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RADIATION ONCOLOGY—ORIGINAL ARTICLE

Faculty of Radiation Oncology 2018 workforce census

John Leung,[1,2] Dion Forstner,[3] Raph Chee,[4] Melissa James,[5] Eddy Que[6] and Shahin Begum[6]

1 University of Adelaide Medical School, Adelaide, South Australia, Australia
2 GenesisCare, Adelaide Radiotherapy Centre, Adelaide, South Australia, Australia
3 GenesisCare, St Vincents Hospital, Sydney, New South Wales, Australia
4 School of Surgery, University of Western Australia, Perth, Western Australia, Australia
5 Christchurch School of Medicine, Canterbury Regional Cancer and Blood Service, University of Otago, Christchurch, New Zealand
6 Royal Australian and New Zealand College of Radiologists, Sydney, New South Wales, Australia

J Leung MBBS, FRANZCR; **D Forstner** MBBS, FRANZCR; **R Chee** MBBS, FRANZCR; **M James** MBBS, BSc, FRANZCR; **E Que** BA; **S Begum** MPhil, MSc, BA.

Correspondence
Associate Professor John Leung, 352 South Terrace, Adelaide 5000, South Australia, Australia.
Email: john.leung@genesiscare.com

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Abstract

Introduction: This paper reports the key findings of the Faculty of Radiation Oncology 2018 workforce census and compares results with previous studies.
Methods: The census was conducted in mid-2018 with distribution to all radiation oncologists and trainees listed on the college database in Australia, New Zealand, Singapore and overseas. There were new questions about hours spent on multidisciplinary meetings (MDTS), leadership positions held, management of inpatients, hypofractionation, stereotactic body radiation therapy (SBRT), income type and gynae-oncology work for radiation oncologists. Trainees were asked about time spent on planning and contouring.
Results: The overall response rate was 69.9% with 67.7% of radiation oncologists and 77.9% of trainees responding. There were 514 radiation oncologists with 60% male and a mean age of 49 years (median = 46 years, range 31–91). The majority of respondents were Caucasian (57.7%) and from New South Wales (29.4%). Sixty-one per cent were subspecialists with breast, SBRT and urological cancers, the most popular areas of interest, and 56% held leadership positions. The majority worked in the public sector (55.7%), but 31.7% worked solely in the private sector with an average working week of 43.4 hours (h) (median = 44, range 2–110). Radiation oncologists spent an average of 3.6 h on MDTS (median = 4 h), 2.2h (median = 2 h) on simulation and 8 h (median = 5 h) on contouring per week. They averaged 245 new patients (median = 250, range 30–695) and 25 inpatients (median = 20) per year. Hypofractionation was used for radical treatment of breast (75%) and prostate cancer (49%). Radiation oncologists were mainly remunerated with a fixed income (53%) with 40% having some incentive-based income. There were 140 trainees with an equal male and female distribution. The large majority (88%) were satisfied with their career and network (83%). Most trainees worked between 36 and 55h per week with 15% having no protected. Most trainees spent less than 5 hours on planning each week and job availability remained a major concern (90%).
Conclusions: The radiation oncologist numbers have increased significantly, but unemployment remains low. Many parameters remain similar to the 2014 census, but new information has been obtained on special interest areas, leadership positions, gynae-oncology, inpatients, hypofractionation use, remuneration and contouring. Trainee numbers remain stable with an increased percentage satisfied with their career with much less concern about oversupply. Protected time remains an issue with contouring time and teaching emerging as a potential issue.

Introduction

This is the sixth Royal Australian and New Zealand College of Radiologists (RANZCR) workforce census of radiation oncologists and trainees in Australia, New Zealand and Singapore with previous studies undertaken in 1996, 2000, 2006, 2010 and 2014.[1–5] The 2006 results were not fully published, and there was a long gap before the 2010 survey.[3,4] The 2010 survey created a faculty database that could be updated regularly to analyse workforce trends and make appropriate recommendations.[4] In 2014, the terminology was changed and the survey became known as the census.

The Economic and Workforce Committee (EWC) then decided to conduct a census every four years. In 2012, the faculty performed a separate trainee survey.[6] However, it was decided to incorporate radiation oncologists and trainees in one study, rather than have separate censuses. Thus, in 2014, the census included both fellows and trainees.[5]

The information obtained in this census will be used to analyse workforce trends and predict future staffing and training requirements. The actual census questions are included in Appendix S1.

Methods

The 2018 census was conducted from July to September 2018. All active radiation oncologists and trainees listed on the FRANZCR database were invited to participate.

Questions were designed and tested by the EWC. A key purpose of the census was to analyse workforce trends, so many of the questions were repeated from the 2010 survey and 2014 census. It was also considered relevant to question the membership about new trends and issues that are topical.

For radiation oncologists, new questions were asked about the hours spend on MDTs, management of inpatients, the use of hypofractionation, SBRT, income type, gynae-oncology work and leadership positions held. Trainees were asked about time spent on planning and contouring.

The census was distributed via Survey Monkey with weekly email reminders. It was closed at the end of September 2018.

Some respondents did not answer every question, and there were also certain logical rules that resulted in a different number of respondents between questions. For example, for radiation oncologists who identified themselves as retired, questions regarding work hours or workplace were omitted.

The responses were analysed to highlight workforce trends. The analysis was done with Microsoft Excel.

Results

Radiation oncologists

Eligible study sample

All radiation oncologists and trainees registered on the RANZCR database as of June 2018 were eligible. This included those retired, working overseas and educational affiliates.

The census was sent to 514 radiation oncologists with responses from 348 (67.7%; Table 1). Thirteen radiation oncologists identified themselves as retired and were not asked questions relevant to practising radiation oncologists.

An analysis of nonrespondents revealed similar demographics to respondents, and thus, the results were not influenced by nonresponder bias.

Educational affiliates, members who practise at consultant level but who have not obtained Fellowship of the RANZCR (FRANZCR), are typically those who have completed their specialist medical training overseas and practice in Australia or New Zealand through the international medical graduate pathway. Due to the small numbers of educational affiliate members, education affiliates were not analysed as a subset of practising radiation oncologists.

Personal and demographic data

The RANZCR database identified 60% of radiation oncologists as male and 40% as female. The average age of consultant radiation oncologists was 48.7 years, with a median of 46 years (range 31–91). Most radiation oncologist respondents were from New South Wales (29.4%) followed by Victoria (20.4%) and then Queensland (16.3%).

Members were asked to indicate the ethnicity to which they most identified with. More than half of the

Table 1. Population of radiation oncologist respondents

	N (population)	*n* (respondents)	Response rate (%)
Australia			
Fellows	381	274	71.9
Retired members	28	10	35.7
Life members	7	4	57.1
New Zealand			
Fellows	54	40	74.1
Retired members	4	1	25.0
Educational affiliates	4	2	50.0
Life members	2	2	100.0
Overseas			
Fellows	32	13	40.6
Retired members	2	2	100.0
Total	514	348	69.9

respondents identified as Caucasian (Australian (47.8%) or New Zealanders (9.9%)) and a substantial percentage as Asian (Chinese, South East Asian or other Asian; 20%) and Indian/Sri Lankan heritage (8%).

On average, responding radiation oncologists graduated from medical school 23 years ago (mean and median). Twenty-three per cent (n = 74) of respondents held another qualification besides their primary medical degree and fellowship with 26 holding a Doctor of Medicine (M.D.), 16 a Doctor of Philosophy (Ph.D.) and three a Masters of Philosophy (M.Phil.).

Special interest areas and generalist vs subspecialist

The most popular special interest areas were breast (n = 160), SBRT (n = 137), urological (n = 121) and lung (n = 119) (Figure 1). There were 24 in the 'other' category which included benign disease, late effects, Merkel cell carcinoma, public health and medical information.

For the 62 members who had a special interest in gynae-oncology, there were 35 females and 27 males. Forty-three spent less than a quarter of their time doing this work with two spending all of their time doing this specialty. Thirty-eight performed cervix high-dose-rate brachytherapy, 49 performed vaginal vault brachytherapy, and the large majority at 59 members intended to continue with this specialty.

Most respondents indicated they were subspecialists (n = 157, 60.6%) compared to generalists (n = 107, 39.4%).

Leadership positions

This question was answered by 319 respondents revealing 179 (56.1%) holding leadership positions. There were many and varied leadership positions nominated. The number of males in leadership positions (n = 108) was statistically significantly higher than females (n = 71) (Tables 2 and 3), but this is not significant when one takes into account the higher number of male respondents.

Practice location and work hours

Respondent radiation oncologists worked at an average of 2.2 sites with a median of 2.0 (range 1–8). The majority worked exclusively in the public sector (55.7%), nearly one-third (31.7%) worked solely in the private sector, and a minority (12.6%) worked across both public/private.

Work hours

For each respondent, the number of reported hours (h) spent working at each practice location was added together for the total number of actual and clinical hours spent per week (Table 4). The mean FTE status for respondents was 0.89 (median 1.0; range 0.1–1.6) with males averaging 0.92 and females 0.82.

Males reported longer actual hours and clinical hours per week compared to females, averages of 45.4 h vs 40.7 h (median 45 h vs 40 h) and 37.6 h vs 34.1 h (median 37 h vs 34 h), respectively, but when differences in FTE status were taken into account, this became non-significant.

Respondents working exclusively in the private sector averaged 36.6 h (median = 40), those exclusively working in the public sector averaged 43.7 h (median = 45), and those working in both public/private practice averaged 44.9 h (median = 44) per week (P = 0.02).

The actual (total hours) and clinical (hours spent on clinical work) work hours per week for radiation oncologists were broken down by geographical location (Table 5).

Fig. 1. Special interest areas.

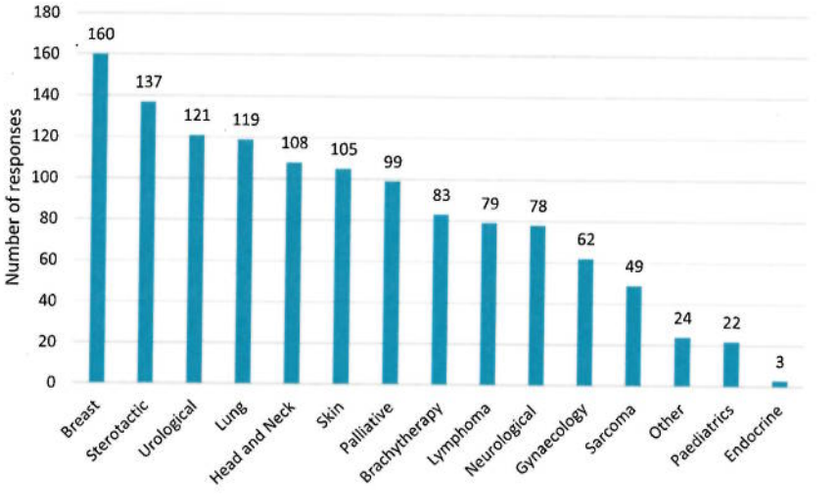

Table 2. Number of leadership positions

Number of leadership positions	Number of male respondents (percentage of respondents %)	Number of female respondents (percentage of respondents %)	Total respondents (percentage of respondents %)
0	73 (22.9)	67 (21.0)	140 (43.9)
1	59 (18.5)	40 (12.5)	99 (31.0)
2	24 (7.5)	15 (4.8)	39 (12.3)
3	16 (5.0)	9 (2.8)	25 (7.8)
4	8 (2.5)	2 (0.6)	10 (3.1)
5	0 (0)	3 (0.9)	3 (0.9)
6	2 (0.6)	0 (0)	2 (0.6)
10	0 (0)	1 (0.3)	1 (0.3)
Total	182 (57.0)	137 (43.0)	319 (100)

Table 3. Examples of types of leadership positions

Examples of types of leadership positions
Director of training
Director of department
Member/Chair of college committee
Chair of MDT
Accreditation panel member
Chair of clinical management committee
Director of regional health service
Member/Chair of special interest group
Examiner
Training network director
Editor of journal
'Lead' radiation oncologist in specialty area
Member of GenesisCare clinical leaders forum
Member of Anti Cancer Council
Deputy director of department
Senior medical advisor
Clinical leader of radiation oncology

Table 4. Reported total actual and clinical hours per week

Category	Actual hours			Clinical hours		
	Mean	Median	Range	Mean	Median	Range
Fellow	43.4	44.0	2–110	36.1	36.0	2–100

South Australians worked the longest actual hours per week (49.4), whilst Western Australians averaged the longest clinical hours at 40.2 h per week. However, most states shared a close range in actual and clinical hours.

New cases, follow-ups, treatment reviews and planning hours

Radiation oncologists spent an average of 6.5 h (median = 6h) per week on new cases, 8.4h (median = 8h) on follow-ups and 4.2h (median = 4h) on treatment reviews. Those in the private sector spent more hours on

Table 5. Reported total actual and clinical hours per week by geographical location for radiation oncologists

	Total actual hours		Clinical hours	
	Mean	Range	Mean	Range
New South Wales	43.0	8–110	33.9	6.7–90
Victoria	41.9	8–100	34.6	4–60
Queensland	44.6	16–110	39.0	16–59
South Australia	49.4	28–110	37.0	20–90
Western Australia	38.5	12–80	40.2	12–57
Tasmania	40.5	33–46	35.5	27–46
Northern Territory	35.0	24–41	26.7	16–34
Australian Capital Territory	39.0	20–55	32.4	20–49
New Zealand	47.2	2–77	37.2	2–77
Overseas	39.0	39–39	37.0	37–37

Table 6. Hours per week spent on activities for radiation oncologists

Activities	Mean	Median	Range
New cases	6.5	6.0	1–20
Follow-ups	8.4	7.0	1–30
Treatment reviews	4.2	3.0	1–30
Multidisciplinary meeting	3.8	4.0	0–26
Simulation	2.2	2.0	0–10
Dosimetry	2.7	2.0	0–15
Contouring	8.0	6.0	1–20
Supervision	3.5	2.0	0–41
Teaching	1.3	1.0	0–10
Research	2.6	1.0	0–30
Management	3.3	2.0	0–20
Jurisdiction/quality committee	1.6	1.0	0–30
Other	3.0	2.0	0–20

treatment reviews with 5.9h v 5.1h for those in public/private vs 3.2h for those in the public sector ($P = 0.01$). Respondents averaged 49.6 minutes (m) (median = 50m) for each new case, 17.9m (median = 15m) per follow-up case and 10.5m (median = 10m) per treatment review. For follow-ups, those in the private sector spend the most time with 20.7m vs 18.2m for those in the public sector and 16.8m for those in public/private ($P = 0.004$). Females averaged 11.3m per treatment review compared with 10.0m for males ($P = 0.019$).

Radiation oncologists spent an average of 3.6h (median = 4h) per week on multidisciplinary team meetings (MDTs) (range 0–26), 2.2h (median = 2h) on simulation, 2.7h (median = 2h) on dosimetry and 8.0h (median = 5h) on contouring (Table 6).

Supervision, teaching, research and other hours

Radiation oncologists averaged 3.5h (median = 2h) on supervision, 2.6h (median = 1h) on research, 3.3h (median = 2h) on management, 1.3h (median = 1h) on

teaching, 1.6h (median = 1h) on jurisdiction/quality committee and 3h (median = 2h) on 'other' activities per week. The 'other' category included activities such as business development, community public speaking, journal reading, oncology software development and answering emails daily.

New patients per year, work status and bed cards

Radiation oncologists reported seeing an average of 245 new patients per year (median = 250; range 30–695). Males averaged 269 new patients per year compared with 210 for females ($P = 0.002$). However, if adjusted for 1 FTE status the numbers were 286 compared to 256 ($P = 0.04$). The comparison between public/private sector, private and public sectors were 282, 231 and 219, respectively ($P = 0.03$). The geographical distribution revealed the highest average for South Australia at 385, followed by Western Australia 327, Tasmania 281, Queensland 248, New Zealand 235, Victoria 229, NSW 220, Northern Territory 215, Overseas 200 and ACT 196 ($P = 0.01$). Figure 2 shows the overall distribution.

Most radiation oncologists (74.2% $n = 193$) managed inpatients under their own bed cards, and the large majority (74.6% $n = 194$) thought this was still worthwhile. They managed an average of 25 (median = 20) inpatients per year. There were 260 respondents to this question.

Hypofractionation and SBRT use

The adoption of hypofractionation in various disease sites is depicted in Table 7.

SBRT was used by the large majority of respondents ($n = 167$, 64.2%) with the most common sites being lung, bone and brain.

Remuneration

The remuneration question was asked to identify the type of remuneration package. Remuneration was mostly on a fixed income ($n = 139$, 53.3%) or mixed fixed income and incentive-based ($n = 104$, 39.8%), but a small proportion had their income purely incentive-based ($n = 18$, 6.9%).

Employment and future practice

Two-thirds of employed respondents ($n = 177$, 67.6%) indicated no intention to change their work hours over the next three years. Four respondents (1.3%) reported being unemployed at the time of the census. All those on leave ($n = 8$) intended to return to work within a year.

Over half of respondents had no intention to retire in the foreseeable future, but a small minority ($n = 30$, 11.5%) intended to retire within 5 years. (Table 8). There were just over 20% (21.8%, $n = 51$) intending to decrease hours with 10.8% ($n = 28$) intending to increase hours.

The thirteen retired members retired between the ages of 62 and 73 and from the years 1994 to 2013.

Early career

There was a period of unemployment for six (1.7%) respondents after admission to fellowship. The majority of respondents became a consultant ($n = 158$, 44.4%) and fellow ($n = 146$, 41.0%) or did locum work ($n = 46$, 12.9%).

Trainees

Eligible study sample and demographics

One hundred and forty trainees were identified in the RANZCR membership database with an even distribution

Fig. 2. New patients per year.

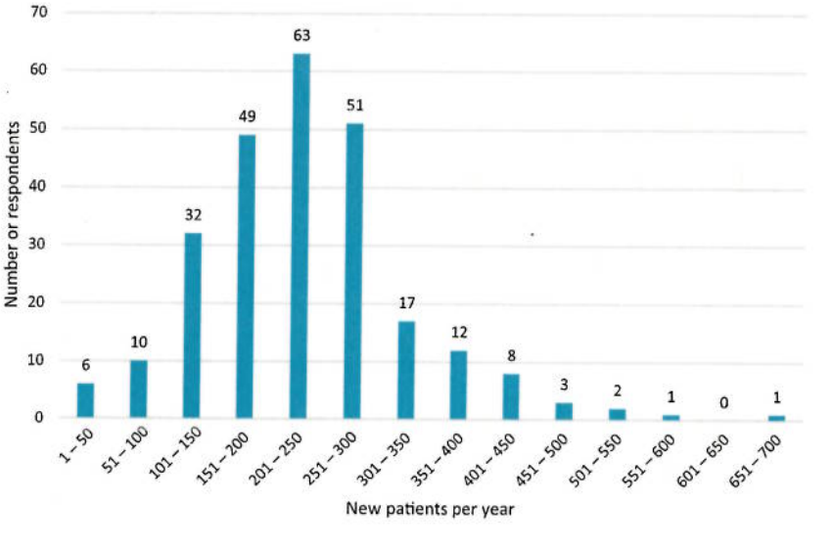

Table 7. Hypofractionation use

Site	Number (*n*)	Percentage of respondents (%)
Breast	186	75.0
Prostate	120	49.2
Glioblastoma multiforme	115	48.7
Preoperative rectum	108	44.6
Single dose for bony metastases	243	94.2

Table 8. Future intentions of radiation oncologists

Change work hours in next 3 years	*n*	%
No change	177	67.6
Yes, increase hours	28	10.7
Yes, decrease hours	57	21.8
Intention to retire		
Not in foreseeable future	141	53.8
0–5 years	30	11.5
6–10 years	39	14.9
11–15 years	52	19.8

Table 9. Population and location of trainee respondents

	N	*n*	Response rate (%)
Australia	115	88	76.5
New Zealand	22	18	81.8
Overseas	3	3	100.0

Table 10. Trainee respondents' year of training

	Number	Percentage (%)
Year 1	23	22.8
Year 2	20	19.8
Year 3	14	13.9
Year 4	17	16.8
Year 5	16	15.8
Beyond year 5	11	10.9
Total	101	100.0

of gender (male: $n = 68$, 48.6%; female: $n = 72$, 51.4%). There were 109 (77.9%) trainee respondents to the census, although in many questions there were 100–101 respondents. Table 9 reveals some relevant demographic data.

The mean age of trainees was 32.4 years (median = 32, range 25–47). The geographical origin reflected that of radiation oncologists, with most trainees from New South Wales (36.4%), followed by Victoria (17.9%), Queensland (16.4%) and New Zealand (15.7%).

Trainee respondents were evenly distributed amongst the five years of training, with a number beyond year 5 in training. (Table 10).

Almost half of trainee respondents ($n = 48$, 47.5%) held another degree besides their medical degree with the most common being a Bachelor of Science ($n = 13$), Bachelor of Applied Science ($n = 7$), Bachelor of Medical Science ($n = 4$) and Bachelor of Pharmacy ($n = 3$). Three trainees held another medical specialist qualification which included a Fellowship of the Australian College of Rural and Remote Medicine, Membership of the Royal College of Physicians and Fellowship of the Royal College of Pathologists of Australia.

Trainee perceptions of radiation oncology as a career

The majority of trainee respondents ($n = 88$, 88%) were satisfied with radiation oncology as a career, and 83% satisfied with their training network. Fourteen per cent ($n = 14$) of trainee respondents would have reconsidered joining the specialty if they were aware of a perceived oversupply.

The top factors (in descending order) influencing career choice were interest in oncology patients, lifestyle after training, work hours and previous attachments as a student or junior doctor. (Table 11) Trainees could have selected more than one factor.

Trainee duties and protected time

Most trainees worked either between 36 and 45h ($n = 32$, 31.6%) or between 46 and 55h ($n = 32$, 31.6%) per week. However, 12 reported working over 55h per week. Nearly two-thirds ($n = 62$, 61%) were on call less than or equal to 5h per week; however, 7% ($n = 8$) reported being on call for over 20h per week.

Trainees had a median of 2h (range 0–≥4) per week of protected time for teaching, but a median of 0h (range 0–≥4) for research and other activities. (Table 12).

Planning and part-time training

The vast majority of trainee respondents ($n = 81$, 81%) reported spending five or less hours on planning each week, with 64% ($n = 64$) spending less than five hours per week contouring. A small number ($n = 8$, 8.0%) were working or planning to work part-time for at least 12 months. Fifty-two per cent ($n = 52$) reported a desire to work part-time, with females more likely to do so than males ($P < 0.001$).

Challenges associated with radiation oncology training

The most difficult aspects of radiation oncology perceived by trainees are shown in Table 13 (respondents could have selected more than one option).

The greatest sources of stress were training demands ($n = 83$, 83.0%), job prospects ($n = 67$, 67.0%),

Table 11. Factors influencing career choice

Factor	*n*	%
Interest in oncology patients	89	88.1
Lifestyle after training	64	63.4
Work hours	52	51.5
Previous attachments as student or junior doctor	49	48.5
Lifestyle during training	48	47.5
Use of technology	48	47.5
Family considerations	41	40.6
Reputation of staff	39	38.6
Interest in physics	39	38.6
Training programme reputation	30	29.7
Interest in radiology	30	29.7
Research opportunities	29	28.7
Earning potential	25	24.8
Job availability	11	10.9
Other	3	3.0

Table 12. Protected time for trainees

Hours per week (h)	Number (*n*)	Percentage (%)
0	15	15.0
1	23	23.0
2	23	23.0
3	16	16.0
4	15	15.0
>4	8	8.0
Total	100	100.0

balancing responsibilities (n = 62, 62.0%) and job demands (n = 56, 56.0%). Most trainees found a mentor to be useful (82%), with only four per cent not finding one useful.

Trainees' future plans

Almost all trainee respondents (n = 98, 98%) intended to continue their career in radiation oncology with 70 per cent (n = 70) wanting to do a fellowship after training. The main reasons for pursuing a fellowship were to gain special skills and expertise (n = 65, 65.0%), to be more competitive in the job market (n = 55, 55.0%) and to ease the transition into a consultant position (n = 51, 51.0%).

The majority of respondents (n = 92, 92.0%) intended to have an academic component in future work, reporting an interest in teaching (n = 66, 66.0%), clinical research (n = 53, 53.0%), a wish to practise in a large teaching centre (n = 43, 43.0%) and an interest in future leadership or administrative opportunities (n = 41, 41.0%) as the predominant reasons. Those not interested in future academic work cited primary interest in patient care and no interest in research as the main reasons.

Eighty-seven trainee respondents (n = 87) were not in bonded medical places, and 83 per cent (n = 83) indicated they wanted a job where a subspecialty clinical interest could be pursued.

Table 13. Most difficult aspects of radiation oncology for trainees

	Number (*n*)	Percentage (%)
Maintaining currency in general medicine	51	51.0
Radiation treatment planning	45	45.0
Trying to understand different cancer treatments	38	38.0
Lack of prior knowledge about the specialty	27	27.0
Dealing with patients when treatments fail	26	26.0
Adjusting to new ways of thinking and treatments that are different to previous medical training	25	25.0
Palliative care	12	12.0
Other	6	6.0

The 48 trainees (48%) who intended to work part-time post-training plan to work 0.5 to 0.6 FTE (n = 14, 29.2%), 0.7 to 0.9 FTE (n = 22, 45.8%) or were unsure (n = 12, 25.0%). Family commitments, parental leave and lifestyle were all equally cited as the main reasons.

There was a preference to work in an urban department by 43 trainee respondents (43.0%), with 32 (32.0%) undecided; 19 (19%) intend to do a combination of urban and rural practice; and 6 (6%) intend to work in a rural department. Most trainee respondents expressed an intent to work in both public and private practice (n = 56, 56.0%) with 43 (43%) wanting to work in the public sector only. Only one respondent reported an interest in exclusive private practice.

Trainee future concerns

Job availability was the major concern for 90% (n = 90) of trainee respondents, followed by fellowship opportunities (n = 40, 40.0%)

Comments by respondents

All respondents were given the opportunity to add further comments. There were 55 responses with very diverse answers. There were five suggestions/criticisms of the census; four comments about contouring complexity; three comments on inpatient load; three comments from retired practitioners wanting to do more work; two comments about increased documentation; and two respondents praised the census.

Discussion

This is the sixth Faculty of Radiation Oncology workforce census and the fourth one this century.[1–5] A separate New Zealand analysis was also published in 2015, and a planned separate New Zealand analysis will follow this census. [7] A major difference in this census was the much

higher number of radiation oncologists in Australia, New Zealand (ANZ) and Singapore ($n = 514$) compared to previous censuses. ($n = 439$ in 2014, $n = 396$ in 2010 and $n = 108$ in 1996). These increased numbers are necessary to improve patient access to treatment as outlined by the Baume report and the Radiation Oncology Tripartite Committee, but there has been apprehension about job availability especially for new graduates.[8–11]

It is acknowledged that there may be potential discrepancy between workforce requirements to match theoretically increased utilisation rates and new graduates trying to secure a job. However, a recent study has revealed over 90% of recent graduates in ANZ and Singapore were employed with over half of them employed as consultants.[11] All three censuses this century have also revealed low unemployment amongst radiation oncologists in general with 1.3% unemployed in this census compared to 1.5% in 2014 and 2.6% in 2010.[4,5]

The question on ethnicity revealed no Aboriginal/Torres Strait or Māori practitioners. There has been a strong desire to attract indigenous doctors into the RANZCR training programme; however, the impact has not yet been seen suggesting that more needs to be done given the disparity in health outcomes between the indigenous and nonindigenous Australians. Under-represented minority groups have been highlighted in the United States (US) workforce which continues to be low, but at least they have some representation (4–7%).[12–14] There is an increasing proportion of Asian representation amongst radiation oncologist respondents up from 13 to 20 per cent. The proportion of female radiation oncologists in the workforce remains steady at around 40 per cent.[5]

The census also showed that although there were more males in leadership positions, this was not statistically significant because this was distributed in proportion to the number of males and females in the workforce. This would suggest that there is no impediment to females becoming leaders on these data compared to males.

The question on leadership positions was asked to ascertain what other roles members had besides their 'routine' clinical work. We did not specify an exact definition of a leadership role, and hence, this could be subject to broad interpretation. Nevertheless, over half of respondents perceived themselves to be in a leadership role. The 2018 census focused on new issues relevant to current practice and of interest. The area of special interest unsurprisingly revealed breast cancer as the most popular area. Perhaps surprisingly SBRT was ranked second above urological and lung cancers. The widespread adoption of SBRT by ANZ and Singaporean radiation oncologists is in keeping with our United States counterparts who had 85% of their practitioners using it in their most recent study.[14]

Gynae-oncology questions were asked because there was a perception that this highly specialised area involving both external beam radiation therapy and brachytherapy might be decreasing. Indeed, it revealed only a minority of the radiation oncologists practise in this area ($n = 62$), and the majority of those who do so spend less than a quarter of their time doing this specialty. There are no comparative previous census figures to ascertain trends.

This census revealed many more respondents working solely in private practice (31.7%) compared to the previous census (14%), which is in accordance with the growth of new private practices in Australia over the last several years.[5] Indeed, radiation oncologists practising in private practice were highlighted at the 2018 RANZCR annual scientific meeting with a specific session devoted to this. Interestingly, the United States has seen a reverse trend. In 2002, there were 76% in private practice and 17% in academic practice.[15] In 2017, there were 40% in private practice and 40% in academic practice.[14]

Contouring is an integral and defining activity of a radiation oncologist's practice and has evolved significantly over the years in time required and complexity, so it is reasonable to obtain information on this activity. Trainees reported an inadequate time devoted to contouring with 25% spending less than one hour per week in a recent study.[16] The average 8h (median = 5h) per week reported by radiation oncologist respondents would suggest that trainees need to be facilitated in this activity and training needs to reflect adequate teaching and time.[16]

The management of inpatients is still a defining activity of radiation oncologists, although it has been noted some sites now do not have inpatients under radiation oncologist bedcards. There has been some debate about this; proponents advocating that as clinicians, managing inpatients is a crucial activity, whilst those opposed to managing inpatients have found that is has been difficult to keep up to date with developments in general medicine or it is too time-consuming. The fact that nearly three-quarters of radiation oncologist respondents thought it worthwhile to have inpatients under their own bedcard and in actual practice did so is reassuring to the official position of RANZCR.

Hypofractionation has been widely adopted with highest utilisation in breast cancer, but recent randomised trials on both prostate cancer and glioblastoma multiforme demonstrating noninferiority should see these areas rise.[17–20]

Remuneration is a sensitive area to ask questions about, but the census has revealed 44% ($n = 115$) of radiation oncologist respondents having some of their income based on incentive. This compares to 77% in the US workforce study, although 37% of the US respondents had a decrease in pay over the last few years, primarily due to a workforce not dependant on pure productivity models and decline in reimbursement.[14]

There are many similarities to the 2014 census. These include the average age of radiation oncologists; the

gender ratios; geographical distributions of the workforce; work hours; time spent on new patients, follow-ups and treatment reviews; supervision, teaching and research hours; the proportion of specialists versus generalists; those intending to change hours or retire; and low unemployment. Although the number of new patients per year is often used as a measure of workload, other parameters such as number of courses of radiation are important, particularly as there are a number of patients being retreated. It is also acknowledged that there are some new patients that are seen but not treated. So, it may be reasonable that future censuses collect information on the number of courses of radiation administered per radiation oncologist.

The trainee part of the census has revealed remarkable similarities to the 2014 census.[5] Trainee numbers have stabilised, with 140 in this census compared to 142 in 2014 and 143 in 2010.[4,5] There was concern that numbers may drop because of concerns of oversupply in the workforce but, as mentioned previously, over 90% of recent graduates are finding employment.[11] This is reinforced by the much larger percentage of trainees at 98%, intending to continue in their career in radiation oncology compared to 85% in the last census.[5]

This census has also revealed only 14% of trainees would have reconsidered their choice of specialty if they had known about workforce oversupply. It was 50% in the last census. Some trainees have commented that many specialties are now facing oversupply, so it is less of a consideration.

Another significant difference was more trainees were satisfied with their career at 88% compared to 71% at the last census.[5] Accreditation visits to sites over the last several years have noted a general satisfaction amongst most of the trainee workforce, and multiple issues that might potentially cause dissatisfaction have been dealt with by the accreditation panel (J.L personal communication).

Contouring has been identified as an issue for trainees with the majority spending less than or equal to five hours per week on this activity. A recent study indicated 25% of trainees spending less than two hours per week on this activity and a large majority wanting more time on this activity irrespective of the actual hours spent.[16] The census length did not allow more questions on this crucial activity, and hence, a more detailed study was done which will be reported separately.[16]

Protected time for trainees requires close monitoring as the proportion receiving no protected time (15%) remains similar to the 2014 census.[5] The 38% receiving one or less hours per week was also similar to the last census at 40%.[5] However, those receiving four or more hours per week rose from 15 to 23%.[5]

The other aspects of the trainee part of the census remain similar to 2014. This includes factors influencing career choice; clinical duties and overtime; most difficult aspects of radiation oncology; approval of a mentor; desire for part-time training; sources of stress; intention to have an academic component to practice; intention to work in a mixture of public and private practice and in an urban department; and concerns about job availability.

A topical area for trainees is burnout with recognition that this may be occurring in half of the trainees.[21] Although this census did not specifically deal with this subject, questions about sources of stress and the value of mentoring are related to this area. There is now information on the prevalence and measures to reduce burnout and emphasis which is beyond the scope of the census.[22,23]

In conclusion, The 2018 RANZCR FRO workforce census has continued the accumulation of data from previous censuses. There are similarities to the previous 2014 census including demographic data, work hours, division of time for radiation oncologists, new patients seen per year, those intending to retire and low unemployment. For trainees, there are also many similarities especially with trainee numbers, factors influencing career choice, clinical duties and concerns about job availability. However, trainees are more satisfied with their career and network, with an increased proportion intending to continue with their career.

The radiation oncologist numbers have increased significantly from the previous census, and although there is currently low unemployment, continuing workforce censuses to monitor workforce trends is recommended. Lack of indigenous workforce in radiation oncology is an ongoing concern, and this needs a multipronged approach by the college and other stakeholders. The increase in radiation oncologists practising SBRT reflects the increasing role of SBRT in radiation oncology. Given the lack of sufficient prospective data, this is a potential area of research to evaluate patterns of practice and outcomes. Inadequate protected time and inadequate time spent on contouring remain ongoing concerns for trainees and departments with the college needing to address these issues.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix S1. 2018 Radiation Oncology workforce census.