**Trends and applicant characteristics in New Zealand: Radiation oncology vs. radiology**

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**ABSTRACT**

**Introduction**

Previous research has projected future shortages in radiation oncologists in Australia. Anecdotal evidence also suggests a similar pattern in New Zealand. Shortages in radiology workforce have not been forecast to date. The present study aimed to examine the trends in application to radiation oncology and radiology in New Zealand.

**Methods**

Data were collected on vocational training applicants and senior medical officer (SMO; consultant) positions from 2009 to 2016. Data were obtained from publicly-available data on the New Zealand Ministry of Health and RANZCR websites.

**Results**

Compared with radiation oncology, applications to radiology significantly outnumbered the available positions—a trend that continued to escalate between 2009 and 2016. In addition, the radiation oncology SMO workforce in New Zealand continued to attract less local graduates (i.e., more international medical graduates) compared with radiology.

**Conclusions**

This is the first study to shed light on application trends of application to the two specialties overseen by the RANZCR in New Zealand. Future efforts should focus on attracting more trainees to radiation oncology, addressing factors underlying the apparent discrepancies between the two specialties, as well as mental health wellbeing in trainees.

**INTRODUCTION**

The Royal Australian and New Zealand College of Radiologists (RANZCR) oversees the training of both radiation oncology and radiology across Australia and New Zealand; training in these specialties can also be done in Singapore. Both radiology and radiation oncology remain among the five most competitive specialties in the US residency match (National Resident Matching Program®, 2017). In Canada, training posts are consistently filled for these specialties, even though the number of available training positions differs in accordance with the predicted workforce need (Lalani et al., 2017). In Australasia, final-year medical students were found to have significant deficits in their awareness of radiation oncology, and had rated oncology among the worst taught subjects within the medical course (Bravery, Shi, Nicholls, et al, *in press*). Interest in either specialty as a career choice in Australia or New Zealand has not been formally assessed to date.

There appears to be a discrepancy in the rates of successful recruitment to radiology and radiation oncology in Australasia. Previous research has projected future shortages in radiation oncologists in Australia, partly due to under-recruitment of new trainees (Schofield et al., 2012). Anecdotal evidence also suggests a similar pattern in New Zealand (personal communication, Resident Doctor Support Team, Canterbury District Health Board). Shortages in radiology workforce, on the other hand, have not been forecast to date. With the increasing demand for qualified practitioners in both specialties (e.g., greater scope for newer radiation treatment modalities for various cancers, and the increase in interventional radiological procedures), future workforce shortages would be inevitable if recruitment of young doctors into these specialties is not enhanced.

The present study aimed to examine the trends in application to radiation oncology and radiology in New Zealand. Our *a priori* hypothesis was that successful application to radiology has been getting significantly harder compared with radiation oncology due to burgeoning interest in radiology but a stagnant interest in radiation oncology. We present the results in the context of the available literature in order to inform educators and interested policy-makers.

**METHODS**

*Data sources*

Data were collected on the total number as well as the number of successful vocational training applicants to radiology and radiation oncology. Data on senior medical officer (SMO; consultant or attending) positions and place of training were also collected. Freely-available data were obtained from the New Zealand Ministry of Health (Ministry of Health, 2017) and RANZCR (The Royal Australian and New Zealand College of Radiologists, 2017) websites. Only data pertaining to New Zealand training applicants and SMO between 2009 and 2016 were included.

*Statistical analysis*

Descriptive statistics and linear regression analysis were used to analyse the data. Statistical significance was determined if type I error rate was < 5% (p-value < 0.05). All analyses were performed using SPSS Statistics® software package (version 22.0.0.0).

**RESULTS**

*Radiation oncology*

Between 2009 and 2016, the mean number of applicants to the radiation oncology training was 5 (± 3.1) applicants/year. The mean number of available training positions was 4.3 (± 2.4) positions/year.

Between 2009 and 2015, there had been a mean of 3 (± 1.6) SMO positions/year. As of 2016, the number of radiation oncology SMO in New Zealand was 66. In 2013, the proportion of female radiation oncologists was 29%.

*Diagnostic and interventional radiology*

Between 2009 and 2016, the mean number of applicants to the radiology training was 40.6 (± 7.5) applicants/year. The mean number of available training positions was 17.8 (± 2.1) positions/year.

Between 2009 and 2016, there had been a mean of 18.3 (± 9.5) SMO positions/year. As of 2016, the number of radiology SMO in New Zealand was 468. In 2012, the proportion of female radiologists was 31.3%.

*Comparative analysis*

The competitiveness (as measured by the ratio of applicant numbers to positions offered) was significantly higher for radiology (2.3 ± 0.5 applicants per position) than radiation oncology (1.1 ± 0.3 applicants per position) training (*p* < 0.0001). In addition, through the years, competitiveness significantly increased for radiology (*p* = 0.02), but not radiation oncology applications (*p* = 0.2; see Figure 1).



Figure 1. Regression analysis demonstrating significantly increasing demand for Radiology but not Radiation Oncology training positions in New Zealand between 2009 and 2016.

The mean age of SMO was not significantly different between the two specialties (49 years for both). International medical graduates made a significantly higher proportion of the radiation oncology SMO workforce (54%) than of radiology (41%, *p* = 0.04).

**DISCUSSION**

This is the first study to shed light on application trends of the two specialties overseen by the RANZCR in New Zealand. Compared with radiation oncology, applications to radiology significantly outnumbered the available positions—a trend that continued to escalate between 2009 and 2016. In addition, the radiation oncology SMO workforce in New Zealand continued to attract fewer local graduates (i.e., more international medical graduates) compared with radiology.

Our findings support anecdotal difficulties of recruiting New Zealand medical graduates to the field of radiation oncology. Whilst the exact cause(s) for the observed trends are not known, several speculations can be made from reviewing the literature.

Several studies have attempted to ascertain specific factors associated with medical students’ choice of specialty. It is unlikely that a single factor solely affects that decision; rather, a constellation of intrinsic (e.g., personal interest) and extrinsic (e.g., perceived prestige or potential income) factors are at play (Jeffe et al., 2014). A survey of all medical students attending the Christchurch campus of the University of Otago (n = 204) in 2000 revealed that 18% ranked radiology as one of their top three career choices (Gill et al., 2001); no reference to radiation oncology was made. Less exposure to radiation oncology by medical students in Australia and New Zealand (Nicholls et al., 2018) could be a contributing factor to the trend observed in our study. Other factors are also likely to play a role in future specialty choice by medical students, including the availability of mentors and role models, as well as specialty-specific interest groups (Kost et al., 2019).

With improved work-life balance being increasingly advocated, it could be speculated that lifestyle factors, such as work hours, perceived stress and on-call duties, play a role in career decisions (Ip et al., 2010). Ip *et al* reported high job satisfaction among radiology trainees in Queensland, Australia (2010). Australian and New Zealand trainees in radiation oncology, on the other hand, reported high levels of burnout and stress (Leung & Rioseco, 2017). However, we acknowledge that the interaction between job satisfaction and burnout/stress is likely to be situational, complex and non-linear.

Other factors may also contribute to the differences observed, although the literature is less robust. The length of training is five years for both programmes (Ministry of Health, 2017), and is therefore unlikely to account for our findings. Similarly, New Zealand trainees are limited by contract provisions, and therefore, additional income from extra work is likely to be similar between trainees of both specialties. Future earning potential, on the other hand, could be a contributing factor, although no official data are available to enable meaningful comparisons.

Several limitations to our study ought to be mentioned. The findings only reflect the status of both RANZCR’s training programmes in New Zealand between 2009 and 2016. A more complete picture ought to be obtained in future studies by the inclusion of a longer time period as well as data from Australia and Singapore.

Currently, the New Zealand Radiology Education Trust provides scholarships and awards to young medical graduates in the hopes of sparking interest in RANZCR specialties—especially in radiation oncology (The Royal Australian and New Zealand College of Radiologists, 2017). Future efforts should focus on addressing mental health wellbeing in trainees, whilst also addressing workplace, training and other structural and systemic factors. If successful, this ought to enhance recruitment of junior doctors into these specialties, and combat any future calamities brought about by the anticipated shortage in the radiation oncology (and, to a lesser extent, radiology) workforces. Surveys aimed to target medical students and junior medical staff’s attitudes towards radiation oncology in order to identify perceived barriers are expected to help ascertain whether our assertions are true.

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