

REPORT

SPECIAL REPORT: RESULTS OF THE 2000–2002 ASSOCIATION OF RESIDENTS IN RADIATION ONCOLOGY (ARRO) SURVEYS

RESHMA JAGSI, M.D., D.PHIL.,* GREGORY M. CHRONOWSKI, M.D.,† DAVID A. BUCK, M.D.,‡
SONG KANG, M.D.,§ AND JAMES PALERMO, M.D.,¶ FOR THE ARRO EXECUTIVE COMMITTEE

*Department of Radiation Oncology, Massachusetts General Hospital, Boston, MA; †The University of Texas M. D. Anderson Cancer Center, Houston, TX; ‡Medical College of Virginia, Richmond, VA; §Duke University, Raleigh, NC; ¶Wake Forest University, Winston-Salem, NC

Between 2000 and 2002, the Association of Residents in Radiation Oncology (ARRO) conducted its 18th, 19th, and 20th annual surveys of all residents training in radiation oncology in the United States. This report summarizes these results. The demographic characteristics of residents in training between 2000 and 2002 are detailed, as are issues regarding the quality of training and career choices of residents entering practice. © 2004 Elsevier Inc.

Association of Residents in Radiation Oncology, ARRO, Radiation oncology residency, Resident training, Survey.

INTRODUCTION

Founded in 1982, the Association of Residents in Radiation Oncology (ARRO) was established to represent the interests of residents in the specialty of radiation oncology. Since its inception, ARRO has conducted annual resident surveys to gauge resident opinion regarding a variety of issues. Data generated from ARRO's annual survey have been used by the American College of Radiology (ACR) Standards and Accreditation Committee, the Radiation Oncology Residency Review Committee, the American Society for Therapeutic Radiology and Oncology (ASTRO), and the Society of Chairman of Academic Radiation Oncology Programs (1), as well as by the ARRO Executive Committee, when reviewing issues pertinent to resident training.

Previous surveys from 1986 (2), 1989 (3), 1992 (4), and 1993 (5) have been published, and each year the results of the annual survey are presented at the ASTRO meeting as part of the ARRO program. This report represents the fifth publication of the ARRO annual surveys and provides the results from the surveys administered in 2000, 2001, and 2002.

METHODS

In May of 2000, 2001, and 2002, survey questionnaires were administered to all residents currently in training in radiation oncology. In 2000, questionnaires were mailed to

residents. In 2001, questionnaires were distributed via both e-mail and conventional mail. In 2002, questionnaires were made available via the Internet, and residents who attended the ASTRO annual meeting were also asked to fill out paper questionnaires. In cases in which a resident's e-mail address was not available in 2001 or 2002, a questionnaire was sent via either conventional mail or fax.

Each questionnaire consisted of 43 questions focusing on demographics, clinical training, and career plans. Frequency distributions were calculated and statistical analyses performed using SAS computer software (SAS Institute Inc., Cary, NC). Chi-square statistics and Fisher's exact test were used to compare responses by gender and level of training and to examine trends between the years.

RESULTS

The number of analyzed responses from the 2000, 2001, and 2002 surveys are listed in Table 1. The actual response rate ranged from 25–30% in each of these 3 years, but random losses of data resulting from technical difficulties resulted in lower numbers of responses being available for comparative analyses.

Demographics

The mean age of respondents was essentially identical between 2000 and 2002: 32 years (median, 30 years) (Fig. 1).

Reprint requests to: Reshma Jagsi, M.D., D.Phil., Department of Radiation Oncology, Massachusetts General Hospital, Cox 3, 100 Blossom Street, Boston, MA 02114.

Presented in preliminary form at the 42nd, 43rd, and 44th Annual Meetings of the American Society for Therapeutic Radiology and Oncology.

Acknowledgments—The authors wish to acknowledge the support of Swati Bansal, President, Sage Computing, Inc., for assistance in the statistical analysis, and the invaluable administrative assistance of Nancy Crum of the American Society for Therapeutic Radiology and Oncology.

Received Sep 8, 2003. Accepted for publication Dec 4, 2003.

Table 1. Number of residents' and responses available for analysis by year

	Year		
	2002	2001	2000
Residents	516	525	498
Responses available for analysis	65	93	59

The median number of years that respondents had trained in radiation oncology was 2 in 2000 and 2001 and 3 in 2002. The median postgraduate year of respondents was 3 in 2000 and 2001 and 4 in 2002.

Of the respondents, 67% were male and 33% female in 2000, 73% male and 27% female in 2001, and 68% male and 32% female in 2002.

Most respondents had graduated from a North American medical school (91% in 2000, 85% in 2001, and 74% in 2002). Very few were board-certified or board-eligible in another specialty (4%, 3%, and 10%, respectively). A sizable minority had other graduate degrees: 28% in 2002, 30% in 2001, and 37% in 2000. Approximately half of these other graduate degrees were PhDs each year.

Choice of radiation oncology as a specialty

Respondents were asked to rate the influence of a number of factors upon their choice of a career in radiation oncology. These results are shown in Table 2.

Respondents were also asked if they were satisfied with their decision to enter a radiation oncology residency. The vast majority reported that they were satisfied, with 93% in 2000, 94% in 2001, and 95% in 2002 reporting being very or somewhat pleased.

Educational experience

Overall, the majority of respondents felt that they were receiving adequate training in their residency programs. This proportion increased from 56% in 2000 to 64% in 2001 to 80% in 2002, with borderline statistical significance for

Table 2. Factors having a strong or moderate influence upon respondents' decision to enter radiation oncology

Factor	Year		
	2000 (%)	2001 (%)	2002 (%)
Interest developed from prior experience	97	62	60
Interest developed from exposure as a medical student	33	71	65
Interest in oncology	66	87	93
Interest in physics	6	59	57
Interest in radiobiology	30	35	34
Interest in subsets of radiotherapy patients	38	52	50
Interest in research	33	60	54
Perceived job market in private practice	50	44	54
Perceived job market in academic practice	80	44	42
Lifestyle during residency	77	65	73
Lifestyle after residency	56	83	87
Earning potential	34	68	73
Entered as an alternative when not accepted into specialty of choice	43	1	9
Other	26	44	16

this trend ($p = 0.06$). The number of didactic lectures also appeared to be trending upward, from a mean of 6 lectures per week in 2000, to 9 lectures per week in 2001, and to 11 lectures per week in 2002 ($p = 0.07$).

Respondents were asked if they favored a number of potential changes to improve the quality of their education during residency training. An increasing proportion of respondents favored each potential change as the years progressed from 2000 to 2002, but only some of these trends achieved statistical significance. Increasing the staff to resident ratio was favored by 24% in 2000, 36% in 2001, and 44% in 2002 ($p = 0.11$). Increasing the minimum number of new patient consults was favored by 8% in 2000, 11% in 2001, and 18% in 2002 ($p = 0.02$). Increasing the number of case conferences run by residents was favored by 24% in 2000, 33% in 2001, and 50% in 2002 ($p = 0.01$). Increasing the number of didactic lectures by attending physicians was favored by 82% in 2000, 80% in 2001, and 95% in 2002 ($p = 0.17$). More time to read during the workday was favored by 64% in 2000, 82% in 2001, and 85% in 2002 ($p = 0.04$). Greater availability of attending physicians was favored by 50% in 2000, 57% in 2001, and 68% in 2002 ($p = 0.17$).

Clinical experience

The number of hours spent by responding residents at work in the clinic during an average week remained essentially constant between 2000 and 2002, with a mean of 53 h. Hours spent studying were also constant between 2000 and 2002, with a mean of 10 h per week.

In the 2000 survey, residents were asked to quantify the amount of time spent performing so-called "scut work,"

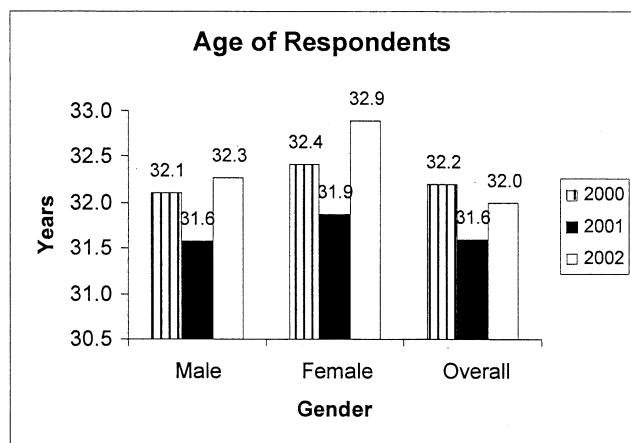


Fig. 1. Demographics.

Table 3. Residents' first choice of career

Career choice	Year		
	2000 (%)	2001 (%)	2002 (%)
Permanent academic	17	33	14
Temporary academic	12	13	12
Fellowship	7	4	3
Group private practice	43	38	54
Solo private practice	0	2	5
Health maintenance organization	0	0	0
Locum tenens	0	1	5
Leave radiation therapy	0	1	0
Undecided	13	7	14

which was defined as “work that should ideally be done by support staff, such as nurses and receptionists.” The median percentage of the average work week spent on scut work was 20%, with a range of 5–60%. Just over one quarter (27%) felt that the amount of these nonphysician duties was excessive.

Also in the 2000 survey, respondents were asked about time spent at satellite facilities. Sixty-eight percent of respondents stated that their institution had one or more satellite facilities. The median number of such facilities was two, with a range of zero to seven. Respondents reported spending an average of 8 weeks at such facilities over the course of their residency, with the vast majority (89%) finding the experience valuable.

In-service examinations

The percentage of respondents who reported taking the in-service examination increased slightly between 2000 and 2002, from 74% in 2000 to 82% in 2001 and 85% in 2002, but this trend was not statistically significant ($p = 0.48$). A majority of respondents reported finding the examination helpful (71%, 76%, and 75% between 2000 and 2002, respectively).

Higher proportions of male respondents found the in-service examination helpful than their female counterparts each year; this difference achieved statistical significance in 2001 only. In 2000, 75% of males but only 60% of females found the examination helpful ($p = 0.09$). In 2001, 81% of males and 64% of females found the examination helpful ($p = 0.002$). In 2002, 77% of males and 70% of females found the examination helpful ($p = 0.30$).

In 2000, 25% of respondents believed that the examination had a strong or moderate impact on their annual evaluations. In 2001, 6% felt that the examination had an impact, and, in 2002, 38% felt that it had a strong or moderate impact.

Career plans after residency

A summary of career preferences after residency is shown in Table 3.

Fellowships after residency were not a popular choice

Table 4. Factors with strong or moderate influence upon those choosing an academic career

Factor	Year		
	2000 (%)	2001 (%)	2002 (%)
Interest in laboratory research	50	37	41
Interest in clinical research	80	83	87
Enjoyment of teaching	76	90	93
Prestige	56	57	58
Administrative opportunities	34	29	44
Leadership opportunities in national organizations	43	47	50
Financial remuneration	42	26	30
Location of available jobs	60	54	61
Time commitment in private practice too great	17	27	37
Academic environment (generally)	83	78	92

among respondents between 2000 and 2002. Few respondents indicated that they planned to leave radiotherapy after residency, and few residents indicated that they planned to join a health maintenance organization or embark on solo private practice.

Joining an established private practice group was a more popular choice among respondents. This choice appeared to be somewhat more popular among female respondents (53%, 36%, and 60% for 2000, 2001, and 2002, respectively) compared with male respondents (38%, 37%, and 49% for 2000, 2001, and 2002, respectively), but these differences were not statistically significant. The proportion of respondents desiring a temporary academic career remained stable, at approximately 12% between 2000 and 2002. Permanent academic careers were a somewhat more popular choice, with 17%, 33%, and 14% of respondents stating that this was their first choice in 2000, 2001, and 2002, respectively.

Those who planned an academic career were asked to rate the influence of a number of potential factors on that choice. Those who did not plan an academic career were also asked to rate the influence of a separate set of potential factors upon that choice. These responses are shown in Tables 4 and 5.

Significant gender differences were found for two of the factors influencing those who chose a nonacademic career, but only in the 2000 survey. These factors were geographic location (a strong or moderate influence for 55% of women compared with 37% of men, $p = 0.005$) and time commitment (a strong or moderate influence for 63% of women compared with 42% of men, $p = 0.01$). For those choosing an academic career, statistically significant gender differences existed for a number of different factors in the 3 survey years. These factors included enjoyment of teaching in 2000 (a strong or moderate influence for 100% of the women compared with 67% of the men, $p = 0.01$), leadership opportunities in national organizations in 2001 (a strong or moderate influence for 36% of the women com-

Table 5. Factors with strong or moderate influence upon those choosing a nonacademic career

Factor	Year		
	2000 (%)	2001 (%)	2002 (%)
Preferring patient care to other duties, such as teaching or research	63	71	82
Anticipation of higher earnings in private practice	74	76	87
Greater flexibility of geographic location in non-academic jobs	43	66	71
Perceived time commitment for academics too great	50	54	81
Support for research declining	40	36	60
Publish or perish environment or other academic pressures	74	75	87
Politics/bureaucracy in academic jobs	78	75	91
Lack of control or freedom in academic jobs	60	68	89

pared with 50% of the men, $p = 0.04$), location of available job in 2002 (a strong or moderate influence for 46% of the women compared with 68% of the men, $p = 0.034$), and enjoyment of the academic environment in 2002 (a strong influence for 31% of the women compared with 60% of the men, $p = 0.04$).

A higher percentage of respondents who were in their third or fourth year of academic training reported a desire to pursue private practice than those in their first or second year of radiation: 59% vs. 29% in 2000, 44% vs. 36% in 2001, and 63% vs. 45% in 2002. Only in the 2002 survey was this difference statistically significant ($p = 0.03$).

The perception of the academic job market was rated as "very good" or "good" by 98% of the respondents in 2000, 78% in 2001, and 82% in 2002. The perception of the private job market was rated as "very good" or "good" by 100% in 2000, 86% in 2001, and 95% in 2002.

DISCUSSION

This special report represents the first publication of the annual ARRO surveys in nearly a decade. Careful analysis of the results of these surveys is essential because recent years have brought about substantial changes in the environment within which radiation oncology residents train. In the decade that has elapsed since the last ARRO surveys were published, managed care has grown and spread (6), teaching hospitals have faced a crisis of funding (7), and perceptions of the job market for radiation oncologists have shifted (8–10). Growing numbers of medical students are applying for the relatively scarce positions in radiation oncology residency programs, making acceptance into the field increasingly competitive. These and other changes are likely to have affected the expectations, experiences, and attitudes of radiation oncology residents currently in training. Only by understanding the nature of these effects can

those who wish to improve the educational experience of today's residents target their efforts appropriately. And only by establishing a baseline can educators understand the effects of changes, such as the new regulations that are being introduced by the Accreditation Council for Graduate Medical Education (ACGME) to regulate residents' hours and to ensure that the basic core competencies are achieved.

There have been no major changes in the demographic composition of residents responding to the three surveys reported here, compared with the surveys previously reported. The male to female ratio continues to be 2:1, identical to that reported in the 1993 survey, and the age distribution of respondents is also very similar to that in previous surveys. The percentages of foreign medical graduates responding to these three surveys were similar to those found in surveys in the mid-1980s, slightly higher than in those from the late 1980s and early 1990s, and dramatically lower than in 1980.

These surveys indicate that residents currently in radiation oncology training were influenced by a number of factors in selecting the field. Most commonly cited as important influences were prior experience and exposure, interest in oncology, lifestyle, and earning potential. These results are broadly similar to those reported a decade ago. There is some indication, however, that changes may have occurred over the years reported here, with fewer residents choosing radiation oncology because they were unable to secure a position in their specialty of choice and increased numbers of residents choosing the field because of interest in research. In future surveys, it will be interesting to determine whether an increasingly competitive residency application process selects for individuals with different underlying expectations, motivations, and values. It will also be interesting to follow the relative influence of lifestyle upon residents' choice of radiation oncology as a career, because recent studies have indicated that lifestyle may be increasing in importance as a determining factor for medical specialty choice (11).

The work hours reported in these surveys are also quite similar to those reported in previous years. From these data, it appears that the ACGME's recent extension of the 80-h limit on hours of duty to all member specialties will probably have little direct impact on residents in radiation oncology training. Nevertheless, reduced hours in other specialties may affect patient care as well as the education and well-being of physicians training in other specialties with whom radiation oncologists interact daily. Thus there may be indirect effects of these changes on the experiences of radiation oncology residents in the future, particularly if reductions in hours are greater for certain colleagues on whom radiation oncologists have traditionally relied for certain aspects of care for their patients, including inpatient care. This may lead to a redefinition of the radiation oncologist's expected duties and perhaps even a paradoxical increase in radiation oncology residents' hours in the coming years. This will merit further attention in future surveys.

Also of note, in the one year in which a question ad-

ressed the issue of scut work in the surveys reported here, a significant minority of respondents deemed it to be excessive in their programs. The median percentage of the work week spent upon scut in 2000 was 20%—exactly the same as reported in the last published ARRO survey from 1993. It is heartening that scut work expected of residents does not appear to have increased as teaching hospitals faced increasing financial difficulties over the past decade. Nevertheless, as noted in the 1993 report, it is striking that residents report spending a median of 10 hours per week doing scut, or the equivalent of more than 2 full-time months per year. As teaching hospitals continue to face increased financial challenges, it is important for program directors to continue to monitor the duties that are expected of their residents and to ensure that a reasonable balance is found on the spectrum from service to education.

The percent of respondents who are satisfied with their training was high and trended upward over the 3 years covered in the surveys reported here. The number of didactic lectures also trended upward. Yet, support for a number of changes to improve training experience also trended upward. As knowledge flourishes and the medical literature expands, ensuring adequate formal teaching may be particularly important, in addition to apprenticeship and experience-based learning. A majority of respondents favored certain changes to improve their education during residency, including more didactic lectures by attending physicians, more time to read during the workday, and greater availability of attending physicians. In contrast, only a minority supported increasing the staff-to-resident ratio, increasing the number of new patient consults, or increasing the number of case conferences run by residents. These results were generally not strikingly different from previous surveys, except that the number supporting increased numbers of new patients was somewhat lower (8–18%) than in 1993 (36%), perhaps suggesting improvements in clinical experience. The ACGME has recently mandated computerized entry of case logs by all radiation oncology residents, and this will be an important source of data that will allow for more accurate quantification of the clinical experience obtained by residents in the future.

Private practice was the career path of choice for the residents responding to this survey. Although the ACR reports that 33% of all radiation oncology-only practices in the United States in 2000 were solo practices (12), group practice was much preferred over solo practice by the respondents to this survey, indicating that the proportion of solo vs. group practices may well shift in the future. Factors that were important to a majority of those who chose private practice included anticipation of higher earnings in private practice, preferring patient care to other duties such as teaching or research, concerns about the publish or perish environment or other academic pressures, a perception of “politics or bureaucracy” in academic careers, perceived lack of control or freedom in academic positions, greater flexibility of geographic location in private practice, and the perception that the time commitment for academics was too

great. Many also noted a concern that support for research is declining.

In contrast, a majority of those who chose academic careers were motivated by interest in clinical research, enjoyment of teaching, the prestige of an academic career, location of available jobs, and attraction to the academic environment more generally. Only a minority reported being strongly or moderately influenced by an interest in laboratory research, administrative opportunities, leadership opportunities in national organizations, or financial remuneration. Only a minority of those choosing academic careers reported that they were motivated by a feeling that the time commitment in private practice was too great.

These findings are particularly important in light of recent concerns that there is a shortage of academic radiation oncologists in the United States (13). Identifying which potential factors appear to be most important to those choosing private practice and those choosing academic practice is essential for informing the leaders of academic programs about how to target their efforts appropriately in attempting to ensure the continued supply of clinician investigators and teachers in our field. The frequency with which respondents cited perceived lifestyle differences between academic and private careers—including financial compensation and time commitment—is important to recognize, although targeting these areas for improvement may be quite challenging in the current financial climate in which teaching hospitals operate.

The data presented here raise a number of hypotheses that require further testing, including the possibility that there may be systematic differences in expectations, experiences, and career choices by gender and by year of training. Although the number of responses here is not high enough to establish statistical significance with confidence, these data suggest that there may well be important differences. For example, it appears that male and female residents may not find the current in-service examination equally helpful. To the extent that the shift of both the written and oral board examinations into the postresidency year may cause program directors to rely more heavily on the written in-service examination scores in evaluating residency performance, understanding gender differences in the perceived utility of that test is particularly important. The data also contain trends suggesting the possibility of gender differences in the factors that influence men and women in their career choices, as well as a tendency for residents more advanced in training to choose private practice over academics. Future surveys will further explore the possibility of gender differences, as well as the possibility that residents’ expectations, experiences, and choices may change over the course of residency or may represent generational changes, with a different population selecting and being selected for the increasingly competitive residency positions in radiation oncology.

The validity of the results presented here is clearly compromised by the extremely low response rates. The possibility of selection bias cannot be ignored. It has long been recognized that physician participation in survey studies is

difficult to achieve. The problem is only compounded when an attempt is made to ensure participation by resident physicians, who are often under the most time pressure. Technical difficulties plagued the administration of surveys in the years discussed in this article. The Internet-based application through which responses were to be collected proved to be unreliable and caused the loss of countless responses. To the extent that these were random losses, the concern of selection bias is mitigated somewhat, although clearly not entirely. It is reassuring, however, that the demographic characteristics of respondents did not vary dramatically from those expected with a random sample.

Despite the important caveat that selection bias may exist among respondents to the surveys reported here, these data

remain the only available results regarding the experiences and attitudes of radiation oncology residents in recent years. Thus this document remains an important source of information for those who wish to improve the experiences of radiation oncology residents, as well as the only available benchmark by which to appreciate the changes that future surveys may reveal.

The findings of these recent surveys provide preliminary evidence and hypotheses that merit further, more rigorous testing in future surveys. Resident physicians constitute the future of our profession, and only with continued careful study of their attitudes and experiences can appropriate interventions be made to ensure that the profession of radiation oncology continues to thrive.

REFERENCES

1. Radiation Oncology Resident Training Working Group and the members of the SCAROP. Radiation oncology training in the United States: Report from the Radiation Oncology Resident Training Working Group organized by the Society of Chairmen of Academic Radiation Oncology Programs (SCAROP). *Int J Radiat Oncol Biol Phys* 1999;45:153–161.
2. Meredith RF, Eisert DR. 1986 Association of Residents in Radiation Oncology survey. *Int J Radiat Oncol Biol Phys* 1987;13:1893–1895.
3. Corn BW, Taylor BW, Knox SJ, Martz KL, Flynn DF. Results of the 1989 Association of Residents in Radiation Oncology survey. *Int J Radiat Oncol Biol Phys* 1991;20:1363–1367.
4. Schilling PJ, Wall TJ. Results of the 1992 Association of Residents in Radiation Oncology (AARO) survey. *Int J Radiat Oncol Biol Phys* 1994;28:1267–1270.
5. Ling SM, Flynn DF. Results of the 1993 Association of Residents in Radiation Oncology (AARO) survey. *Int J Radiat Oncol Biol Phys* 1996;34:221–226.
6. Dudley RA, Luft HS. Managed care in transition. *N Engl J Med* 2001;344:1087–1092.
7. Dickler R, Shaw G. The Balanced Budget Act of 1997: Its impact on US teaching hospitals. *Ann Intern Med* 2000;132:820–824.
8. Flynn DF, Kresl JJ, Sheldon JM. The employment status of 1995 graduates from radiation oncology training programs in the United States. *Int J Radiat Oncol Biol Phys* 1999;43:1075–1081.
9. Bushee GR, Sunshine JH, Simon C, Schepps B. Initial employment experiences of 1997 graduates of radiation oncology training programs. *Int J Radiat Oncol Biol Phys* 2001;50:173–177.
10. Bushee GR, Sunshine JH, Schepps B. The status of radiation oncology training programs and their graduates in 1999. *Int J Radiat Oncol Biol Phys* 2001;49:133–138.
11. Dorsey ER, Jarjoura D, Rutecki G. Influence of controllable lifestyle on recent trends in specialty choice by US medical students. *JAMA* 2003;290:1173–1178.
12. Cypel Y, Sunshine JH, Schepps B. Radiation oncologists in 2000; Demographic, professional, and practice characteristics. *Int J Radiat Oncol Biol Phys* 2002;53:720–728.
13. Hussey DH, Sagerman RH, Halberg F, Dubey A, Coleman CN. Report of the 1997 SCAROP survey on resident training. *Acad Radiol* 2000;7:176–183.