective vocational training and support for education.	Continue and extend funding (to reflect the additional vocational training support infrastructure that will be required to increase radiotherapy treatment rate) for positions that support vocational training and continuing education.	

Workforce issue	Application							Existing workforce development strategies	Workforce development opportunity	
	Profession			Pub facilities		Priv facilities				
	RO	RT	ROMP	Metro	Reg	Metro	Reg		Short term	Mid term
Role of private sector in vocational training	X	X	X			X	X	Some private facilities have pursued opportunities to become more involved in training ROs, RTs and ROMPs, but there have been barriers in terms of the requirements of existing training programs and the need for financial support.	Review existing training programs to identify (and remove as appropriate) any barriers to more ROs, RTs and ROMPs being trained in the private sector	Review of the MBS and assess the need to take into account CPD, research and other costs to provide and incentive for private facilities to offer these opportunities.
Access to professional development opportunities		X	X	X	X	X	X	Many employers, public and private have provided staff with access to professional development opportunities including attendance at national and international conferences. In the Victorian public sector, a professional development allowance is paid on top of salary, which can be accessed for any purpose. More commonly in the public and private sector a professional development allowance is available to employees to attend an overseas conference.	Facilities to continue with local initiatives (consistent with jurisdictional requirements in the public sector) that best meet needs, no need for system level action.	
Access to opportunities to work conduct research and development work	X	X	X	X	X	X	X	Many employers (public and private) seek to provide staff with opportunities undertake research and development work opportunities, although in practical terms, research seems to take place more often in public sector facilities	Pursue suggested studies of the impact of emerging technologies on workload.	
Access to opportunities to develop and apply skills in emerging technologies	X	X	X	X	X	X	X	Many employers (public and private) aim to provide staff with opportunities to train on and use the latest available radiotherapy technologies as a method of attracting and retaining them. Nonetheless, professionals in all disciplines often expressed concern about the pace of adoption of new radiotherapy technologies relative to overseas countries.		Consider the barriers to the adoption of new radiotherapy technologies in Australian and, as may be appropriate, and develop strategies for overcoming them.
Career progression opportunities		X	X	X	X	X	X	The professional bodies, particularly for RTs and ROMPs, have been examining role substitution and sub-specialisation (practitioner roles) opportunities in order to make RT and ROMP careers more attractive and satisfying.	Undertake a review of the role of the RT in Australia and consider adopting the UK model to enhance job satisfaction of the Australian workforce	
Professional isolation in regional facilities	X	X	X		X		X	Some attempts at networking regional and metropolitan services to provide collegial and backfill support were identified, but these were at an early stage of development.	Further develop cancer service networks that include regional and metropolitan radiotherapy services.	Consider a program to that funds short term rotation of regional radiotherapy service staff into metropolitan centres
Support for undergraduate and postgraduate programs		X						The Commonwealth government and often the state/territory health authorities have provided funding to, and worked with, the universities to support the provision of undergraduate and postgraduate courses in radiation therap. These initiatives have resulted in an increased flow of graduates in the disciplines	Continue support to Universities, as significantly increased graduate numbers will be required to generate the workforce to increase the radiotherapy treatment rate.	
Lack of awareness of professions	X	X	X					Some employers are taking initiatives to make school students more aware of the career opportunities in radiation oncology. In Victoria, basic medical physics has been introduced into the year 11 curriculum as an elective with a view to generating interest in a career in medical physics.	Consider national campaign to raise the awareness of the three key professions involved in delivery of radiation oncology services	

O20: Examine the overseas recruitment process for ROMPs and make arrangements to ensure that ROMPs are allocated the highest priority for obtaining working visas so that any unnecessary delays in overseas qualified ROMPs taking up positions in Australia are eliminated.

A range of other short-term (pursuit within six months) workforce development opportunities are identified in Table 11.7. These opportunities include moving towards closer alignment of pay and conditions for ROMPs across Australia, the continued development of the ACPSEM TEAP, the further development of regional/metropolitan cancer services networks to address the issue of professional isolation of practitioners in regional facilities, and the conduct of a national campaign to promote the attractiveness of radiation oncologist, radiation therapist and radiation oncology medical physicist careers.

O21: Pursue, in the short term (within six months), the further development of the radiation oncology workforce by:

- **jurisdictions reviewing relevant Awards with the objective of moving towards national parity of pay and conditions for ROMPs across Australia;**
- **continuing the development of the ACPSEM TEAP;**
- **further developing regional/metropolitan cancer services networks to address the issue of professional isolation of practitioners in regional facilities; and**
- **conducting a national campaign to promote careers as radiation oncologists, radiation therapists and radiation oncology medical physicists.**

Table 11.7 also identifies a range of workforce development opportunities that should be pursued in the mid-term (between six months and two years). These opportunities include the development of nationally consistent pay and conditions for RTs and ROMPs; a review of the length of the ACPSEM TEAP for candidates who already hold Masters or PhD level qualifications in physics but not medical physics; a review the radiation oncology items in the MBS to assess the need to take into account CPD research and other costs to provide incentives for private facilities to offer these opportunities, a consideration of the barriers to the adoption of new radiotherapy technologies in Australia and, as may be appropriate, development of strategies for overcoming them; and a consideration of a program that funds short term rotation of regional radiotherapy staff into metropolitan centres.

O22: Pursue, in the mid-term (between six months and two years), the further development of the radiation oncology workforce by:

- **developing nationally consistent pay and conditions for RTs and ROMPs;**
- **reviewing the length of the ACPSEM TEAP program for candidates who hold Masters or PhD level qualifications in physics but not medical physics;**
- **reviewing the radiation oncology items in the MBS and assessing the need to take into account CPD, research and other costs to provide incentives for private facilities to offer these opportunities;**
- **considering the barriers to the adoption of new radiotherapy technologies in Australia and, as may be appropriate, strategies for overcoming them; and**
- **considering a program that funds short term rotation of regional radiotherapy staff into metropolitan centres.**

11.11 IMPLEMENTATION ACTIONS

A range of opportunities to further develop the radiation oncology workforce have been identified through the project. It is important to pursue all the opportunities identified in this project to prevent a recurrence of the workforce shortages in ROs and RTs experienced earlier this decade and to address the current shortage of medical physicists. There are significant risks if no action is taken. Not only will Australia's radiotherapy treatment rate stagnate at round 38%, but careers in the radiation oncology disciplines will become less attractive as the potential student perceive that employment on graduation is difficult to obtain, thereby causing a return to workforce shortages for RTs and ROMPs even at the 38% treatment rate. According to the information gained from the case study process, a significant number of new facilities, and additional linacs in existing facilities, are being planned so the current workforce planning parameters must be changed to ensure there are qualified staff available to operate these new services.

Pursuit of an increase in the radiotherapy treatment rate to the 52.3% benchmark will require very significant action. The workforce planning model predicts that an additional 11 ROs (50% increase on current numbers), 205 RTs (33% increase on current number and 23 ROMPs (50% increase on current number) are needed each year for 10 years to produce sufficient qualified staff to treat 52.3% of new cancer patients with radiotherapy in 2019. So even with a very aggressive investment in training (i.e. training 50% more ROs and ROMPs and 33% more RTs each year) it will take 10 years to attain the desired treatment rate. Implementing the opportunities for workforce development identified in this project, which have classified into priority groups in the Table 11.8, is the key to moving forward.

Table 11.8: Implementation priorities for workforce development opportunities

Priority Level	**Opportunity**	**Responsibility***
Immediate – action to commence within three months	O11 – monitor pace of new facilities development	C/J/PS
	O12 – career progression study for RTs	C/J/P
	O13 – study to examine attrition of RT students	C/P/U
	O14 – adopt new targets for vocational training	C/J/PS
	O15 – adopt new targets for RT and ROMP students	C/U
	O18 – fund vocational training support infrastructure	C/J/PS
	O19 – fund Universities to attract RT and ROMP students	C/U
	O20 – increase immigration priority for overseas ROMPs	C
Short-term – action to commence within six months	O3 – short term review of existing workforce benchmarks	C/J/P/PS
	O4 – separate public and private sector benchmark thresholds	C/J/P/PS
	O5 – review role of private sector in training and research	C/PS/F
	O8 – studies of impact of new technologies on workload	C/J/F
	O9 – bias toward regional sites in technology impact studies	CJ/F
	O16 – Imbed vocational training funding into public facilities	C/J
	O17 – support for private sector to participate in vocational training	C/J/PS/F
	O21 – pursue other short term opportunities	C/J/P/F
Mid-Term – action to commence within six months to two years	O1 – repeat professions' surveys	C/P
	O2 – repeat facilities' surveys	C/J/PS/F
	O6 – new workforce benchmarks for ROs, RTs and ROMPs	C/J/P/PS
	O7 – full costing study of radiotherapy services	C/J/PS
	O10 – monitor radiotherapy service model developments	C/J/PS
	O22 – pursue other mid-term opportunities	C/J/P/PS/F
	O23 – repeat radiation oncology workforce planning study	C/J/P/PS

* C = Commonwealth; F= Facilities; J= jurisdictions; P = Professions; PS = Private Sector; U = Universities

Finally, as with any workforce planning study of this magnitude conducted at a point in time, it is important to maintain the currency of the underlying information. Repetition of the facilities' and professions' surveys at regular intervals has been proposed as an opportunity to monitor changes in workforce characteristics. Repetition, in full, of this radiation oncology workforce planning study in 2012 is also proposed as an opportunity to reset the planning parameters having regard to the evolution of radiotherapy services and the associated workforce in the intervening period.

O23: Repeat, in full, the radiation oncology workforce planning study in 2012 so that the planning parameters can be reset having regard to the evolution of radiotherapy services and the associated workforce in the intervening period.

Appendix A

AN OVERVIEW OF CANCER, CANCER SERVICES AND RADIOTHERAPY IN AUSTRALIA

A

Cancer services and radiotherapy

This Appendix provides an overview of the cancer services landscape in Australia with a particular focus on the radiotherapy modalities and their use.

A.1 CANCER IN AUSTRALIA

Cancer is a leading cause of death in the Australia with more than 39,000 deaths and over 100,000 people diagnosed every year[122]. However, over the last decade improved early detection and treatment have resulted in better survival rates, despite the absolute numbers of sufferers and deaths continuing to increase by 2% to 3% per year as the population ages[123]. This section presents some high level statistics on cancer incidence and mortality.

A.1.1 Cancer incidence

Table A.1 shows that in 2005, 100,514 (56,158 males and 44,356 females) people were diagnosed with cancer. The five most common cancers were: prostate cancer (16,349 or 16.2% of all cancers), colorectal cancer (13.0%), breast cancer (12.2%), melanoma of the skin (10.6%) and lung cancer (9.1%), in aggregate accounting for over 61% of all cancers.

Table A.1: Cancer incidence by tumour stream and sex, 2005, Australia

Cancer Type	Number	% of total	Risk to age 75	Risk to age 85
Male				
Prostate	16,349	29.1	1 in 8	1 in 5
Colorectal	7,181	12.8	1 in 19	1 in 10
Melanoma	6,044	10.8	1 in 23	1 in 14
Lung	5,738	10.2	1 in 24	1 in 12
Lymphoma	2,373	4.2	1 in 56	1 in 34
All cancers*	**56,158**	**100**	**1 in 3**	**1 in 2**
Female				
Breast	12,170	27.4	1 in 11	1 in 9
Colorectal	5,895	13.3	1 in 28	1 in 15
Melanoma	4,640	27.4	1 in 31	1 in 22
Lung	3,444	7.8	1 in 42	1 in 24
Lymphoma	2,057	4.6	1 in 75	1 in 44
All cancers*	**44,356**	**100**	**1 in 4**	**1 in 3**
Persons				
Prostate	16,349	16.3	-	-
Colorectal	13,076	13.0	1 in 23	1 in 12
Breast	12,265	12.2	-	-
Melanoma	10,684	10.6	1 in 26	1 in 17
Lung	9,182	9.1	1 in 30	1 in 16
All cancers*	**100,514**	**100**	**1 in 3**	**1 in 2**

Source: AIHW (2008), Cancer in Australia: An overview 2008. Canberra. * Excluding non-melanocytic skin cancer.

Table A.1 also shows that the most common cancers for males and females are largely the same, and occur in mostly the same frequency of incidence order, except for the sex-specific cancers. Almost all cancers occur at a higher rate in males, with an overall male to female

[122] AIHW (2008), Cancer in Australia: An overview 2008. Canberra: ACT
[123] ibid, p:176

ratio of 1.4[124]. Furthermore, based on 2005 data, Table A.1 highlights that the risk of being diagnosed with cancer before age 75 was 1 in 3 and before 85 was 1 in 2.

The incidence of cancer increases with age. Cancer incidence rates are about the same for males and females until age 30. For ages 30 to 53 females have a higher rate than males, peaking at around 1.8 times higher at age 41. From age 55 onwards males have a higher rate, peaking at double the female rate at age 84[125].

A.1.2 State/Territory cancer incidence comparison

With reference to Table A.2 there are State/Territory variations in cancer incidence. Excluding skin cancer (which has a geographical component), the highest age-standardised incidence rate from 2001-2005 occurred in Tasmania (433.9 per 100,000), followed by Queensland (429.1), New South Wales (423.6), South Australia (417.5), Western Australia (413.6), the Australian Capital Territory (408.3) and the Northern Territory (392.9)[126].

Table A.2: Age standardised* incidence rates, by tumour stream and state/territory, 2001-2005

Cancer	NSW	Vic	QLD	WA	SA	Tas	ACT	NT	Aust
Prostate	150.9	148.7	143.9	148.7	146.9	157.8	154.1	120.3	148.7
Colorectal	61.0	64.6	64.9	58.7	64.5	63.5	61.9	46.8	62.7
Breast	114.1	112.2	115.1	115.3	114.2	115.9	129.2	88.6	114.0
Melanoma	38.4	32.7	53.9	41.9	34.4	42.2	39.8	25.6	39.9
Lung	28.1	28.5	29.8	31.0	28.6	35.7	22.4	31.2	28.9
All cancers**	**398.1**	**383.8**	**416.3**	**392.6**	**387.1**	**407.1**	**395.3**	**337.0**	**396.4**

Source: AIHW (2008), Cancer in Australia: An overview 2008. Canberra.
*Age-standardised mortality rate using 2001 standard population, expressed per 100,000 persons.
** Excluding non-melanocytic skin cancer. Including melanoma of skin in the total, where in the text above it was removed to show differences excluding geographical influence.

A.1.3 Cancer mortality

Table A.3 shows that in 2005, there were 39,097 (22,017 males and 17,080 females) deaths from cancer in Australia. The five most common cancer deaths in 2005, accounting for 53% of all deaths from cancer were: lung cancer 7,427 (19.0%), colorectal cancer 4,165 (10.7%), cancer of unknown primary site 3,445 (8.8%), prostate cancer 2,949 (7.5%) and breast cancer 2,726 (7.0%). Australian's lost 258,195 person-years of life to age 75 and 522,890 years to age 85 due to premature death from cancer[127].

Table A.3: Cancer mortality by tumour stream, Australia, 2005

Cancer	Number	Percent of all deaths
Lung	7,427	19.0%
Colorectal	4,165	10.7%
Unknown site	3,445	8.8%
Prostate	2,949	7.5%
Breast	2,726	7.0%
All cancers	**39,097**	**100%**

Source: AIHW (2008), Cancer in Australia: An overview 2008. Canberra.

[124] AIHW (2008), Cancer in Australia: An overview 2008. Canberra: ACT, p: 4
[125] ibid., p:72
[126] ibid., p:59
[127] ibid., p:38

A.1.4 Cancer projected incidence and mortality

As shown in Table A.4, from 2006 to 2010 the number of new cases of cancer is expected to grow by 3,090 cases per year with the greatest growth projected for prostate cancer (939), followed by melanoma of the skin (392), colorectal cancer (319), breast cancer (314) and lung cancer (190). Both sexes are projected to have increasing rates of cancer overall (1.2 extra cases per 100,000 males and 0.5 extra cases per 100,000 females). This growth in cancer is mainly due to Australia's ageing population but there is also projected to be a small increase in the underlying cancer incidence rate.

Table A.4: Cancer incidence projections by tumour stream, age standardised rates*, Australia 2005

Cancer	2006	2007	2008	2009	2010	Annual % change***
Prostate	156.5	159.6	162.7	165.8	168.9	3.1 (939)
Melanoma of the skin	49.5	50.1	50.6	51.1	51.6	0.5 (392)
Colorectal	61.8	61.6	61.3	61.0	60.8	-0.3 (319)
Breast	113.8	113.9	114.0	114.0	114.1	0.1 (314)
Lung	42.4	42.2	41.9	41.6	41.3	-0.3 (190)
All cancers**	**471.3**	**472.6**	**473.9**	**475.1**	**476.4**	**1.3 (3,090)**

Source: AIHW (2008), Cancer in Australia: An overview 2008. Canberra.
*Age-standardised mortality rate using the Australian 2001 standard population, expressed per 100,000 persons.
Excluding non-melanocytic skin cancer. * In brackets is predicted average annual increase in cases.

The death rate from cancer is expected to decrease slightly from 2006-2010 as the survival rate for most cancers improves[128]. Both sexes are projected to have decreasing overall rates of death from cancer per year (2.8 deaths per 100,000 per for males and 0.8 per 100,000 for females)[129]. Despite the predicted drop in cancer death rates, the number of deaths from cancer is expected to grow by over 800 per year. This is a consequence of the ageing of, and general increase in, Australia's population. Table A.5 presents the five cancers with the greatest expected growth in deaths are cancer of the unknown primary site (200 extra deaths per year), lung cancer (114), prostate cancer (84), pancreatic cancer (68) and rectal cancer (50).

Table A.5: Cancer mortality projections by tumour stream, age standardised rates*, Australia, 2005

Cancer	2006	2007	2008	2009	2010	Annual % change***
Unknown primary site	16.1	16.4	16.8	17.1	17.5	0.3 (200)
Lung	34.4	34.0	33.6	33.2	32.8	-0.4 (114)
Prostate	33.2	32.8	32.4	32.0	31.6	-0.4 (84)
Pancreatic	9.4	9.4	9.4	9.5	9.5	0.0 (68)
Rectal	6.9	6.9	6.9	7.0	7.0	0.0 (50)
All cancers**	**183.8**	**182.4**	**180.8**	**179.4**	**178.0**	**-1.5 (836)**

Source: AIHW (2008), Cancer in Australia: An overview 2008. Canberra: ACT. p: 8
*Age-standardised mortality rate using 2001 Standard population, expressed per 100,000 persons.
** Excluding non-melanocytic skin cancer. *** In brackets is predicted average annual increase in deaths

A.1.5 Conclusion

This short analysis shows that cancer already has a major impact on individuals, families and the health system in Australia. Although cancer survival rates have improved, fuelled by population growth and ageing, the latest projections indicate an expected increase in cancer incidence of over 3,000 persons per year and an expected increase in cancer deaths in excess of 800 persons per year. This situation combined with evidence that suggests that nearly one

[128] AIHW (2008), Cancer in Australia: An overview 2008. Canberra: ACT. p: viii
[129] ibid., p:8

third of patients with cancer (around 17% of all patients with cancer) who would benefit from radiotherapy are not receiving it[130] demonstrates that there is still considerable work to be done in developing radiation oncology services in Australia.

A.2 RADIATION ONCOLOGY SERVICES IN AUSTRALIA

Radiation oncology is the discipline of treating malignant disease with radiation. The treatment is referred to as radiotherapy or radiation therapy. Radiation oncology is a complex specialty involving the delivery of therapy in a series of attendances which form part of a treatment regimen designed according to the site and stage of the cancer, the health and well-being of the patient, and on the basis of past history and treatments (surgical, chemotherapeutic and other radiation). Actual radiation treatment follows a complex process of consultation, planning and simulation in order that the radiation dose delivered to the site can be as closely targeted as possible to achieve the maximum delivery to the cancer while minimising potential damage to surrounding tissues and organs. This section presents an overview of radiotherapy facilities and treatment modalities in Australia.

A.2.1 Radiotherapy facilities

Radiation oncology services are provided through both public and private sectors in Australia[131] and all States/Territories have radiation oncology treatment facilities (the Northern Territory site will open in early 2010). These facilities vary in size from small clinics to specialist departments in public hospitals and comprehensive cancer care centres. The modern treatment approach to cancer care is multidisciplinary, with surgical, medical and radiation oncology treatments playing significant roles[132]. Radiotherapy treatment is provided in specialised facilities using mainly linear accelerators (linacs).

Radiation oncology divides into two main types: external beam radiotherapy (which uses high energy machines); and brachytherapy (which uses radioisotopes). 'Megavoltage' services, an external beam therapy, delivered by linear accelerators, represent the vast majority of services. Other types of radiation oncology, such as superficial and orthovoltage radiotherapy, paediatric, total skin irradiation and stereotactic radiosurgery together form only a small part of services[133].

A.2.2 External beam radiotherapy

As mentioned above external beam radiotherapy is delivered by linear accelerators, which fall into two categories: single energy linear accelerators (SPLA) which produce a high energy X-ray with specific physical properties while dual mode linear accelerators (DMLA) which have X-ray and electron beams with different energies and physical properties providing flexible treatment options[134]. Megavoltage equipment replacement is recommended at 10 years[135]. After 10 years machines are considered to become technically out of date and there is mechanical wear so they are less accurate and less reliable[136]. The Quality Program Survey[137]

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[130] Barton, M., Gabriel, S & Shafiq, J (2008). Overview of cancer treatment services in Western Australia. p.30-31

[131] The Australian health care system comprises public and private sectors. There are essentially three categories of radiation oncology patient in Australia at present; public patients treated in public facilities, private patients treated in public facilities and private patients treated in private facilities. ROs employed in the public sector in Australia generally have rights to private practice, which they negotiate with the employing institution, and while these patients are classified as private they use the same treatment and planning facilities as the public patients.

[132] Rubin P, Williams JP. *Clinical oncology: a multidisciplinary approach for physicians and students*, 8th ed. Philadelphia, PA: WB Saunders, 2001.

[133] http://www.health.gov.au/internet/main/Publishing.nsf/Content/health-roi-radiother-index.htm

[134] RANZCR 2001, National Strategic Plan for Radiation Oncology (Australia)

[135] RANZCR 2000, Provision and replacement of radiotherapy equipment

[136] National Radiotherapy Advisory Group, 2007, Radiotherapy, developing a world class service for England <available online>: http://www.cancerimprovement.nhs.uk/%5Cdocuments%5Cradiotherapy%5CNRAG_0507.pdf

in 2006 reported that at least one linear accelerator at 12 separate facilities was reported to be older than 12 years, and at least 12 others were older than 10 years, although at least some of these were to be replaced in 2006. In order to provide a quality service, it is desirable for radiation equipment to be efficient and state of the art.

The number of available linear accelerators gives an indication of the total treatment capacity, however the operational hours of each linear accelerator is a more useful measure. In 2002, the Baume Inquiry[138] noted that current operating hours were insufficient to meet patient demands. Given the reported relative under-use of radiotherapy compared to evidence based practice it would appear that there are still insufficient available operating hours.

A.2.3 Brachytherapy

Brachytherapy is radiotherapy for cancers where the radiation source is placed directly in contact with the malignancy. Brachytherapy divides into two modalities high dose rate (HDR) and low dose rate (LDR). LDR also referred to as 'seed' involves radioactive 'seeds' being carefully placed inside the cancerous tissue[139].

In the United States brachytherapy has become the most prominent form of treatment for localised prostate cancer[140]. Reports from some European countries indicate that brachytherapy services account for approximately 10% of the total number of radiotherapy treatments, with this ratio reaching as high as 25% in some countries[141]. A study conducted in the UK found that, in 1998, gynaecological treatments made up 68% of brachytherapy services[142]. The Royal College of Radiologists in the UK[143] recommended that a total of 60 patients per year are taken as a minimum workload in each radiography centre for gynaecological treatments. They recommended a minimum of two members from each discipline within the brachytherapy team (clinical oncologists, physicists and radiographers)[144]. More recently, prostate cancer is increasingly being treated with brachytherapy. In 2004, Thomson et al[145] stated that in Australia, the optimum utilisation rate for low dose rate prostate is 2.7% of all new cases of prostate cancer and 10.7% for high dose rate boost.

A.2.4 Other treatment modalities

Stereotactic radiosurgery and superficial/orthovoltage treatments are other treatment modalities that form a small part of radiation oncology services in Australia. The number of superficial and orthovoltage treatments have declined in recent years as megavoltage workloads have increased. Declines are believed to be due to skin cancer being treated by other means. Stereotactic radiosurgery treats brain disorders with a precise delivery of a single, high dose of radiation in a one-day session.

A.2.5 Emerging technologies and modalities that may influence workforce requirements

There are a number of new and emerging technologies and shifts in practice that will impact on the future workforce requirements. Some of the new and emerging technologies include:

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137 The Tripartite Committee, 2007. Radiation oncology treatment services quality program: report of the quality program survey.
138 ibid., 94-95
139 American Brachytherapy Society <online> available from: www.abs.org.au
140 Doust, J., Miller, E., Duchesnes, G., Kitchener, M & Weller, D. 2004, A systematic review of brachytherapy: Is it an effective and safe treatment for localised prostate cancer. *Australian Family Physician*, 33(7): 525-531
141 The Royal College of Radiologists (2001) The role and development of brachytherapy services in the United Kingdom
142 ibid., p: 7
143 ibid., p:12
144 ibid., p: 11
145 Thompson, S., Barton, M & Delaney, G , 2004. Estimating the optimal utilisation of brachytherapy for the treatment of cancer. Sydney, CCORE

- **Image guided radiotherapy (IGRT)**: refers to the use of frequent imaging in the treatment position during a course of radiotherapy to localize the tumour prior to or during each treatment. IGRT improves the accuracy and delivery of radiation by reducing the volume of normal tissue that needs to be irradiated and facilitating dose escalation to the tumour, reducing the risk of toxicity[146];
- **Intensity modulated radiotherapy (IMRT)**: offers an additional dimension of freedom as compared with field shaping in three-dimensional conformal radiotherapy. This added freedom allows the treatment planning system to better shape the radiation doses to conform to the target volume while sparing surrounding normal structures, offering better dose escalation to tumours and reduced toxicity to surrounding tissue[147];
- **RapidArc**: is a system for IMRT incorporating capabilities such as variable dose-rate, variable gantry speed, and accurate and fast dynamic multileaf collimators (DMLC), to optimize dose conformality, delivery efficiency, accuracy and reliability[148];
- **TomoTherapy:** uses a dynamic delivery in which the gantry, treatment couch, and multileaf collimator leaves are all in motion during treatment. Radiotherapy is delivered 'slice-by-slice', this results in highly conformal radiotherapy. This method of radiation delivery differs from other forms of external beam radiotherapy in which the entire tumour volume is irradiated at one time[149];
- **Other technologies** include: PET/CT, CyberKnife and MammoSite.

More detail regarding the perceived workforce impact of these technologies has been derived from HealthConsult's consultation process and is available in Chapter 4 and 9.

A.3 RADIOTHERAPY AND CANCER CARE

Radiation treatment is a powerful weapon against cancer, it increases cure rates and is used for palliation and symptom control in cases of advanced cancer. It is used to treat a range of cancers as a primary or adjuvant therapy. This section highlights some of the key cancers that benefit from radiotherapy and provides an overview of radiotherapy utilisation rates for specific cancers.

A.3.1 Radiation treatment for different cancer types

If used appropriately, radiotherapy is a very effective treatment for cancer, second only to surgery in contributing to the cure of cancer. At least half of all patients whom radiotherapy is prescribed, either alone or combined with surgery and/or chemotherapy, are treated with the goal of achieving a cure[150]. Most advances in the range of treatable cancers and their cure have been achieved as a result of combined treatments. Radiotherapy is used by itself when it is the best treatment for the condition because of the known cure rate or because it is likely to have fewer side-effects than other treatments[151]. As normal tissues recover better than tumours, it is possible to treat cancer without destroying the host organ. Surgery is one of the most effective treatments of cancer. However, even where surgery is an option it is often not possible to remove all the tissues potentially harbouring cancer cells because of the disability

[146]Lee, M., Brock, K & Dawson, L, 2008. Multimodality image-guided radiotherapy of the liver, *Imaging in Liver Radiation Therapy*
[147] Yu, C., Amies, C & Svatos, M, 2008. Planning and delivery of intensity-modulated radiation therapy, Medical Physics, 35(12): pp.5233-5241
[148] Ling, C., Zhang, P., Archambault, Y., Bocanek., J., Tang, G., Phil, M & LaSasso, T, 2008 (Abstract), Commissioning Quality Assurance of RapidArc Radiotherapy Delivery System, International Journal of Radiation Oncology, Biology, Physics, 72(2): pp.575-581
[149] Balog, J & Soisson, E, 2008 (Abstract). Helical tomotherapy quality assurance, International Journal of Radiation Oncology, Biology, Physics, 71(1): pp. 113-117
[150] The Faculty of Radiation Oncology, 2002. Clinicians Guide to Radiation Oncology, RANZCR.
[151] ibid

that would result[152]. Consequently, surgery for large tumours is usually combined with radiotherapy and chemotherapy.

Radiotherapy is combined with surgery when: organ preservation is desirable, the tumour has a high risk of local recurrence after surgery alone and close surgical margins need treating to prevent local recurrence[153]. Chemotherapy may improve the results of radiotherapy through several mechanisms including, spatial cooperation, independent toxicity, enhanced tumour response and for protection of normal tissue.[154] Table A.6 lists the different cancers that benefit from radiotherapy alone and when combined with other treatments.

Table: A.6 Radiation treatment for different cancer types

Primary Treatment	Combined with surgery	Combined with chemotherapy
• Pituitary tumours • Deep-seated gliomas • Arterio-venous malformations • Early stage nasopharyngeal cancer • Early stage low grade lymphomas • Larynx • Prostate	• Breast • head and neck • rectal	• Hodgkin's lymphoma • breast • rectal • anal • prostate • stomach • bladder • head and neck • cervix • oesophageal • lung

Source: 2002 Faculty of Radiation Oncology. Radiation Clinical Guidelines

Breast cancer in women and prostate cancer in men fall within the top five reported cancers, and also within the top five leading causes of death from cancer[155]. Radiotherapy is used in the primary or adjuvant treatment of both these cancers, therefore increased demand for radiation oncology services will persist. Table A.7 provides a summary of radiotherapy use in the treatment of the five cancers with the highest reported incidence in 2005. Radiotherapy can be used as the main treatment for prostate and lung cancer, this being dependent on the type and severity of the cancer. Radiotherapy may also be used to treat almost every type of solid tumour, generally as an adjuvant therapy, these include cancers of the brain, breast, cervix, larynx, pancreas, skin, spine, stomach, uterus or soft tissue sarcomas[156]. It can also be used to treat leukaemia and lymphoma.

Table A.7: Radiotherapy treatment for five cancers with highest reported incidence in 2005

Cancer	Radiotherapy treatment type
Prostate	Radiotherapy (EBRT and Brachytherapy) can be used as primary treatment, sometimes with hormone therapy provided as a neo-adjuvant/adjuvant therapy; and Radiotherapy can also be used as adjuvant therapy to surgery[157]
Colorectal	Adjuvant therapy for rectal cancer[158]
Breast	Mainly as an adjuvant therapy to surgery[159]
Melanoma	Radiotherapy can be used as an adjuvant therapy for melanoma's- its use varies for the type of melanoma and looks to make up a small part of possible treatment options[160]
Lung	Radiotherapy may be used as primary treatment, in combination with surgery/chemotherapy and is also used as an adjuvant therapy. This is all dependent on the stage and type of cancer.[161]

[152] ibid., p:6
[153] ibid., p:7
[154] ibid., p:8
[155] AIHW (2008), Cancer in Australia: An overview 2008. Canberra: ACT
[156] Faculty of Radiation Oncology, The Royal Australia and New Zealand College of Radiologists, 2002. The Clinicians Guide to Radiation Oncology
[157] NHMRC's Clinical Practices Guidelines: Evidence based information and recommendations for the management of localised prostate cancer.
[158] NHMRC. 2005. Clinical Practice Guidelines for the Prevention, Early Detection and Management of Colorectal Cancer.
[159] Australian Cancer Network 2001. Clinical Practice Guidelines for the management of early breast cancer: 2nd Edition.
[160] Australian Cancer Network Melanoma Guidelines Revision Working Party, 2008. Clinical Practice Guidelines for the Management of Melanoma in Australia and New Zealand. Cancer Council Australia and Australian Cancer Network.
[161] Australian Cancer Network, 2004. Clinical Practice Guidelines for the prevention, diagnosis and management of lung cancer.

A.3.2 *Optimal radiotherapy utilisation and actual underutilisation for different cancer types*

Studies on optimal utilization rates for radiotherapy across the five cancers listed in Table 3.7 have been conducted nationally and internationally. Some studies have suggested that this may be a better way to estimate radiotherapy requirements[162]. Across all five cancers there appears to be a shortfall in radiotherapy utilization. Some of the following information has been identified:

- ***Prostate cancer***- A Canadian study looked at utilization rates for a typical North American population and estimated that 61.2% of prostate cancer cases develop one or more indications for radiotherapy at some point in the course of the illness[163]. An Australia study[164] found similar results recommending that 60% of patients with prostate cancer should receive radiotherapy. This was restricted to external-beam radiotherapy, therefore may under-estimate total need. Actual utilization rates based on the South Australian Hospital-Based Cancer Registry are 26%[165];
- ***Breast cancer***- A similar study was conducted in Canada for breast cancer where it was estimated that 66.4% of breast cancer patients develop one or more indications for radiotherapy at some point in the course of the illness[166]. In Australia recommended radiotherapy utilization is higher at 83% of all patients with a breast carcinoma[167]. Actual utilization rates vary from 24% to 71% across Australia;
- ***Colorectal cancer***- In an Australian study the optimal utilization rate for radiotherapy, based on assessing treatment guidelines and incidence, was 61% for rectal cancer with an actual utilization rate of 38%[168]. Other studies have indicated that a 69% utilization rate would be optimal;
- ***Melanoma***- The proportion of patients for whom radiotherapy is indicated at some point in their illness was calculated at 23% of all melanoma patients. The utilization rates of radiotherapy for melanoma recorded in actual practice were 13% in New South Wales and 6% in data from the American College of Surgeons[169]; and
- ***Lung cancer***- The proportion of patients with *lung cancer in* whom *radiotherapy* is indicated (according to the best available evidence) is 76%[170]. This ideal rate was compared to the actual rates of use of *radiotherapy* for *lung cancer in* Australia, and internationally, *in* the past decade. A substantial discrepancy was found between the evidence-based recommended rate of use and the actual rates reported *in* clinical practice. One study conducted in the South-Western Sydney Area Health Service 56% of patients with lung cancer received radiotherapy[171].

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[162] Slotman, B., Cottier, B., Bentzen, S., Heeren, G., Lievens, Y & Bogaert, W. 2004 (Abstract). Overview of national guidelines for infrastructure and staffing of radiotherapy. ESTRO-QUARTS: Work package 1. *Journal of the European Society for Therapeutic Radiology and Oncology*: 75(3).

[163] Foroudi, F., Tyldesley, S., Barbera, L., Huang, J & Mackillop, W (Abstract) (2003). Evidence-based estimate of the appropriate radiotherapy utilization rate for prostate cancer, *International Journal of Radiation Oncology, biology, physics,* 55 (1).

[164] Delaney, G., Jacob, S & Barton, M (2004). Estimating the optimal external-beam radiotherapy utilization rate for genitourinary malignancies, *Cancer,* 103 (3) 462-470

[165] ibid

[166] Foroudi, F., Tyldesley, S., Walker, H & MacKillop, W (Abstract) (2002). An evidence-based estimate of appropriate radiotherapy utilization rate for breast cancer, *International Journal of Radiation Oncology, biology, physics,* 53 (5).

[167] Delaney, G., Barton, M & Jacobs, S (2003). Estimation of optimal radiotherapy utilization rate for breast carcinoma: A review of the evidence, *Cancer,* 98 (9): p. 1977-1986

[168] Delaney, G., Barton, M & Jacobs, S (Abstract) (2004). Estimation of an optimal radiotherapy utilization rate for gastrointestinal carcinoma: A review of the evidence, *Cancer*: 101 (4): 657-70

[169] Delaney, G., Barton, M & Jacobs, S (Abstract) (2004). Estimation of an optimal radiotherapy utilization rate for melanoma: A review of the evidence, *Cancer*: 100 (6): 1293-1301

[170] Delaney, G., Barton, M., Jacobs, S & Jalaludin, B (Abstract) (2003), A model for decision making for the use of radiotherapy in lung cancer, Lancet Oncology, 4 (2): 120-8

[171] Vinod, S & Barton, M (Abstract) (2007), Actual versus optimal utilization of radiotherapy in lung cancer: Where is the shortfall, Asia-Pacific Journal of Clinical Oncology, 3 (1): 30-36

A survey conducted by Stevens and Berry (1996) of ROs revealed that three types/sites of cancer account for approximately 50% of ROs' clinical time, namely, breast cancer (24.5%), urology (14.5%) and head/neck cancers (10.5%). According to a recent AIHW[172] report these three types of cancer combined are projected to increase at a rate of nearly 1500 new cases per year from 2006 to 2010. This information is based on 1996 data, therefore technological advancements in radiotherapy along with better clinical guidelines for the treatment of cancer may provide a different more up to date analysis of the current situation.

Research has shown that just over 52% of cancer patients stand to benefit from the use of radiotherapy as part of their management at some time during their disease trajectory, either for cure or for palliation of advanced disease[173,174.] As discussed in Chapter 2 nationally the uptake rates for radiotherapy remain on average about 35%[175,] indicating that a third of cancer patients who could benefit from radiotherapy are not receiving that treatment. The problem is worst for people over 55 and those not in metropolitan areas. 83% of women with breast cancer should have radiotherapy, but in Australia only 71% do so. With lung cancer the optimal figure is 76% but only half receive radiation[176]. The reasons for the low uptake of radiotherapy are described as being multiple and complex. As stated in the National Strategic Plan for Radiation Oncology[177] low referral rates are due to:

- ignorance regarding the role of radiotherapy in cancer treatment;
- lack of undergraduate teaching and postgraduate education amongst doctors resulting in 'gate keeping 'actions[178];
- access to treatment, and delays between referral and commencement of treatment[179];
- specialist staff shortages in all disciplines[180]; and
- inadequate equipment infrastructure base.

In many centres the demand for services has outstripped available resources, leading to the development of waiting lists for radiotherapy. Delays in accessing treatment are a concern in Australia, both in terms of the proportion of patients who are actually able to access care, and in the timeliness of starting treatment. A study conducted by Kenny & Lehman 2004[181], found that in 2002 more than 15,000 Australians who potentially could have benefited from radiotherapy, did not receive this treatment. For those who are able to access radiotherapy treatment, one in three patients experience an unacceptable delay in starting treatment and one in four patients starts within standard good practice times. Delays of up to 151 days were experienced in Australia. Delays in starting radiotherapy are also common place in other developed nations including the United Kingdom, Canada and New Zealand[182]

The Baume Inquiry recognised factors contributing to increased cancer incidence and the increasing need for more radiation oncology in the future to meet demand. These factors include[183]:

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[172] AIHW (2008), Cancer in Australia: An overview 2008. Canberra: ACT
[173] Delaney G, Jacob S, Featherstone C and Barton M, Cancer, Volume 104, Issue 6 (2005) The role of radiotherapy in cancer treatment: Estimating optimal utilization from a review of evidence-based clinical guidelines
[174] Baume P. *Radiation Oncology Inquiry. A vision for radiotherapy*. Canberra, ACT: Commonwealth of Australia, 2002.
[175] The Tripartite Committee pp.6–7.
[176] RANZCR (Media release), 2002. Huge effort needed for Australians to receive the cancer services they deserve
[177] ibid.
[177] National Strategic Plan For Radiation Oncology (Australia) (2001) p14
[178] Milross C G & Boyle F M, 'Better To Ensure Equal Access To Excellent Care Than Acceptable Access To Barely Adequate Care' paper presented at the NSW Cancer Summit November 2000
[179] AHTAC Report 1996
[180] Barton M, 'Radiotherapy Utilization In New South Wales From 1996 To 1998', Australasian Radiology (2000) p44
[181] Kenny, L & Lehman, M 2004. Sequential audits of unacceptable delays in radiation therapy in Australia and New Zealand. *Australasian Radiology* (48):29-34
[182] ibid
[183] Baume P. *Radiation Oncology Inquiry. A vision for radiotherapy*. Canberra, ACT: Commonwealth of Australia, 2002

- the continuous ageing of the population;
- advances in medical and diagnostic technology and the development of population screening programs;
- greater awareness by increasing numbers of 'gatekeepers' of the benefits of appropriate cancer therapy; and
- advances in radiation technology, making the treatment more effective.

The issues surrounding radiotherapy are well recognised. Over the past two decades, nearly 50 reports have delivered the same messages: that radiotherapy is a vital part of cancer treatment, that radiotherapy services have been chronically under-resourced, that this deficiency has been deteriorating rapidly, and that correction of the lack of resources and manpower is long overdue[184].

A.3 TREATMENT ACTIVITY

Medicare Australia claims for radiotherapy in 2006 (the most recent year for which cancer incidence data are available) are shown in Table A.8. A claim for radiotherapy can only be made for outpatients referred by name to a radiation oncologist. About 80% to 90% of radiotherapy activity is eligible for a claim to Medicare[185]. Megavoltage radiotherapy is the major form of radiotherapy and accounted for 88% of claims[186]. Each megavoltage claim represents one treatment on one day. About 35% of new cases of cancer in Australia receive radiotherapy[187]. This would suggest that on average each radiotherapy patient receives about 24 fractions of radiotherapy.

Table A.8: Medicare claims for radiotherapy services by state/territory of patient residence

Type of radiotherapy service	NSW & ACT	VIC	QLD	WA	SA	TAS	NT	Total
Superficial	5,981	6,185	1,910	9	706	512	20	15,323
Orthovoltage	3,557	130	97	-	45	-	-	3,829
Megavoltage	256,106	185,546	154,231	71,325	63,167	28,697	2,708	761,780
Brachytherapy	1,234	375	711	418	157	245	17	3,157
Planning*	26,168	19,398	16,215	7,373	5,800	2,523	235	76,478
Stereotactic radiotherapy	62	104	104	22	3	4	-	236
Total claims	291,874	211,738	211,738	79,147	69,878	31,981	2,980	860,803
Estimated number of new cancer cases, 2006	37,094	25,394	20,227	9,459	8,948	2,803	523	104,450
Megavoltage radiotherapy claims per new cancer case	7.9	8.3	8.6	8.4	7.8	11.4	5.7	8.2

* Planning comprises- field setting, dosimetry and other planning

Source: Barton, M., Gabriel, S & Shafiq, J (2008). Overview of cancer treatment services in Western Australia. p.31

Current data on the different modalities and required workforce is required across all treatment modalities particularly the more common methods such as external beam radiotherapy and brachytherapy.

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184 Barton MB, Peters LJ and Kenny LM (2004) Radiotherapy in Australia one year after the Baume report: vision or mirage? MJA; 180 (2): 55-56

185 Barton, M., Frommer, M & Gabriel, G (2005). An overview of Cancer Services in NSW. Cancer Institute NSW.

186 Barton, M., Gabriel, S & Shafiq, J (2008). Overview of cancer treatment services in Western Australia. p.30-31

187 The Tripartite Committee pp.6–7.

Appendix B

RADIATION ONCOLOGY FACILITIES SURVEY

FOREWORD

Dear Colleague

As you would be aware, there has been considerable recent focus on the development of radiation oncology services in Australia. A key part of further increasing the capacity to provide radiotherapy services is to ensure that there is an adequate supply of an appropriately skilled workforce. The Commonwealth Government Department of Health and Ageing (DoHA) working with the Radiation Oncology Reform Implementation Committee (RORIC) has recognised that workforce planning is a key tool for addressing the workforce issues and has engaged HealthConsult to:

> ***"undertake a review of the current status and capacity of three main professions that make up the radiation oncology workforce (ROs, RTs and medical physicists) and to identify opportunities for ensuing an adequate supply of well trained radiation oncology workforce"***

DoHA intends to use the information generated by the project to provide recommendations to the Commonwealth Government on strategic workforce initiatives. State/Territory Health Authorities intend to use the data provided by public sector facilities within their jurisdiction to develop further their radiation oncology workforce initiatives. The objective at both levels of Government is to ensure the delivery of timely, accessible and quality radiation oncology services. The specific project objectives are to:

- prepare information on the current radiation oncology workforce profession numbers and issues affecting radiation oncology service provision in Australia;
- formulate a methodology which will ensure reliable workforce planning can be conducted in the future; and
- identify opportunities to address workforce and skills shortages.

This survey of all public and private radiation oncology facilities is a key part of the data collection process for the project. HealthConsult has developed the survey by working in consultation with representatives of the professional bodies for ROs, RTs, medical physicists; representatives of the State/Territory Health Authorities; and with the Workforce Working Group of the RORIC (which includes representatives of private sector radiation oncology services).

Although we have asked you to provide reasonably detailed data about your facility, **I can assure you that all the data you provide will be strictly confidential.** For public sector facilities, ownership of the data rests with the Jurisdictional Health Authority. For private sector facilities ownership of the data remains with individual facilities. At the conclusion of the project, HealthConsult will give DoHA all the data generated by the survey and, for public sector facilities only, give the data to the relevant Jurisdictional Health Authority. For the purposes of HeathConsult's workforce planning project, the survey analysis will only be reported in aggregate form.

We at HealthConsult urge you and your key staff to take the time that will be required to complete each section of the survey, as it is only by having accurate information on the current workforce that we can develop reliable workforce planning models. **Your time is greatly appreciated.**

Joe Scuteri

Joe Scuteri
Director
HealthConsult

GUIDELINES FOR COMPLETION

The survey is targeted at individual radiation oncology facilities (site). We are aware that there are facilities in both the public and private sectors that are under common management (and/or ownership). The intention is that a survey form is completed for each physical site where at least one linear accelerator is located. For any sites where a public radiation oncology service is co-located with a private radiation oncology service, one survey should be completed for the public service and one for the private service.

The survey form contains 41 questions grouped logically into seven sections. Sections 1, 2, 3 and 7 are general and could be completed by the head of service, the business manager or equivalent person. Sections 4, 5 and 6 are designed to be completed respectively by the heads of radiation oncology, radiation oncology medical physics and radiotherapy at each site. Every question should be answered. To assist respondents to complete the survey a Glossary that explains and defines the terms used in the survey is provided below.

We are happy to accept the completed surveys by return email admin@healthconsult.com.au, by fax (02) 9261-3705, or in the post 4409/93 Liverpool Street, Sydney, NSW 2000. Please **submit your completed response so it arrives at HealthConsult by 12th June 2009. Please contact Lisa Fodero on (02) 9261-3707 or** lisa.fodero@healthconsult.com.au **should you require any assistance.**

GLOSSARY OF TERMS

Attendances: a single presentation by a patient for radiotherapy treatment; at each attendance a fraction of the prescribed treatment course is delivered.

Fields: exposures of radiation from a prescribed direction either alone or as part of a multi-beam treatment technique; this includes exposures that are static in nature, or those delivered dynamically as part of an IMRT technique, or those that are comprised of multiple control points, or “fields within fields”.

Fractions: the number of smaller doses (i.e. parts) required to deliver the total prescribed treatment course.

FTEs: the number of full-time equivalent professionals equals the number of professionals multiplied by the average weekly hours worked, divided by the number of hours in a 'standard' full-time working week. Use the ‘standard’ hours in the Award under which your staff are employed in the calculation and in the absence of an Award ‘standard’ use 45 hours for medical practitioners and 37.5 hours for RTs and medical physicists.

Headcount: The number of individual persons employed by the facility irrespective of the hours that they are paid to work.

New patients: patients presenting to your facility for the first course of treatment for a given cancer diagnosis (i.e. they have not received a previous course of radiotherapy for the given cancer diagnosis at any facility).

Number of days for commissioning or decommissioning: the integer number of days that the linear accelerator is not available for at least half the day for treating patients because it is being commissioned or de-commissioned. For days where time is exactly equally divided between two functions, allocate the day in the preference order: treatment, maintenance, commissioning or decommissioning then non-operating.

Number of days for maintenance or calibration: the integer number of days that the linear accelerator is not available for at least half the day for treating patients because of planned or unplanned maintenance or calibration. For days where time is exactly equally divided between two functions, allocate the day in the preference order: treatment, maintenance, commissioning or decommissioning then non-operating.

Number of non-operating days: the integer number of days that the linear accelerator is not used for any purpose for at least half the day (i.e. the machine is available but not being used because it is a weekend or public holiday day, suitable staff are not available, the machine is unserviceable, etc.). For days where time is exactly equally divided between two functions, allocate the day in the preference order: treatment, maintenance, commissioning or decommissioning then non-operating.

Number of treatment days: the integer number of days that the linear accelerator is used to treat patients for at least half the time it is operating on the day. For days where time is exactly equally divided between two functions, allocate the day in the preference order: treatment, maintenance, commissioning or decommissioning then non-operating.

Palliative treatment: cancer treatment to alleviate potential/actual symptoms due to the underlying cancer, without the prospect of cure.

Radical treatment: cancer treatment with the aim of curing the cancer. Include all treatments where the aim is to increase survival. The radiotherapy course could be either primary or adjuvant treatment.

Re-treatment patients: patients having a second or subsequent course of radiotherapy after having previously received a course of radiotherapy for the same primary diagnosis (including treating a second anatomical site for the same primary diagnosis) whether or not the previous course(s) was delivered in your facility.

Total annual treatment hours: the aggregate in a one year period of the number of hours that the linear accelerator is booked for treating patients.

Vacant position: a position for which there are funds available, that is not currently occupied (i.e. no-one is being paid from the funds available to fill the position), and there are active processes in place and/or it is clearly intended to find a suitable person to fill the position.

Section 1: Profile of facility

(1) Name of radiation oncology facility/site: ______________________________

(2) Name of hospital/owner organisation*:* ______________________________

(3) Location of facility/site: State: __________ Postcode: __________

(4) Public/Private facility/site:

☐ Public ☐ Private

Section 2: Equipment

(5) Please provide details of linear accelerators (Linacs) operating at your facility as at 31st December 2008.

Linac id number	Capable of (tick applicable features that were commissioned as at 31st December 2008)								Year replacement planned
	Multi leaf collimator (MLC)	Electronic Portal Imaging (EPI)	Intensity modulated radiotherapy (IMRT)	Onboard imager		Stereotactic radiosurgery/ radiotherapy	Dual Energy	Electrons	
				2D	3D				
1									
2									
3									
4									
5									
6									

(6) Please estimate Linac usage in 2008 *(please align your answers with the Linac id numbers in question 5 and ensure that the total of the reported DAYS is 366).*

Linac id number	Operating Days				Number of non-operating DAYS i.e. number of days linac is not used for any purpose
	Treatment		Non Treatment		
	Total annual HOURS booked for treatment	Number of treatment DAYS	Number of DAYS for maintenance or calibration	Number of DAYS for commissioning or decommissioning	
1					
2					
3					
4					
5					
6					

Section 3: Utilisation

(7) Please provide total attendances (fractions) by linac by the equipment/therapy used for 2008 *(please align your answers with the Linac id numbers in question 5).*

Linac id number	Number of attendances	Number of fields	Number of attendances that use the following equipment/therapies						
			IMRT	EPI	Onboard imager		Stereotactic radiosurgery/ radiotherapy	Total body irradiation	Total body electrons
					2D	3D			
1									
2									
3									
4									
5									
6									
TOTAL									

(8) Please provide the total number of patients, attendances (fractions) and fields for megavoltage treatments in 2008 *(note the total attendances and total fields reported here should equal the total attendances and total fields reported in question 7)*

Megavoltage treatment	Number of patients in 2008		Number of attendances in 2008		Number of fields in 2008
	New	Re-treatment	Radical	Palliative	
TOTAL					

(9) Does your service provide brachytherapy services?

☐ Yes ☐ No *(go to **Question 11**)*

(10) What is the number of patients and attendances treated by brachytherapy in 2008?

Brachytherapy	Number of patients in 2008			Number of attendances in 2008	
	HDR	LDR	Seed	HDR	LDR
TOTAL					

(11) Does your facility have kilovoltage (superficial and/or orthovoltage) equipment?

☐ Yes ☐ No *(go to section 4)*

(12) What is the total number of patients and attendances treated by kilovoltage equipment in 2008?

Kilovoltage equipment	Number of patients in 2008		Number of attendances in 2008
	New	Retreatment	
TOTAL			

Section 4: ROs

(13) Please provide details of the average number of ROs employed in 2008 and the number of RO filled and vacant positions as at 31st December 2008.

Staff category/level	Average number of ROs employed in 2008 (FTEs)	ROs staffing situation as at 31st December 2008						
		Number of filled positions (FTEs)			Number of vacant positions (FTEs)			Number of individuals filling positions (Headcount)
		Permanent	Temporary	Total	Permanent	Temporary	Total	
Director/Head								
Specialist								
Registrar								
Other								
TOTAL								

(14) Please provide details of the movement of ROs into and out of your facility in 2008.

Staff category/level	Number that left your facility in 2008		Number recruited to your facility in 2008	
	Headcount	FTEs	Headcount	FTEs
Director/Head				
Specialist				
Registrar				
Other				
TOTAL				

(15) Of the ROs that left your facility in 2008, what were their reasons for leaving? *(enter the number who left in each row against the reason for leaving as applicable, note that the totals column for FTEs and headcount should be the same as the corresponding totals reported in question 14)*

Reason for leaving	**Number of ROs who left your facility in 2008**		**Details/Comment**
	Headcount	**FTEs**	
Another job in the same state			
Another job interstate ***(specify states/territory(ies))***			
Another job overseas ***(specify country(ies))***			
Resigned from the profession			
Retired from the profession			
Other ***(please specify)***			
TOTAL			

(16) Of the ROs that were recruited to your facility in 2008, where were they recruited from? *(enter the number who were recruited in each row against where recruited from as applicable, note that the totals column for FTEs and headcount should be the same as the corresponding totals reported in question 14)*

Where recruited from	**Number of ROs recruited in 2008**		**Details/Comment**
	Headcount	**FTEs**	
The same state			
Interstate ***(please specify State/Territory)***			
Overseas ***(please specify country)***			
Returning to the profession			
Other ***(please specify)***			
TOTAL			

(17) If your facility had ROs on staff as at 31st December 2008 that were recruited <u>directly</u> from overseas *(i.e. the RO job they had immediately prior to the RO job they held at your facility was not in Australia),* **please provide the following details for each radiation oncologist.** *(complete one row for each RO recruited from overseas)*

RO recruited from overseas who is on your <u>current</u> staff	**Year recruited**	**Country recruited from**	**<u>Current</u> FTE**	**Level of position <u>currently</u> occupied** *(tick one box)*			
				Director	**Specialist**	**Registrar**	**Other**
Person 1							
Person 2							
Person 3							
Person 4							
Person 5							
Person 6							

(18) What metric (benchmark) for RO workforce planning, if any, do you use in deciding the number of RO positions you need at your facility?

____

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(19) What are the main recruitment and retention issues relating to ROs experienced at your facility? *(please tick more than one response as appropriate)*

☐ Remuneration
☐ Location of service
☐ Career progression
☐ Collegial support
☐ Supply of trained professionals
☐ Training requirements (i.e. length of training)
☐ Other (*please specify*) ____________________

(20) What initiatives do you consider have worked well in addressing the balance between demand and supply for the RO workforce?

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(21) What further initiatives do you believe could be taken to improve the balance between demand and supply for the RO workforce?

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Section 5: ROMPs (ROMPs)

(22) Please provide details of the average number of ROMPs employed in 2008 and the number of ROMP filled and vacant positions as at 31st December 2008.

Staff category/level	Average number of ROMPS employed in 2008 (FTEs)	ROMP staffing situation as at 31st December 2008						
		Number of filled positions (FTEs)			Number of vacant positions (FTEs)			Number of individuals filling positions (Headcount)
		Permanent	Temporary	Total	Permanent	Temporary	Total	
Chief								
Senior								
Base grade								
Trainee/Registrar								
Educator/Teacher								
Research								
Other								
TOTAL								

(23) Please provide details of the movement of ROMPs into and out of your facility in 2008.

Staff category/level	Number that left your facility in 2008		Number recruited to your facility in 2008	
	Headcount	FTEs	Headcount	FTEs
Chief				
Senior				
Base grade				
Trainee/Registrar				
Educator/Teacher				
Research				
Other				
TOTAL				

(24) Of the ROMPs that left your facility in 2008, what were their reasons for leaving? *(enter the number who left in each row against the reason for leaving as applicable, totals column for FTEs and headcount should be the same as the corresponding totals reported in question 23)*

Reason for leaving	Number of ROMPs who left facility in 2008		Details/Comment
	Headcount	FTEs	
Another job in the same state			
Another job interstate *(specify states/territory(ies))*			
Another job overseas *(specify country(ies))*			
Resigned from the profession			
Retired from the profession			
Other *(please specify)*			
TOTAL			

(25) Of the ROMPs that were recruited to your facility in 2008, where were they recruited from? *(enter the number who were recruited in each row against where recruited from as applicable, note that the totals column for FTEs and headcount should be the same as the corresponding totals reported in question 23)*

Where recruited from	Number of ROMPS recruited in 2008		Details/Comment
	Headcount	FTEs	
The same state			
Interstate *(please specify State/Territory)*			
Overseas *(please specify country)*			
Returning to the profession			
Other *(please specify)*			
TOTAL			

(26) If your facility had ROMPs on staff as at 31st December 2008 that were recruited <u>directly</u> from overseas *(i.e. the medical physics job they had immediately prior to the medical physics job they held at your facility was not in Australia),* **please provide the following details for each ROMP** *(complete one row for each medical physicist recruited from overseas)*

ROMP recruited from overseas who is on <u>current</u> staff	Year recruited	Country recruited from	<u>Current</u> FTE	Level of position <u>currently</u> occupied *(tick one box)*				
				Chief	Senior	Base grade	Trainee /Registrar	Other
Person 1								
Person 2								
Person 3								
Person 4								
Person 5								
Person 6								

(27) What metric (benchmark) for ROMPs workforce planning, if any, do you use in deciding the number of ROMP positions you need at your facility?

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(28) What are the main recruitment and retention issues relating to ROMPs experienced at your facility *(please tick more than one response as appropriate)***?**

- ☐ Remuneration
- ☐ Location of service
- ☐ Career progression
- ☐ Collegial support
- ☐ Supply of trained professionals
- ☐ Training requirements (i.e. length of training)
- ☐ Other (*please specify*) ______________________________

(29) What initiatives do you consider have worked well in addressing the balance between demand and supply for the ROMP workforce?

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(30) What further initiatives do you believe could be taken to improve the balance between demand and supply for the ROMP workforce?

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Section 6: RTs

(31) Please provide details of the average number of RTs employed in 2008 and the number of RT filled and vacant positions as at 31st December 2008.

Staff category/level	Average number of RTs employed in 2008 (FTEs)	RTs staffing situation as at 31st December 2008						
		Number of filled positions (FTEs)			Number of vacant positions (FTEs)			Number of individuals filling positions (Headcount)
		Permanent	Temporary	Total	Permanent	Temporary	Total	
Chief								
Supervisor/Senior								
Base grade								
PDY/Trainee								
Educator/Tutor								
Research								
Other								
TOTAL								

(32) Please provide details of the movement of RTs into and out of your facility in 2008.

Staff category/level	Number that left your facility in 2008		Number recruited to your facility in 2008	
	Headcount	FTEs	Headcount	FTEs
Chief				
Supervisor/senior				
Base Grade				
PDY/Trainee				
Educator/Tutor				
Research				
Other				
TOTAL				

(33) Of the RTs that left your facility in 2008, what were their reasons for leaving?

(enter the number who left in each row against the reason for leaving as applicable, note that the totals column for FTEs and headcount should be the same as the corresponding totals reported in question 32)

Reason for leaving	Number of RTs who left facility in 2008		Details/Comment
	Headcount	FTEs	
Another job in the same state			
Another job interstate *(specify states/territory(ies))*			
Another job overseas *(specify country(ies))*			
Resigned from the profession			
Retired from the profession			
Other *(please specify)*			
TOTAL			

(34) Of the RTs that were recruited to your facility in 2008, where were they recruited from? *(enter the number who were recruited in each row against where recruited from as applicable, note that the totals columns for FTEs and headcount should be the same as the corresponding totals reported in question 32)*

Where recruited from	Number of RTs recruited in 2008		Details/Comment
	Headcount	FTEs	
The same state			
Interstate ***(please specify***			
Overseas ***(please specify country)***			
Returning to the profession			
Other ***(please specify)***			
TOTAL			

(35) If your facility had RTs on staff as at 31st December 2008 that were recruited directly from overseas *(i.e. the RT job they had immediately prior to the RT job they held at your facility was not in Australia),* **please provide the following details for each radiation therapist.** *(complete one row for each RT recruited from overseas)*

RT recruited from overseas who is on current staff	Year recruited	Country recruited from	Current FTE	Level of position currently occupied *(tick one box)*				
				Chief	Supervisor/Senior	Base Grade	PDY/ Trainee	Other
Person 1								
Person 2								
Person 3								
Person 4								
Person 5								
Person 6								

(36) Please indicate the capacity of your facility to take on radiotherapy students undertaking their undergraduate clinical placements over the next three years.

	Year		
	2009	2010	2011
Number of undergraduate clinical placements possible			

(37) What metric (benchmark) for RT workforce planning, if any, do you use in deciding the number of RT positions you need at your facility?

____

____

(38) What are the main recruitment and retention issues relating to RTs experienced at your facility *(please tick more than one response as appropriate)***?**

- ☐ Remuneration
- ☐ Location of service
- ☐ Career progression
- ☐ Collegial support
- ☐ Supply of trained professionals
- ☐ Training requirements (i.e. length of training)
- ☐ Other (*please specify*) ______________________________

(39) What initiatives do you consider have worked well in addressing the balance between demand and supply for the RT workforce?

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(40) What further initiatives do you believe could be taken to improve the balance between demand and supply for the RT workforce?

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Section 7: Other comments

(41) Please provide any other comments that you believe are relevant to planning for the radiation oncology workforce in Australia

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The end – thank you for your assistance in this project

Appendix C

RADIATION ONCOLOGISTS PROFESSIONS SURVEY

FOREWORD

Dear Colleague

As you would be aware, there has been considerable recent focus on the development of radiation oncology services in Australia. A key part of further increasing the capacity to provide radiotherapy services is to ensure that there is an adequate supply of an appropriately skilled workforce. The Commonwealth Government Department of Health and Ageing (DoHA), amongst other stakeholders, has recognised that workforce planning is a key tool for addressing the workforce issues and has engaged the Firm 'HealthConsult' to:

> ***"undertake a review of the current status and capacity of three main professions that make up the radiation oncology workforce (ROs, RTs and medical physicists) and to identify opportunities for ensuing an adequate supply of well trained radiation oncology workforce"***

DoHA intends to use the information generated by the project to provide recommendations to the Commonwealth Government on strategic workforce initiatives to ensure the delivery of timely, accessible and quality radiation oncology services. The project objectives are to:

- prepare information on the current radiation oncology workforce profession numbers and issues affecting radiation oncology service provision in Australia;
- formulate a methodology which will ensure reliable workforce planning can be conducted in the future; and
- identify opportunities to address workforce and skills shortages.

This survey of ROs and radiation oncology registrars is a key part of the data collection process for the project. HealthConsult has developed the survey by working in consultation with the Faculty of Radiation Oncology of the Royal Australian and New Zealand College of Radiologists (RANZCR). Completion of the survey is strongly supported by the RANZCR, which is why you have received the survey directly from the College.

I urge you to take the time required to complete the survey, as it is only by having accurate information on the current workforce that reliable workforce planning models can be developed. Although you have been asked to (optionally) provide your name, it will only be used it to follow up any responses you make that cannot be understood. **All the data you provide will be strictly confidential and anonymous.** The survey analysis will only be reported in aggregate form. **Your time is greatly appreciated.**

A/Professor Christopher Milross
Dean
Faculty of Radiation Oncology
Royal Australian and New Zealand College of Radiologists

GUIDELINES FOR COMPLETION

The survey form contains 33 questions grouped logically into seven sections. Please answer every applicable question. To assist you to complete the survey a Glossary that explains and defines the terms used in the survey is provided below.

It would be greatly appreciated if you could make your colleagues who are qualified as, or in training to be, ROs aware of the survey. Some of them may not have personally received the survey due to the fact that they are not members of, nor do they have any affiliation with, the RANZCR, but their response would be greatly valued and we ask you to encourage them to complete the survey. A better, more reliable, and therefore more useful, workforce planning model will be produced if we have data on everyone qualified as, or in training to be, a RO in Australia, not just those whose details are accurate on the available mailing lists.

Please **complete the survey online** at **www.surveymonkey.com/RadOncWS by 12th June 2009.** If you wish to complete the survey offline please visit www.healthconsult.com.au to download a Microsoft Word version. Once completed we are happy to accept the survey by email to **admin@healthconsult.com.au** or by fax **(02) 9261-3705**, or in the post to **Reply Paid 84861, HealthConsult, Sydney, NSW 2000**. If you use any of these methods, please submit your completed response so it arrives at HealthConsult by **12th June 2009. Please contact Lisa Fodero on (02) 9261-3707 or lisa.fodero@healthconsult.com.au should you require any assistance.**

GLOSSARY OF TERMS

AMC: Australian Medical Council.

Area of Need: the program that enables the recruitment of suitably qualified overseas-trained doctors into declared Area of Need positions on a temporary basis.

College Fellow RANZCR: the postgraduate qualification awarded by the ***Royal Australian and New Zealand College of Radiologists (***RANZCR) after appropriate examinations and training, approval of Council, and payment of the subscription.

Clinical workload: comprises anything linked to patient care, including: new patient/follow up clinics, multidisciplinary clinics, planning/simulation, contouring organs/voluming, treatment review, multidisciplinary team meetings, remote case conferences, patient/clinician phone calls, and ward rounds.

Educational Affiliate of RANZCR: a person who is practising as a RO in Australia but is not a Fellow of RANZCR who, by paying a membership fee, establishes an association with the College for the purposes of participating in educational activities, meetings and seminars organised by the College.

Independent practice: no longer working under supervision, generally characterised by the completion of specialised vocational training to become a qualified radiation oncologist.

Management/Administration workload: quality assurance activities, dictating/correcting letters, management director/associations, meetings, reports, guidelines, surveys.

Metropolitan: includes areas within the city limits of Sydney, Melbourne, Brisbane, Perth, Adelaide, Newcastle, Gold Coast, Canberra, Wollongong, Sunshine Coast, Hobart, Geelong, Townsville and Cairns.

New patients: patients presenting to your facility for the first course of treatment for a given cancer diagnosis.

Outreach services: are services provided by clinicians to patients in locations other than from their usual/main workplace e.g. in the patient's home or place of work, or in clinics in other hospital settings or community health centres; an outreach service involves the clinician travelling to the patient.

Research workload: investigations/activities that are carried out as part of a recognised research project and/or clinical trial for which a specific proposal has been prepared and approved by a relevant body (e.g. work under a funded research grant, work approved by the hospital's ethics committee).

Sub-specialist: a clinician who has an advanced knowledge of, expertise or experience in, a particular area within their speciality.

Teaching workload: supervising medical students, radiation oncology registrars, and/or other registrars/students; and preparing lectures and presentations to be given in seminars, grand rounds and related activities where the principal purpose is to educate students/trainees.

Section 1: Your demographic data

(1) Name (*optional*): ______________________________

(2) Gender: Male ☐ Female ☐

(3) Year of birth: ☐☐☐☐

(4) Country of birth:

- ☐ Australia
- ☐ United Kingdom
- ☐ New Zealand
- ☐ Canada
- ☐ United States of America
- ☐ Republic of Ireland
- ☐ Japan
- ☐ China
- ☐ Singapore
- ☐ South Africa
- ☐ India
- ☐ Other (*please specify*)______________

(5) Where is your current residence?

- ☐ New South Wales
- ☐ Queensland
- ☐ South Australia
- ☐ Tasmania
- ☐ Victoria
- ☐ Western Australia
- ☐ Australian Capital Territory
- ☐ Northern Territory
- ☐ Other (*please specify*)______________________________

Section 2: Your professional training and qualifications

(6) What was the location of the institution where you completed your basic medical degree?

Within Australia *(please indicate State):*

- ☐ New South Wales
- ☐ Victoria
- ☐ Queensland
- ☐ Western Australia
- ☐ South Australia
- ☐ Tasmania
- ☐ Australian Capital Territory
- ☐ Northern Territory

Overseas *(please indicate country):*

- ☐ New Zealand
- ☐ Canada
- ☐ India
- ☐ Singapore
- ☐ United Kingdom
- ☐ South Africa
- ☐ Republic of Ireland
- ☐ Other (*please specify*) ______________

(7) Which of the following best describes your present status as a radiation oncologist?

☐ College Fellow (FRANZCR)
☐ Educational Affiliate of RANZCR
☐ Registrar (working in RANZCR accredited position)

- How many months do you have left to complete before you become a qualified radiation oncologist? ☐☐ *months* (*go to **question 15***)

☐ Other *(please specify)* ____________________

(8) In what year did you qualify as a RO *(completion of FRANZCR (Faculty of Radiation Oncology) or equivalent)***?** ☐☐☐☐

(9) In which Australian State/Territory or country did you qualify as a radiation oncologist?

Within Australia *(please indicate State)*	**Overseas** *(please indicate country)*
☐ New South Wales ☐ Victoria ☐ Queensland ☐ Western Australia ☐ South Australia ☐ Tasmania ☐ Australian Capital Territory ☐ Northern Territory	☐ New Zealand ☐ Canada ☐ India ☐ Singapore ☐ United Kingdom ☐ South Africa ☐ Republic of Ireland ☐ Other (*please specify*) ____________
*If selected '**Australia**' go to **question 14***	*If selected '**overseas**' go to **question 10***

(10) If you qualified overseas as a radiation oncologist, please indicate how you obtained your credentials to practice in Australia *(tick one or more boxes).*

☐ AMC graduate
☐ Area of Need
☐ Fellowship with RANZCR
☐ Other (*please specify*) ____________________

(11) Are you an Australian citizen?

☐ Yes (*go to **question 15***)
☐ No

(12) Do you have permanent resident status in Australia?

☐ Yes (*go to **question 15***)
☐ No

(13) If you are working in Australia on a temporary visa *(including an occupational trainee visa)***, how long in months before your current visa expires?**

☐☐ *months (go to **question 15**)*

(14) If you qualified in Australia as a radiation oncologist, please indicate how many years, if any, *(rounded to the nearest year)* **you have spent practising as a RO overseas** *(exclude any training time spent overseas prior to first qualifying as a radiation oncologist)***?** ☐☐ *years*

(15) Do you hold and/or are you currently completing additional qualifications that are relevant to your work as a radiation oncologist.

Postgraduate qualification	Name of qualification	Year Completed	Expected year of completion
Graduate certificate			
Graduate diploma			
Masters			
PhD			
Other Medical Fellowship			
Other			
Other			

Section 3: Your current professional profile and job

(16) Are you currently practising independently as a RO in Australia? *(take this to mean unsupervised full time or part time practice, and to include any private practice or public hospital work, educational activity (including student teaching), honorary work, locum work, administrative, managerial activity, or indeed anything that is part of working as a RO or in a 'deemed specialist' capacity in an Area of Need position)*

☐ Yes
☐ No currently a RANZCR Registrar or working under supervision (*go to* ***question 19***)
☐ No (*please go to* ***section 6***)

(17) In what year did you start independent practice as a RO in Australia? ☐☐☐☐

(18) Where did you start independent practice as a RO in Australia?

☐ New South Wales
☐ Victoria
☐ Queensland
☐ Western Australia
☐ South Australia
☐ Australian Capital Territory
☐ Tasmania
☐ Northern Territory

(19) Please provide details of facilities/sites *(including any outreach services you provide)* **within which you <u>currently</u> work.**

Facility 1: Name _________________________State ______City/Town____________

Facility 2: Name _________________________State ______City/Town____________

Facility 3: Name _________________________State ______City/Town____________

Facility 4: Name _________________________State ______City/Town____________

(20) Please select which position category/job title accounts for <u>most</u> of your working time as a radiation oncologist?

- ☐ Director/Head of Service
- ☐ Staff Specialist in Public Hospital
- ☐ Visiting Medical Officer in Public Hospital
- ☐ Specialist in Private Practice
- ☐ Registrar
- ☐ Other (please specify)________________________________

Section 4: Your current work practices

(21) Based on your current working arrangements, please estimate the number of weeks that you expect to be on leave this year. *(these weeks would include vacation, conference, study, long service, maternity, sick leave and such)* ☐☐*weeks*

(22) Based on your current working arrangements, please breakdown your weekly average hours worked as a RO across the following categories:

Work breakdown	Hours
Clinical	
Management/Administration	
Teaching/Education	
Research/Clinical Trials	
Other	
TOTAL	

(23) Based on your current working arrangements and the total weekly average working hours reported in question 22, please estimate the average hours per week you spend working in various organisations and/or institutions.

Organisations/institutions	Hours
Private radiation oncology practice	
Public hospital	
Universities	
Other private sector	
Other public sector	
TOTAL	

(24) Please estimate the number of new patients (public and/or private) that you see in a 12 month period *(refer to the last 12 months)***.**

- ☐ 50 or fewer
- ☐ 51 – 100
- ☐ 101 – 150
- ☐ 151 – 200
- ☐ 201 – 250
- ☐ 251 – 300
- ☐ 301 − 350
- ☐ 350 − 400
- ☐ 401 − 450
- ☐ 451+

(25) Please estimate the proportion of your average <u>clinical hours</u> *(the weekly average clinical hours reported in question 22)* **per week that you spend working across the different modalities** *(allocate all your clinical time across the prescribed treatment modalities; e.g. for IMRT estimate the proportion of your time that you spend on consultation, planning, simulation, review, etc. for patients for whom you prescribe IMRT).*

Modalities	**% of time**
Megavoltage	
➢ Standard	
➢ IMRT	
➢ Stereotactic radiosurgery	
➢ Total body irradiation	
➢ Total skin electrons	
Brachytherapy	
➢ High Dose Rate (HDR)	
➢ Low Dose Rate (LDR)	
➢ Seed	
Kilovoltage equipment (superficial and/or orthovoltage)	
No treatment prescribed	
TOTAL	**100%**

(26) Please estimate the proportion of your clinical time *(the weekly average clinical hours reported in question 22),* **related to the following cancer sites/types and whether you attend regular multidisciplinary team (MDT) meetings for each cancer site/type.**

Cancer site/type	**% clinical time**	**Attend MDT meetings**
Central nervous system		Y/N
Head/neck		Y/N
Thoracic		Y/N
Breast		Y/N
Upper gastrointestinal tract		Y/N
Colorectal		Y/N
Gynaecology		Y/N
Urology		Y/N
Haematology		Y/N
Paediatrics		Y/N
Musculoskeletal		Y/N
Skin/melanoma		Y/N
Other *(please specify)*		Y/N
	100%	

(27) As a RO do you consider yourself to be a sub-specialist?

☐ Yes *(please specify)*____
☐ No

Section 5: Impact of new/emerging technologies on your work

(28) What ongoing impact *(estimate in percentage terms, ignoring the short term impact that is typically associated with professionals learning and becoming proficient in a new technology)* **has the introduction of any of the following technologies had on your workload?** *(only respond if you have had direct experience in working with the specified technology and please complete only one box in each row)*

Technology	Estimated impact on workload (%)			
	Increase	No change	Decrease	Don't know
Intensity Modulated Radiotherapy (IMRT)				
Brachytherapy – HDR				
Brachytherapy – LDR				
Brachytherapy – Seed				
Modulated arc therapy				
Stereotactic radiosurgery/radiotherapy				
Image fusion for treatment planning				
Treatment verification imaging				
Gated delivery				
Four-dimensional computerised tomography				
Adaptive planning and treatment (including IGRT)				
Other *(please specify)*				
Other *(please specify)*				

(29) Please describe any other new/emerging technologies that you believe will influence your workload in the future and their perceived impact

____

____

____

Section 6: Your view on changing your work arrangements

(30) What changes, if any, do you anticipate in your working arrangements as a RO over the next 12 months?

☐ None
☐ Increase working hours by ☐☐ hours
☐ Decrease working hours by ☐☐ hours
☐ Taking a break from radiation oncology practice (e.g. maternity leave, extended travel)
➢ What is the intended length of your break? ☐☐ *months*
☐ Change in career (ceasing to practice as a radiation oncologist)
☐ Retirement
☐ Other (*please specify*) ____

(31) Please indicate your current work location (*if more than one please choose the one which accounts for most of your radiation oncology work*) **and your anticipated work location in 12 months time?**

Current work location	**Expected work location (in 12 months)**
Within current State of residence ➢ ☐ Metropolitan ➢ ☐ Non-metropolitan	Within current State of residence ➢ ☐ Metropolitan ➢ ☐ Non-metropolitan
Within Australia, but outside current State of residence ➢ ☐ Metropolitan ➢ ☐ Non-metropolitan	Within Australia but outside current State of residence ➢ ☐ Metropolitan ➢ ☐ Non-metropolitan
☐Overseas *(please specify)*:	☐Overseas *(please specify)*:

(32) At what age do you expect to retire completely from radiation oncology practice?

☐☐ *years*

Section 7: Other comments

(33) Please provide any other comments that you believe are relevant to planning for the radiation oncology workforce in Australia

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The end – thank you for your assistance in this project

Appendix D

RADIATION THERAPISTS PROFESSIONS SURVEY

FOREWORD

Dear Colleague

As you would be aware, there has been considerable recent focus on the development of radiation oncology services in Australia. A key part of further increasing the capacity to provide radiotherapy services is to ensure that there is an adequate supply of an appropriately skilled workforce. The Commonwealth Government Department of Health and Ageing (DoHA), amongst other stakeholders, has recognised that workforce planning is a key tool for addressing the workforce issues and has engaged the Firm 'HealthConsult' to:

> ***"undertake a review of the current status and capacity of three main professions that make up the radiation oncology workforce (ROs, RTs and medical physicists) and to identify opportunities for ensuing an adequate supply of well trained radiation oncology workforce"***

DoHA intends to use the information generated by the project to provide recommendations to the Commonwealth Government on strategic workforce initiatives to ensure the delivery of timely, accessible and quality radiation oncology services. The project objectives are to:

- prepare information on the current radiation oncology workforce profession numbers and issues affecting radiation oncology service provision in Australia;
- formulate a methodology which will ensure reliable workforce planning can be conducted in the future; and
- identify opportunities to address workforce and skills shortages.

This survey of RTs and trainees is a key part of the data collection process for the project. HealthConsult has developed the survey by working in consultation with the Radiotherapy Advisory Panel of the Australian Institute of Radiography (AIR). The AIR supports and endorses the radiation oncology workforce surveys being conducted by HealthConsult believing that they are part of an important initiative essential to ensuring a viable radiotherapy workforce into the future.

Accordingly, the AIR accordingly urges all RTs to participate in the surveys, whether currently practising or not. Please take the time that will be required to complete the survey which will be evaluated by HealthConsult, as it is only by having accurate information on the current workforce that we can develop reliable workforce planning models. Although you have been asked to (optionally) provide your name, it will only be used to follow up any responses you make that cannot be understand. **All the data you provide will be strictly confidential and anonymous.** The survey analysis will only be reported in aggregate form. **Your time is greatly appreciated.**

David Collier

David Collier
Executive Officer
Australian Institute of Radiography

GUIDELINES FOR COMPLETION

The survey form contains 28 questions grouped logically into seven sections. Please answer every applicable question. To assist you to complete the survey a Glossary that explains and defines the terms used in the survey is provided below.

It would be greatly appreciated if you could make your colleagues who are qualified as, or in training to be, RTs aware of the survey. Some of them may not have personally received the survey due to incompleteness of the mailing lists but their response would be greatly valued and we ask you to encourage them to complete the survey. A better, more reliable, and therefore more useful, workforce planning model will be produced if we have data on everyone qualified as, or in training to be, a RT in Australia, not just those whose details are accurate on current mailing lists.

Please **complete the survey online** at **www.surveymonkey.com/RTsWS by 12th June 2009.** If you wish to complete the survey offline please visit www.healthconsult.com.au to download a Microsoft Word version. Once completed we are happy to accept the survey by email to **admin@healthconsult.com.au** or by fax **(02) 9261-3705**, or in the post to **Reply Paid 84861, HealthConsult, Sydney, NSW 2000**. If you use any of these methods, please submit your completed response so it arrives at HealthConsult by **12th June 2009. Please contact Lisa Fodero on (02) 9261-3707 or lisa.fodero@healthconsult.com.au should you require any assistance.**

GLOSSARY OF TERMS

Clinical workload: comprises anything linked to patient care, including new patient/follow up clinics; multidisciplinary clinics; planning/simulation; contouring organs/voluming; treatment review; and multi-disciplinary team meetings.

Independent practice: no longer working under supervision, generally characterised by the completion of professional development year (PDY) or equivalent to become a qualified RT (i.e. no longer considered to be in training).

Management/Administration workload: includes quality assurance activities; professional development activities; team meetings; report writing; surveys; and so on.

Metropolitan: includes areas with the city limits of Sydney, Melbourne, Brisbane, Perth, Adelaide, Newcastle, Gold Coast, Canberra, Wollongong, Sunshine Coast, Hobart, Geelong, Townsville and Cairns.

PDY: Professional Development Year: the vocationally based professional development year that radiotherapy graduates are required to complete prior to being eligible for full accreditation with the Australian Institute of Radiography.

Research workload: includes investigations/activities that are carried out as part of recognised research project and/or clinical trial for which a specific proposal has been prepared and approved by a relevant body (e.g. work under a funded research grant, work approved by the hospital's ethics committee).

Teaching workload: includes supervising registrars/trainees in radiotherapy; preparing lectures and presentations to be given in seminars, formal courses and related activities where the principal purpose is to educate students/trainees in any discipline.

Section 1: Your demographic data

(1) **Name** (*optional*):

____

(2) **Gender**: Male ☐ Female ☐

(3) **Year of birth:** ☐☐☐☐

(4) **Country of birth**:

- ☐ Australia
- ☐ United Kingdom
- ☐ New Zealand
- ☐ Canada
- ☐ United States of America
- ☐ Republic of Ireland
- ☐ Japan
- ☐ China
- ☐ Singapore
- ☐ South Africa
- ☐ India
- ☐ Other (*please specify*) ______________

(5) **Where is your current residence?**

- ☐ New South Wales
- ☐ Queensland
- ☐ South Australia
- ☐ Tasmania
- ☐ Victoria
- ☐ Western Australia
- ☐ Australian Capital Territory
- ☐ Northern Territory
- ☐ Other (*please specify*) ____

Section 2: Your professional training and qualifications

(6) **What was the location of the institution where you completed your base radiotherapy certificate/diploma/degree?**

Within Australia *(please indicate State):*

- ☐ New South Wales
- ☐ Victoria
- ☐ Queensland
- ☐ Western Australia
- ☐ South Australia
- ☐ Tasmania
- ☐ Australian Capital Territory
- ☐ Northern Territory

Overseas *(please indicate country):*

- ☐ New Zealand
- ☐ Canada
- ☐ India
- ☐ Singapore
- ☐ United Kingdom
- ☐ South Africa
- ☐ Republic of Ireland
- ☐ Other (*please specify*) _____________

(7) Which of the following best describes your present status as a radiation therapist?

☐ Accredited by the AIR or another RT accreditation body

- ➢ What is the accreditation? ☐ AIR
  ☐ Other (specify) ______________________________
- ➢ In which year was it awarded? ☐☐☐☐

☐ Enrolled in a training program that will lead to accreditation

- ➢ What is the program? ☐ PDY/intern
  ☐ Other (specify) ______________________________
- ➢ How long until you complete the program? ☐☐ months *(go to **Question 13**)*

☐ Other *(please specify)* __________________________________ *(go to **Question 9**)*

(8) In which Australian State/Territory or country did you complete your training?

Within Australia *(please indicate State):*	**Overseas** *(please indicate country):*
☐ New South Wales ☐ Victoria ☐ Queensland ☐ Western Australia ☐ South Australia ☐ Tasmania ☐ Australian Capital Territory ☐ Northern Territory	☐ New Zealand ☐ Canada ☐ India ☐ Singapore ☐ United Kingdom ☐ South Africa ☐ Republic of Ireland ☐ Other (*please specify*)____________
*If selected '**Australia**' go to **question 12***	*If selected '**overseas**' go to **question 9***

(9) Are you an Australian citizen?

☐ Yes *(go to **question 13**)*
☐ No

(10) Do you have permanent resident status in Australia?

☐ Yes *(go to **question 13**)*
☐ No

(11) If you are working in Australia on a temporary visa *(including an occupational trainee visa)*, **how long in months before your current visa expires?**

☐☐ *months (go to **question 13**)*

(12) If you qualified in Australia as a radiation therapist, please indicate how many years, if any, *(rounded to the nearest year)* **you have spent practising as a RT overseas** *(excluding any training time spent overseas prior to first qualifying as a radiation therapist)***?** ☐☐ *years*

(13) Do you hold and/or are you currently completing additional qualifications that are relevant to your work as a radiation therapist?

Postgraduate qualification	**Name of qualification**	**Year Completed**	**Expected year of completion**
Graduate certificate			
Graduate diploma			
Masters			
PhD			
Other undergraduate degree			
Other			
Other			

Section 3: Your current professional profile and job

(14) Are you currently practising independently as a RT in Australia? *(take this to mean unsupervised full time or part time practice (i.e. following the completion of your training), and to include any private practice or public hospital work, educational activity (including student teaching), honorary work, locum work, administrative, managerial activity, or indeed anything that is part of working as a radiation therapist)***?**

☐ Yes
☐ No currently training/PDY (*please go to **question 17***)
☐ No (*please go to **section 6***)

(15) In what year did you start practising independently as a RT in Australia? ☐☐☐☐

(16) Where did you start practising independently as a RT in Australia?

☐ New South Wales
☐ Victoria
☐ Queensland
☐ Western Australia
☐ South Australia
☐ Australian Capital Territory
☐ Tasmania
☐ Northern Territory
☐ Other (*please specify*) ____

(17) Please provide details of facilities/sites within which you <u>currently</u> work.

Facility 1: Name ________________________State _____City/Town _____________

Facility 2: Name ________________________State _____City/Town _____________

Facility 3: Name ________________________State _____City/Town _____________

(18) Please select which position category/job title accounts for most of your working time as a radiation therapist?

- ☐ Professional development year (PDY/intern)
- ☐ Base grade
- ☐ Intermediate grade
- ☐ Senior in charge
- ☐ Chief or Manager
- ☐ Educator/Tutor
- ☐ Research
- ☐ Other (*please specify*) ______________________________

Section 4: Your current work practices

(19) Based on your current working arrangements, please estimate the number of weeks that you expect to be on leave, this year *(these weeks would include vacation, conference, study, long service, maternity, sick leave and such)* ☐☐ *weeks*

(20) Based on your current working arrangements, please breakdown your weekly average hours worked as a RT across the following categories:

Work breakdown	Hours
Clinical	
Management/Administration	
Teaching/Education	
Research/Clinical Trials	
Other	
TOTAL	

(21) Based on your current working arrangements and the total weekly average working hours reported in question 20, please estimate the average hours per week you spend in various organisations and/or institutions.

Organisations/institutions	Hours
Private radiation oncology practice	
Public hospital	
Universities	
Other private sector	
Other public sector	
TOTAL	

(22) Please estimate the proportion of your average <u>clinical hours</u> (*the weekly average clinical hours reported in **question 20***) **per week that you spend working across the different modalities** *(allocate all your clinical time across the prescribed treatment modalities; e.g. for IMRT estimate the proportion of your time that you spend on planning, simulation, mould room, consultation, treatment, review, etc. for patients for whom IMRT is prescribed).*

Modalities	**% of time**
Megavoltage	
➢ Standard	
➢ IMRT	
➢ Stereotactic radiosurgery	
➢ Total body irradiation	
➢ Total skin electrons	
Brachytherapy	
➢ High Dose Rate (HDR)	
➢ Low Dose Rate (LDR)	
➢ Seed	
Kilovoltage equipment (superficial and orthovoltage)	
Other	
TOTAL	100%

Section 5: Impact of new/emerging technologies on your work

(23) What ongoing impact *(estimate in percentage terms, ignoring the short term impact that is typically associated with professionals learning and becoming proficient in a new technology)* **has the introduction of any of the following technologies had on your workload?** *(only respond if you have had direct experience in working with the specified technology and please complete only one box in each row)*

Technology	**Estimated impact on workload (%)**			
	Increase	**No change**	**Decrease**	**Don't know**
Intensity Modulated Radiotherapy (IMRT)				
Brachytherapy – HDR				
Brachytherapy – LDR				
Brachytherapy – Seed				
Modulated arc therapy				
Stereotactic radiosurgery/radiotherapy				
Image fusion for treatment planning				
Treatment verification imaging				
Gated delivery				
Four-dimensional computerised tomography				
Adaptive planning and treatment (including IGRT)				
Other *(please specify)*				
Other *(please specify)*				

(24) Please describe any other new/emerging technologies that you believe will influence your workload in the future and their perceived impact

____

____

____

Section 6: Your view on changing your work arrangements

(25) What changes, if any, do you anticipate in your working arrangements as a RT over the next 12 months?

☐ None
☐ Increase working hours by ☐☐ hours
☐ Decrease working hours by ☐☐ hours
☐ Taking a break from radiotherapy practice (e.g. maternity leave, extended travel)
➢ What is the intended length of your break? ☐☐ *months*
☐ Change in career (ceasing to practice as a radiation therapist)
☐ Retirement
☐ Other (*please specify*) ____

(26) Please indicate your current work location *(if more than one please choose the one which accounts for most of your radiotherapy work)* **and your anticipated work location in 12 months time?**

Current work location	**Expected work location (in 12 months)**
Within current State of residence ➢ ☐ Metropolitan ➢ ☐ Non-metropolitan	Within current State of residence ➢ ☐ Metropolitan ➢ ☐ Non-metropolitan
Within Australia, but outside current State of residence ➢ ☐ Metropolitan ➢ ☐ Non-metropolitan	Within Australia but outside current State of residence ➢ ☐ Metropolitan ➢ ☐ Non-metropolitan
☐Overseas *(please specify)*:	☐Overseas *(please specify)*:

(27) At what age do you expect to retire completely from radiotherapy practice?

☐☐ *years*

Section 7: Other comments

(28) Please provide any other comments that you believe are relevant to planning for RT workforce in Australia.

____

____

____

____

The end – thank you for your assistance in this project

Appendix E

RADIATION ONCOLOGY MEDICAL PHYSICISTS PROFESSIONS SURVEY

FOREWORD

Dear Colleague

As you would be aware, there has been considerable recent focus on the development of radiation oncology services in Australia. A key part of further increasing the capacity to provide radiotherapy services is to ensure that there is an adequate supply of an appropriately skilled workforce. The Commonwealth Government Department of Health and Ageing (DoHA), amongst other stakeholders, has recognised that workforce planning is a key tool for addressing the workforce issues and has engaged HealthConsult to:

> ***"undertake a review of the current status and capacity of three main professions that make up the radiation oncology workforce (ROs, RTs and medical physicists) and to identify opportunities for ensuring an adequate supply of well trained radiation oncology workforce"***

DoHA intends to use the information generated by the project to provide recommendations to the Commonwealth Government on strategic workforce initiatives to ensure the delivery of timely, accessible and quality radiation oncology services. The project objectives are to:

- prepare information on the current radiation oncology workforce profession numbers and issues affecting radiation oncology service provision in Australia;
- formulate a methodology which will ensure reliable workforce planning can be conducted in the future; and
- identify opportunities to address workforce and skills shortages.

This survey of ROMPs and registrars is a key part of the data collection process for the project. HealthConsult has developed the survey by working in consultation with the Australian College of Physical Scientists and Engineers in Medicine (ACPSEM). Completion of the survey is strongly supported by the ACPSEM, which is why you have received the survey directly from the College.

Please take the time that will be required to complete the survey which will be evaluated by HealthConsult, as it is only by having accurate information on the current workforce that we can develop reliable workforce planning models. Although we have asked you to (optionally) provide your name, it will only be used to follow up any responses you make that we cannot understand. **All the data you provide will be strictly confidential and anonymous.** The survey analysis will only be reported in aggregate form. **Your time is greatly appreciated.**

Tomas Kron
President ACPSEM

GUIDELINES FOR COMPLETION

The survey form contains 31 questions grouped logically into seven sections. Please answer every applicable question. To assist you to complete the survey a Glossary that explains and defines the terms used in the survey is provided below.

It would be greatly appreciated if you could make your colleagues who are qualified as, or in training to be, ROMPs aware of the survey. Some of them may not have personally received the survey due to the fact that they are not members of, nor do they have any affiliation with, the ACPSEM, but their response would be greatly valued and we ask you to encourage them to complete the survey. A better, more reliable, and therefore more useful, workforce planning model will be produced if we have data on everyone qualified as, or in training to be, a ROMP in Australia, not just those whose details are accurate on the available mailing lists.

Please **complete the survey online** at **www.surveymonkey.com/ROMPWS by 25th May 2009.** If you wish to complete the survey offline please visit www.healthconsult.com.au to download a Microsoft Word version. Once completed we are happy to accept the survey by email to **admin@healthconsult.com.au** or by fax **(02) 9261-3705**, or in the post to **Reply Paid 84861, HealthConsult, Sydney, NSW 2000**. If you use any of these methods, please submit your completed response so it arrives at HealthConsult by **25th May 2009. Please contact Lisa Fodero on (02) 9261-3707 or lisa.fodero@healthconsult.com.au should you require any assistance.**

GLOSSARY OF TERMS

ARECQA: Accreditation in Radiotherapy Equipment Commissioning and Quality Assurance; the accreditation program in radiation oncology medical physics offered by the ACPSEM prior to the development and implementation of the TEAP.

AROMP: Accreditation in Radiation Oncology Medical Physics; the accreditation awarded by the ACPSEM after successful completion of the TEAP program.

Clinical (patient-related activities) workload: comprises anything linked to patient care, including direct contact with the patient as part of service delivery; treatment planning and/or simulation; and treatment plan review.

Equipment commissioning and quality assurance workload: includes acquisition and installation of new equipment; safety checks; initial radiation survey and acceptance testing; commissioning of the machine for clinical use; establishment of the baseline quality assurance parameters and schedule; and routine quality assurance activities.

Management/Administration workload: includes professional development activities; team meetings; report writing; surveys and so on but excludes quality assurance activities (include quality assurance activities under *equipment commissioning and quality assurance*).

Metropolitan: includes areas with the city limits of Sydney, Melbourne, Brisbane, Perth, Adelaide, Newcastle, Gold Coast, Canberra, Wollongong, Sunshine Coast, Hobart, Geelong, Townsville and Cairns.

Radiation safety and protection workload: includes activities ensuring equipment is functioning properly and according to applicable standards and that the equipment is installed and used in a way which provides maximum radiation safety for operators, patients and others; and examination of protective equipment and shielding to ensure that they are present and provide the required protection.

Research workload: includes investigations/activities that are carried out as part of recognised research project and/or clinical trial for which a specific proposal has been prepared and approved by a relevant body (e.g. work under a funded research grant, work approved by the hospital's ethics committee).

Teaching workload: includes supervising registrars/trainees in radiation oncology medical physics; preparing lectures and presentations to be given in seminars, formal courses and related activities where the principal purpose is to educate students/trainees in any discipline.

TEAP: Training, Education and Accreditation Program: this program addresses the training of medical physicists to become accredited (be awarded the AROMP) as a ROMP by the Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM).

Working independently: no longer working under direct supervision, generally characterised by the completion of the ACPSEM TEAP or a similar program to become an accredited ROMP (i.e. no longer considered to be in training).

Section 1: Your demographic data

(1) Name (*optional*):

____

(2) Gender: Male ☐ Female ☐

(3) Year of birth: ☐☐☐☐

(4) Country of birth:

- ☐ Australia
- ☐ United Kingdom
- ☐ New Zealand
- ☐ Canada
- ☐ United States of America
- ☐ Republic of Ireland
- ☐ Japan
- ☐ China
- ☐ Singapore
- ☐ South Africa
- ☐ India
- ☐ Other (*please specify*) ________________

(5) Where is your current residence?

- ☐ New South Wales
- ☐ Queensland
- ☐ South Australia
- ☐ Tasmania
- ☐ Victoria
- ☐ Western Australia
- ☐ Australian Capital Territory
- ☐ Northern Territory
- ☐ Other (*please specify*) ____

Section 2: Your professional training and qualifications

(6) What was the location of the institution where you completed your base undergraduate degree?

Within Australia *(please indicate State):*

- ☐ New South Wales
- ☐ Victoria
- ☐ Queensland
- ☐ Western Australia
- ☐ South Australia
- ☐ Tasmania
- ☐ Australian Capital Territory
- ☐ Northern Territory

Overseas *(please indicate country):*

- ☐ New Zealand
- ☐ Canada
- ☐ India
- ☐ Singapore
- ☐ United Kingdom
- ☐ South Africa
- ☐ Republic of Ireland
- ☐ Other (*please specify*)

____

(7) How many years of radiation oncology medical physics experience have you had since completing your base undergraduate degree?

- ☐ 0 – 3 years
- ☐ 4 – 5 years
- ☐ 6 – 10 years
- ☐ 11 – 15 years
- ☐ 16 – 20 years
- ☐ 20 + years

(8) Which of the following best describes your present status as a radiation oncology medical physicist?

☐ Accredited by ACPSEM or another medical physics accreditation body

- What is the accreditation? ☐ ACPSEM ARECQA
  ☐ ACPSEM AROMP
  ☐ Other (specify)________________________
- In which year was it awarded? ☐☐☐☐

☐ Enrolled in a training program, or intending to sit an exam, that will lead to an accreditation

- What is the program or exam? ☐ ACPSEM TEAP
  ☐ ACPSEM ARECQA
  ☐ Other (specify)________________________
- How long until you complete the program or sit the exam? ☐☐ months *(go to **Question 14**)*

☐ Not accredited and not in formal training program *(go to **Question 10**)*

(9) Where did you complete your accreditation program?

Within Australia *(please indicate state):*	**Overseas** *(please indicate country):*
☐ New South Wales ☐ Victoria ☐ Queensland ☐ Western Australia ☐ South Australia ☐ Tasmania ☐ Australian Capital Territory ☐ Northern Territory	☐ New Zealand ☐ Canada ☐ India ☐ Singapore ☐ United Kingdom ☐ South Africa ☐ Republic of Ireland ☐ Other (*please specify*) _____________
*If selected '**Australia**' go to **question 13***	*If selected '**overseas**' go to **question 10***

(10) Are you an Australian citizen?

☐ Yes *(go to **question 14**)*
☐ No

(11) Do you have permanent resident status in Australia?

☐ Yes *(got to **question 14**)*
☐ No

(12) If you are working in Australia on a temporary visa *(including an occupational trainee visa)*, **how long in months before your current visa expires?**

☐☐ *months (go to **question 14**)*

(13) If you qualified in Australia as a radiation oncology medical physicist, please indicate how many years, if any, *(rounded to the nearest year)* **you have spent practising as a ROMP overseas** *(exclude any training time spent overseas prior to first qualifying as a RO medical physicist)***?** ☐☐ *years*

(14) Do you hold and/or are you currently completing additional qualifications that are relevant to your work as a radiation oncology medical physicist?

Postgraduate qualification	Name of qualification	Year Completed	Expected year of completion
Graduate certificate			
Graduate diploma			
Masters			
PhD			
Other Fellowship			
Other			
Other			

Section 3: Your professional profile and job

(15) Are you currently working independently as a ROMP in Australia? *(take this to mean unsupervised full time or part time work (i.e. following the completion of your training), and to include any private practice or public hospital work, educational activity (including student teaching), honorary work, locum work, administrative, managerial activity, or indeed anything that is part of working as a radiation oncology medical physicist)***?**

☐ Yes
☐ No, currently in training (*go to **question 18***)
☐ No (*go to **section 6***)

(16) In what year did you start working independently as a ROMP in Australia? ☐☐☐☐

(17) Where did you start working independently as a ROMP in Australia?

☐ New South Wales ☐ Victoria
☐ Queensland ☐ Western Australia
☐ South Australia ☐ Australian Capital Territory
☐ Tasmania ☐ Northern Territory
☐ Other *(please specify)* ____

(18) Please provide details of facilities/sites within which you <u>currently</u> work.

Facility 1: Name ________________________State _____City/Town_____________

Facility 2: Name ________________________State _____City/Town_____________

Facility 3: Name ________________________State _____City/Town_____________

(19) Please select which position category/job title accounts for most of your working time as a radiation oncology medical physicist?

☐ Chief physicist
☐ Senior medical physicist
☐ Base grade medical physicist
☐ Trainee/Registrar
☐ Educator/Teacher
☐ Research
☐ Other (*please specify*) ____

Section 4: Your current work practices

(20) **Based on your current working arrangements, please estimate the number of weeks that you expect to be on leave this year?** *(these weeks would include vacation, conference, study, long service, maternity, sick leave and such)* ☐☐*weeks*

(21) **Based on your current working arrangements, please breakdown your weekly average hours worked as a ROMP across the following categories:**

Work breakdown	Hours
Clinical (patient-related activities)	
Equipment commissioning and quality assurance	
Radiation safety and protection	
Management/Administration	
Teaching/Education	
Research/Clinical Trials	
Other	
TOTAL	

(22) **Based on your current working arrangements and the total weekly average working hours reported in question 21, please estimate the average hours per week you spend working in various organisations and/or institutions.**

Organisations/institutions	Hours
Private radiation oncology practice	
Public hospital	
Universities	
Other private sector	
Other public sector	
TOTAL	

(23) **Based on the weekly average working hours reported in question 21 please estimate how many hours per week you would spend 'in' normal working hours and 'out' of normal working hours** *(please regard 'in hours' as 8.00 am to 6.00 pm Monday to Friday)***?**

- 'In' hours: ☐☐
- 'Out' hour: ☐☐

(24) Please estimate the proportion of your average <u>treatment related hours</u> *(based on the total of the weekly average hours reported in the first three rows of question 21)* **per week that you spend working across the different modalities** *(allocate all your treatment related time across the prescribed treatment modalities; e.g. for IMRT estimate the proportion of your time that you spend on patient care, commissioning, quality assurance and safety activities related to the delivery of IMRT treatment)***.**

Modalities	**% of time**
Megavoltage	
➢ Standard	
➢ IMRT	
➢ Stereotactic radiosurgery	
➢ Total body irradiation	
➢ Total skin electrons	
Brachytherapy	
➢ High Dose Rate (HDR)	
➢ Low Dose Rate (LDR)	
➢ Seed	
Kilovoltage equipment (superficial and/or orthovoltage)	
Other	
TOTAL	100%

Section 5: Impact of new/emerging technologies on your work

(25) What ongoing impact *(estimate in percentage terms, ignoring the short term impact that is typically associated with professionals learning and becoming proficient in a new technology)* **has the introduction of any of the following technologies had on your workload?** *(only respond if you have had direct experience in working with the specified technology and please complete only one box in each row)*

Technology	**Estimated impact on workload (%)**			
	Increase	**No change**	**Decrease**	**Don't know**
Intensity Modulated Radiotherapy (IMRT)				
Brachytherapy – HDR				
Brachytherapy – LDR				
Brachytherapy – Seed				
Modulated arc therapy				
Stereotactic radiosurgery/radiotherapy				
Image fusion for treatment planning				
Treatment verification imaging				
Gated delivery				
Four-dimensional computerised tomography				
Adaptive planning and treatment (including IGRT)				
Other *(please specify)*				
Other *(please specify)*				

(26) Please describe any other new/emerging technologies that you believe will influence your workload in the future and their perceived impact.

____

____

____

Section 6: Your view on changing your work arrangements

(27) What changes, if any, do you anticipate in your working arrangements as a ROMP over the next 12 months?

☐ None

☐ Increase working hours by ☐☐ hours

☐ Decrease working hours by ☐☐ hours

☐ Taking a break from radiation oncology medical physics work (e.g. maternity leave, extended travel)

- What is the intended length of your break? ☐☐ *months*

☐ Change in career (ceasing to practice as a radiation oncology medical physicist)

☐ Retirement

☐ Other (*please specify*)

____

(28) Please indicate your current work location *(if more than one please choose the one which accounts for most of your radiation oncology medical physics work)* **and your anticipated work location in 12 months time?**

Current work location	**Expected work location (in 12 months)**
Within current State of residence ☐ Metropolitan ☐ Non-metropolitan	Within current State of residence ☐ Metropolitan ☐ Non-metropolitan
Within Australia, but outside current State of residence ☐ Metropolitan ☐ Non-metropolitan	Within Australia but outside current State of residence ☐ Metropolitan ☐ Non-metropolitan
☐Overseas *(please specify)*:	☐Overseas *(please specify)*:

(29) At what age do you expect to retire completely from radiation oncology medical physics practice? ☐☐ years

Section 7: Other comments

(30) What is your view on compulsory national registration for ROMPs as a prerequisite to working as a qualified ROMP? If you believe in compulsory registration, should ACPSEM or another organisation be the registration authority?

____

____

____

(31) Please provide any other comments that you believe are relevant to planning for the ROMP workforce in Australia

____

____

The end – thank you for your assistance in this project

Appendix F

CASE STUDY FRAMEWORK

1

Introduction

There has been considerable recent focus on the development of radiation oncology services in Australia. A key part of further increasing the capacity to provide radiation oncology services is to ensure that there is an adequate supply of an appropriately skilled workforce. The Commonwealth Government Department of Health and Ageing (DoHA) working with the Radiation Oncology Reform Implementation Committee (RORIC) has recognised that workforce planning is a key tool for addressing the workforce issues and engaged HealthConsult on 28th January, 2009 to:

> ***"undertake a review of the current status and capacity of three main professions that make up the radiation oncology workforce (ROs, RTs and medical physicists) and to identify opportunities for ensuring an adequate supply of well trained radiation oncology workforce"***

DoHA intends to use the information generated by the project to provide recommendations to the Commonwealth Government on strategic workforce initiatives. State/Territory Health Authorities intend to use the data provided by public sector facilities within their jurisdiction to develop further their radiation oncology workforce initiatives. The objective at both levels of Government is to ensure the delivery of timely, accessible and quality radiation oncology services. The specific project objectives (see Appendix A for more details) are to:

- prepare information on the current radiation oncology workforce profession numbers and issues affecting radiation oncology service provision in Australia;
- formulate a methodology which will ensure reliable workforce planning can be conducted in the future; and
- identify opportunities to address workforce and skills shortages.

In order to successfully complete the project, HealthConsult is working and consulting with, amongst other stakeholders, representatives of public and private sector radiation oncology services around Australia. Our methodology provides for us to spend two to three hours at selected radiation oncology services in each Australian State and the ACT. These visits (a process that we have termed a case study) will enable us to consult with managers and clinicians involved in the delivery of radiotherapy services across the country.

For the private sector, we plan to visit one facility representing each ownership group (a total of nine services). Where an ownership group has multiple sites, the actual facility to be visited will be selected in consultation with head of the group. In addition, a representative sample of eleven public sector services will be visited including at least one site in each State and the ACT. Public sector sites will be selected in consultation with the relevant jurisdictional Health Authority.

We intend to collected qualitative information about issues related to workforce planning from the discussions we hold as part of the case study visits. The information we gather will supplement the data that are collected through the professions and facility survey components of the project. Each radiation oncology facility around Australia should have received a request to complete the facility survey (a copy of the facility survey form, along with a copy of the professions survey for ROs, RTs and medical physicists can be downloaded at www.healthconsult.com.au)

This document sets out the framework for the twenty case studies that will be undertaken in the period from May to June 2009. It is targeted at managers and clinicians working in the case study sites to assist them in to prepare for the case study discussions.

We also want to assure you that the views expressed through the case study process will be strictly confidential. HealthConsult will analyse themes and patterns emerging from the information collected through case studies but we will not attribute views to specific individuals or services. The information will be used to assist us to interpret the data gathered through the professions and facilities surveys as well as to contribute to the identification of strategies for further development of the radiation oncology workforce.

Joe Scuteri or Lisa Fodero will be pleased to provide any further information that may be required prior to the case study site visits.

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We would also greatly appreciate it if each site could nominate a case study coordinator with whom we may liaise to work through the specific details of the process at each site. We will ask the case study coordinators to assist us with the identification of the relevant managers and clinicians to be involved in interviews and with the logistics associated with achieving the required meetings in a two to three hour period that does not cause undue disruption to the patient treatment work of the service.

2

Issues to be discussed

The issues to be discussed through the case study process come from the project terms of reference (see Appendix A). As previously stated, we will be conducting approximately two to three hour visits to the selected 20 radiation oncology services. The objective of the visit is to have a series of discussions with personnel involved in the management and delivery of the services. Key areas we expect to cover are:

- any issues associated with the completion of the facility survey, including the provision of explanation and assistance by HealthConsult as required;

- overview of the service model used by the radiation oncology facility (i.e. number of linacs, key therapies in use; number of clinicians in the various disciplines, etc);

- overview of the key cancer sites/types treated a the facility and the specific therapies that are used for the major cancer sites/types (i.e. specific service profiles);

- discussion of how the service model might need to change in response to trends in cancer incidence including planned developments in services at the facility (i.e. additional linacs, additional features on existing linacs, additional staff recruited in key disciplines, role substitution amongst staff in key disciplines, etc.);

- the current workforce situation of the service covering the issues related to any perceived shortfall in staff, the recruitment and retention strategies used, and any location (metro vs. non-metro) or sector (public vs. private) specific concerns;

- the desired service model in terms of linear accelerators and staffing levels for the service and its feasibility/affordability in the location;

- views on emerging radiation oncology technologies and the impact that they will have on workforce requirements in the key disciplines; and

- the local approaches to workforce planning (including recruitment and retention) and ideas on workforce solutions that may be used to deal with identified issues.

3

Case Study Format

Each case study will involve a site visit for two to three hours by Joe Scuteri and Lisa Fodero (the HealthConsult team). Whilst the precise scope of the visits will vary from site to site, we have outlined a program for each of the visits. We anticipate that we will need to speak to a range of stakeholders who will be in a position to discuss details of issues relating to workforce planning. The key meetings to be held in the consultations include:

Meeting with the Facility Director/Manager (and/or proprietor(s) in the case of private facilities). The meeting will provide us with an overview of the services and the issues related to workforce planning. It will also enable us to discuss and resolve any issues associated with completion of the facilities survey.

Meeting(s) with the heads of radiation oncology, radiotherapy and medical physics. This meeting (or meetings if it is more convenient to meet with the three individuals separately) will cover the detailed issues with regards to the numbers (actual and desired) of professionals in each discipline, the recruitment and retention issues and the emerging service delivery issues and their impact on workforce needs.

Focus Group workshop for ROs, RTs, medical physicists and services managers working at the facility. This meeting will enable all staff in the three key disciplines to contribute their views on the workforce planning issues and their ideas on strategies that might be used to address the issues.

We expect that the maximum length of time for any one meeting will be one hour but most meetings should be able to be completed within 30 to 45 minutes. It is likely that there will be somewhere between three to four meetings (to be determined in consultation with the nominated case study coordinator) at each site to allow all stakeholders to be engaged.