



Specialising in radiology in Switzerland: Still attractive for medical school graduates?

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ABSTRACT

Purpose: To gain insight into the professional characteristics of radiologists in Switzerland and to determine how to enhance the attractiveness of radiology to medical graduates as a specialty.

Materials and methods: Data from 262 members of the Swiss Society of Radiology (m:f=76:24%) obtained in a questionnaire survey were analysed regarding socio-demographic variables, working status, specialty, main fields of interest, career success, mentoring and reasons for the shortage of radiologists.

Results: 35 (56.4%) female and 85 (45.5%) male radiologists were aged ≤ 45 years. 228 (87%) were board-certified; 44 (17.9%) had completed a sub-specialisation. Men worked part-time mostly just before retirement, while women worked part-time at a younger age. As reasons for specialty choice, the wide range of clinical work and the combination of technology and medicine were ranked highest. Women reported significantly less career success and support. To improve the attractiveness of radiology to graduates, radiology should be visible on medical school curricula.

Conclusion: In Switzerland, more female radiologists work part-time than male ones, and there is less career success and support for women. In order to make radiology more attractive to medical graduates as a specialty, structured residency programmes and reliable gender-respecting career support are needed.

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1. Introduction

Radiology as a cross-sectional and interdisciplinary medical specialty has contributed considerably to the rapid progress in diagnostic and therapeutic procedures in modern medicine. The impressive strides made in the field of advanced imaging technology have led to major improvements in a physician's ability to diagnose and treat a variety of diseases. Expenditures on imaging services has increased more rapidly than for any other physician-ordered services [1]. Thus, the massive growth in the application of radiological imaging and image-guided interventions has resulted in a worldwide shortage of trained radiologists [2].

In the USA, the number of radiologists has increased annually by 2%, which is apparently less than needed to cover a 3.5% growth in procedures and a 5.5% growth in relative value units [2]. In Switzerland, there was a low increase in newly board-certified radiologists in the past decade with an average of 29 radiologists per year between 1999 and 2009 [3].

Compared with an approximately similar proportion of men and women graduating from medical school in most Western countries a decade ago, disproportionately few women entered radiology [2,4,5]. Despite many attractive characteristics, such as its reasonable call hours, flexible scheduling and high salaries, the gender ratio to date in Switzerland and the USA remains at 1 female to 4 male radiologists [3,5].

There are several studies showing that the average workload per full-time-equivalent (FTE) radiologist increased substantially in recent years [6]. As the radiologists' productivity has grown at the same time, the radiologists could keep their annual work hours relatively fixed [6]. Because of changes in technology and the increased intensity of their work by approximately 15%, the shortage of radiologists has eased only very recently [7]. Furthermore, the workforce in radiology could profit from the radiologists' current retirement pattern of tending to work beyond the usual age of 65 years in Switzerland. The shortage of radiologists may worsen because of new tasks for radiologists, such as screening programmes where radiology is involved (i.e. screening programmes for breast cancer, etc.).

In order to gain more insight into the tendency towards a shortage of radiologists in Switzerland as well as to identify factors that may enhance the attractiveness of radiology to medical graduates

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choosing their specialty, we designed a study where all radiologists (residents and board-certified radiologists) working in Switzerland were invited to participate in a survey using a written questionnaire.

The aims of this survey were as follows: (1) to assess the demographic and professional characteristics of radiologists in Switzerland, (2) to explore the professional self-image, and (3) to identify measures that may enhance the attractiveness to students of choosing radiology as their medical specialty.

2. Materials and methods

2.1. Design and study sample

The present study was designed and performed together with the research group of the Centre for Career Development at Zurich University Hospital. The Swiss Society of Radiology (SGR-SSR) was fully aware of the scope and design of the study and allowed the membership database to be used to invite their physician members (i.e. those members who are either radiologists in training or board-certified radiologists) to participate in the study. A questionnaire written in English (to have the same wording for all addressees) was mailed to 689 SGR-SSR members currently working in radiology in Switzerland. 270 of the 689 radiologists took part in the study and returned the questionnaire, resulting in a response rate of 39.2%. Of the questionnaires returned, 8 were excluded because they did not meet the inclusion criteria for the study analyses (professionally active radiologist in Switzerland). Finally, the *study sample* comprised 200 (76.3%) men, and 62 (23.7%) women. The mean age of the respondents was 46.6 years (SD 9.5 years, range 29–75 years), men being 47.5 years old (SD 9.8 years), women 43.9 years old (SD 7.8 years; $p = 0.008$). Of the total number of SGR-SSR members ($n = 729$, including members currently working abroad) there are 545 (74.8%) male radiologists, and 184 (25.2%) female radiologists; in terms of language region, there is only a distinction between German-speaking (546; 74.9%) and French-speaking (183; 25.1%) members.

2.2. Instruments used in the questionnaire

For data acquisition, self-assessment scales were used. Some issues have been adapted from the American College of Radiology's 2003 Survey [5]. The survey included questions regarding the following topics:

- socio-demographic data
- board-certification in radiology and in a sub-specialty
- workplace and position at work
- work status as a percentage and workload per week
- reasons and motivation for choosing radiology as specialty
- enjoyment in radiology compared with five years ago
- main fields of interest in radiology
- career (aspired to/pursued) in radiology
- career success and career satisfaction: both career success and career satisfaction were assessed using the following scales:
 - o *Career Success Scale* [8] is a measure of objective career steps consisting of 7 items addressing scientific activities as criteria corresponding to the requirements for tenure track (lectures at conferences, publications, collaborating on large research projects, research as the main field, scholarships and grants).
 - o *Subjective Assessment of Career Success* [9] is a measure of one's own career advancement compared with other cohort subjects (7-point Likert scale, 1 = less successful, 7 = more successful).

- o *Question on Satisfaction with Career Success* [10] (7-point Likert scale, 1 = very unsatisfied, 7 = very satisfied) is a measure of a person's satisfaction with his/her career success.
- career support and mentoring were assessed using the following method:
 - o *Mentor-Protégé Relationships Questionnaire* [11] (Likert scale 0–4) consists of five scales measuring different types of career support: *networking* (4 items), *support in career planning* (3 items), *coaching* (2 items), *emotional support* (4 items), *role model* (3 items).
 - o Having a mentor (yes/no)
- Attractiveness of radiology for medical graduates
- Personal assessment of the shortage of radiologists

2.3. Statistical analysis

All analyses were carried out with SPSS for Windows, release 15. Descriptive statistics are given in terms of means and standard deviations on the one hand, and counts and percentages on the other. Differences between groups in categorical variables such as occupational position and employment status were analysed with Chi-squared tests and *t*-test for continuous variables. Levels of significance $p \leq 0.05$ were deemed to be meaningful.

3. Results

3.1. Demographic and professional characteristics

The *age* distribution of the respondents shows that 13% of eligible study participants ($n = 262$) were 35 years old or younger, about 70% fall within the range 36–55 years, and 17% were 56 years or older (Table 1). Although there was no gender difference in the overall age distribution, it has to be stated that in the female group there were only a few respondents in the upper age group, but a higher percentage in the age group up to 45 years. In the age group of 45 years and older, male subjects were over-represented. The gender ratio in favour of female radiologists has risen to 32% in the age group ≤ 35 years. Most of the participants lived in a *partnership*. Three quarters of the male radiologists, and over half of the female radiologists had *children*. The fact that fewer female radiologists had children than their male colleagues is due to the mentioned age effect.

Ninety-six (36.6%) of the participating radiologists did not graduate from a Swiss Medical School. The distribution of the radiologists' workplaces reveals that 70% of the respondents work in the German-speaking part, 27% in the French-speaking part, and only 3% in the Italian- or Roman-speaking part of Switzerland.

As to the *professional characteristics* of the participants (Table 2), 13% were still in radiology residency, corresponding to the 34 radiologists in the age group of 35 years or younger. The largest part of the study sample consisted of board-certified radiologists. 44 (16.8%) participants completed the additional sub-specialty training either in paediatric or neuro-radiology (note: currently, the official sub-specialisation catalogue of Switzerland contains only paediatric radiology and neuro-radiology as sub-specialty titles). 81.1% of the radiologists worked in the radiology institute within a public or private hospital, whereas 18.9% of the radiologists worked in private practice not located in a hospital. A significant gender-related difference was not found in any of these professional characteristics. However, the data show that in the lower career positions (residents and senior physicians), there was a relatively higher percentage of women, and a lower percentage in the top positions (chief physicians and department chiefs).

In terms of *working status*, however, significant gender differences were seen (Table 3): of the male radiologists, 156 (78%)

Table 1
Socio-demographic characteristics of the study participants (*n* = 262).

	Men (200) <i>n</i> (%)	Women (62) <i>n</i> (%)	Total (262) <i>n</i> (%)	<i>p</i>
Age (in years)				0.008*
– Minimum	29	30	29	
– Mean	47.5	43.9	46.6	
– Median	47.0	43.5	47.0	
– Maximum	75	59	75	
– SD	9.8	7.8	9.5	
Living in a partnership	182 (91.0)	50 (83.3)	232 (89.2)	0.093**
Children	146 (73.0)	33 (54.1)	179 (68.6)	0.005**
Language region				0.215**
– German	142 (71.7)	38 (63.3)	180 (69.8)	
– French	51 (25.8)	19 (31.7)	70 (27.1)	
– Italian	5 (2.5)	2 (3.3)	7 (2.7)	
– Roman	0	1 (1.7)	1 (0.4)	

Bold print of the *p*-values indicates a significant difference between male and female participants.

* *t*-test.

** Chi-squared.

Table 2
Professional characteristics of the study participants (*n* = 262).

	Men (200) <i>n</i> (%)	Women (62) <i>n</i> (%)	Total (262) <i>n</i> (%)	<i>p</i>
Board certification				0.087
– Completed	178 (89.0)	50 (80.6)	228 (87.0)	
– In training	22 (11.0)	12 (19.4)	34 (13.0)	
Sub-specialisation				
– Paediatric radiology	12 (6.5)	3 (5.2)	15 (6.1)	0.723
– Diagnostic neuro-radiology	21 (11.3)	3 (5.2)	24 (9.8)	0.172
– Interventional neuro-radiology	5 (2.7)	0	5 (2.0)	0.207
Actual position at work				0.192
– Resident	17 (8.5)	10 (16.1)	27 (10.3)	
– Senior physician	27 (13.5)	14 (22.6)	41 (15.6)	
– Chief physician	56 (28.0)	14 (22.6)	70 (26.7)	
– Department chief	44 (22.0)	7 (11.3)	51 (19.5)	
– In private practice employed	26 (13.0)	7 (11.3)	33 (12.6)	
– Private practice owner	25 (12.5)	8 (12.9)	33 (12.6)	
– Other	5 (2.5)	2 (3.2)	7 (2.7)	
Workplace				0.503
– University hospital	44 (22.0)	9 (15.0)	53 (20.4)	
– Cantonal hospital	48 (24.0)	14 (23.3)	62 (23.8)	
– Regional hospital	35 (17.5)	17 (28.3)	52 (20.0)	
– Private hospital	34 (17.0)	10 (16.7)	44 (16.9)	
– Single practice	5 (2.5)	2 (3.3)	7 (2.7)	
– Group practice	34 (17.0)	8 (13.3)	42 (16.2)	

Table 3
Working status depending on gender and age.

	Male radiologists' working status <i>n</i> (%)				Female radiologists' working status <i>n</i> (%)				<i>p</i>
	Full-time 100%	Part-time ≤50%	Part-time 55–75%	Part-time 80–95%	Full-time 100%	Part-time ≤50%	Part-time 55–75%	Part-time 80–95%	
Age (in years)									0.000
≤35	21 (13.5)	0 (0)	2 (28.6)	0 (0)	7 (24.1)	1 (20.0)	1 (5.9)	2 (22.2)	
36–45	51 (32.7)	0 (0)	0 (0)	11 (36.7)	11 (37.9)	3 (60.0)	6 (35.3)	3 (33.3)	
46–55	58 (37.2)	0 (0)	1 (14.3)	15 (50.0)	7 (24.1)	1 (20.0)	10 (58.8)	4 (44.4)	
56–65	25 (16.0)	2 (28.6)	2 (28.6)	4 (13.3)	4 (13.8)	0 (0)	0 (0)	0 (0)	
Over 66	1 (0.6)	5 (71.4)	2 (28.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Total	156 (100)	7 (100)	7 (100)	30 (100)	29 (100)	5 (100)	17 (100)	9 (100)	

worked full-time, and only 7 (3.5%) worked 50% or less; in the latter group there were mainly those aged 56 years or older. Of the women, 29 (48.3%) worked full-time, 26 (43.8%) had part-time employment of 55% to 95%, and only 5 (8.3%) worked 50% or less. There were only 4 (6.7%) female radiologists aged 56 years and older, and they reported working full-time. In the age group under 45 years, only some men (*n* = 11, 5.5%) slightly reduced their work status, while distinctively more women (*n* = 16, 26.7%) worked part-

time. The workload per week reported per full-time employment was 57.27 h (SD 8.57 h) for men, and 56.15 h (SD 7.92 h) for women (*p* = 0.370).

3.2. Reasons for choosing radiology as specialty

The participants were asked to list reasons for their specialty choice. Multiple answers were possible. In Table 4 the answers

Table 4
Ranking of very/quite important reasons for specialty choice, multiple answers possible (n = 262).

	Total (262) n (%)	Men (200) n (%)	Women (62) n (%)	p
Wide range of clinical work	238 (91.9)	180 (90.9)	58 (95.1)	0.484
Combination of technology and medicine	211 (81.2)	170 (85.0)	41 (68.3)	0.012
High-tech specialty	186 (72.1)	148 (74.7)	38 (63.4)	0.026
Good working conditions	185 (70.9)	138 (69.0)	47 (77.0)	0.339
Good work-family balance	150 (57.9)	109 (54.5)	41 (69.5)	0.012
Interventional procedures	131 (51.0)	103 (52.2)	28 (46.6)	0.091
Little administrative work	127 (49.0)	89 (44.7)	38 (63.3)	0.032
Financial attractiveness	114 (43.9)	99 (49.5)	15 (25.0)	0.005
Prestige/reputation	39 (15.0)	29 (14.5)	10 (16.7)	0.636

Bold print of the p-values indicates a significant difference between male and female participants.

Table 5
Ranking of main fields of interest in radiology (multiple answers possible).

	Total (262) n (%)	Men (200) n (%)	Women (62) n (%)	p
Magnetic resonance imaging	219 (83.9)	167 (83.9)	52 (83.9)	0.993
Body imaging/cross-sectional imaging	200 (76.3)	158 (79.0)	42 (67.7)	0.068
Abdominal imaging	193 (73.7)	146 (73.0)	47 (75.8)	0.661
Musculoskeletal radiology	187 (71.4)	145 (72.5)	42 (67.7)	0.469
Chest (thoracic) imaging	144 (55.0)	114 (57.0)	30 (48.4)	0.234
Gastrointestinal radiology	143 (54.6)	107 (53.5)	36 (58.1)	0.528
Ultrasound	138 (52.7)	108 (54.0)	30 (48.4)	0.439
Emergency and trauma radiology	134 (51.1)	106 (53.0)	28 (45.2)	0.281
Breast imaging/mammography	132 (50.4)	95 (47.5)	37 (59.7)	0.094
Neuro-radiology	127 (48.4)	95 (47.5)	32 (51.6)	0.571
Genitourinary radiology	124 (47.3)	95 (47.5)	29 (46.8)	0.920
Women's imaging	102 (38.9)	70 (35.0)	32 (51.6)	0.019
Interventional/vascular radiology	87 (33.2)	75 (37.5)	12 (19.4)	0.008
Cardiac/cardiovascular radiology	82 (31.3)	66 (33.0)	16 (25.8)	0.286
Paediatric radiology	42 (16.1)	29 (14.6)	13 (21.0)	0.231
Neuro-interventional radiology	16 (6.1)	14 (7.0)	2 (3.2)	0.278

Bold print of the p-values indicates a significant difference between male and female participants.

are listed ranked by frequency. *Wide range of clinical work, combination of technology and medicine, high-tech specialty* and *good working conditions* were ranked highest. For male respondents, the technological reasons and the *financial attractiveness* of radiology were significantly more important reasons than for their female colleagues; *good work-family balance* and *little administrative work* were reasons significantly more frequently given by women.

3.3. Main fields of interest in radiology

Four fields of interest ranked highest in the list given by the participants (Table 5): *Magnetic Resonance Imaging, Body Imaging, Abdominal Imaging* and *Musculoskeletal Radiology*. Gender differences in the preference of various fields were only seen in *Women's Imaging* (F > M) and in *Interventional/Vascular Radiology* (M > F).

3.4. Satisfaction at work

The participants were asked whether they enjoyed working in radiology as much as they had done five years ago. 39% enjoyed it the same, 39% enjoyed it even more than before, but 22% enjoyed it less. There was no gender difference in the assessment ($p = 0.848$; n.s.).

3.5. Professional career (aspired to/pursued)

Of the total study sample, 35 (13.9%) participants had not yet decided upon their career. These respondents were still in residency training. Of the board-certified radiologists, 75 (29.9%) pursued a career in a specialist practice, 101 (40.3%) pursued a clinical career in a hospital, and 36 (14.3%) pursued an academic career. No gender

differences were seen with regard to career preference ($p = 0.511$; n.s.).

3.6. Career success

Assessing the career success by objective criteria, male radiologists were more engaged in research than female respondents (Table 6): they had significantly more research scholarships, research grants and awards, and had more often passed the academic career step "habilitation" (postdoctoral thesis). When they were asked to rate their own career advancement compared with other cohort subjects, and how satisfied they are with their career, women assessed these factors with significantly lower marks than men.

3.7. Career support and mentoring

Table 7 demonstrates the results of the measurements of career support assessed by the Mentor-Protégé Relationships Questionnaire [11]. More male radiologists reported having been introduced into the networks of their professional field and the scientific community by their seniors and other colleagues than female radiologists. Thus, men were more satisfied with the career support received than women. Furthermore, more male radiologists had a mentor than female radiologists. Of the men, 37 (28.9%) had one mentor, 48 (37.5%) had two mentors, 26 (20.3%) had three mentors and 17 (13.3%) had more than three mentors. Of the women, 12 (50.0%) had one mentor, 7 (29.2%) had two mentors, 3 (12.5%) had three mentors and 2 (8.3%) had more than three mentors. Furthermore, the participants assessed on a 7-point rating scale (1 = very much, 7 not at all) how much their gender had an influence on the

Table 6
Career success of study participants.

	Men (200) n (%)	Women (62) n (%)	Total (262) n (%)	p
Objective career success				
Doctorate thesis	177 (90.8)	50 (83.3)	227 (89.0)	0.107
Publications (peer-reviewed)	147 (75.0)	40 (64.5)	187 (72.5)	0.107
Research scholarship	29 (14.9)	2 (3.3)	31 (12.2)	0.015
Self-acquired research grants	39 (19.7)	3 (4.9)	42 (16.2)	0.006
Research awards	38 (19.4)	3 (4.9)	41 (16.0)	0.007
'Habilitation' (postdoctoral thesis)	36 (18.2)	2 (3.3)	38 (14.7)	0.004
Professorship	21 (10.6)	2 (3.3)	23 (8.9)	0.079
Subjective career success	Mean (SD)	Mean (SD)	Mean (SD)	
Other-referent career success ^a	5.26 (1.10)	4.74 (1.37)	5.14 (1.19)	0.002
Self-referent career success/career satisfaction ^b	5.72 (1.22)	5.16 (1.53)	5.59 (1.32)	0.010

Bold print of the *p*-values indicates a significant difference between male and female participants.

^a Less successful = 1 to more successful than colleagues = 7.

^b Very unsatisfied = 1 to very satisfied = 7.

Table 7
Career support and mentoring.

	Men (200) n (%)	Women (62) n (%)	p
Career support ^a			
Networking	1.80 (1.21)	1.43 (1.14)	0.034
Career planning	1.71 (1.15)	1.39 (1.15)	0.063
Coaching	2.14 (1.10)	2.00 (1.18)	0.280
Emotional support	1.92 (1.04)	1.78 (1.28)	0.376
Role model	1.76 (1.18)	1.61 (1.27)	0.396
Satisfaction with career support ^b	Mean (SD)	Mean (SD)	
Having a mentor (yes)	4.18 (1.66)	3.21 (1.58)	≤ 0.001
	128 (64.0)	25 (40.3)	≤ 0.001

Bold print of the *p*-values indicates a significant difference between male and female participants.

^a Does not apply = 0 to does very much apply = 4.

^b Very unsatisfied = 1 to very satisfied = 7.

career support by other professionals. The mean value given by the women was 3.67 (SD 2.02), and that given by the men was 5.51 (SD 1.73). Women considered their gender an important factor in the lower amount of career support they received, whereas men did not ($p \leq 0.001$).

3.8. Factors making radiology attractive as a specialty for medical graduates

The respondents ranked factors, which in their opinion make radiology an attractive specialty for graduate students (Table 8). Working in an interdisciplinary setting, the high-technology environment, structured residency training, good work-family compatibility and the possibility of part-time jobs were the top ranking factors mentioned.

Table 8
Ranking of factors which make radiology an attractive specialty for graduate students ($n = 262$).

	Important factors %
Working in interdisciplinary setting	92.9
High-tech environment	90.5
Structured residency curriculum	74.5
Possibilities for part-time job	73.4
Work-family compatibility	68.3
Possibilities for clinical work	64.6
High income	60.0
Collaboration in patient care	53.1
Reputation of radiology as a specialty	42.8

3.9. Reasons for the shortage of radiologists

As main reasons for not choosing radiology as a specialty (Table 9) were mentioned the lack of visibility of radiology in medical school, the status of a medical service provider, not a good reputation as a specialty, too much work at the monitor and insufficient patient contact.

4. Discussion

4.1. Current professional situation of radiologists

Although about 300 radiologists have achieved board certification in Switzerland in the past ten years [3], this is by far not

Table 9
Ranking of main reasons for the current lack of qualified radiologists ($n = 262$).

	Important factors %
Lacking visibility in medical school	87.4
Only medical provider/preliminary work only	71.7
Reputation of radiology as a specialty not good enough	60.3
Too much work at screen	55.5
Not enough patient contact	52.3
Too many "turf battles" with clinical colleagues	51.0
Insufficient collaboration with other specialists in patient care	45.1
Tremendous expansion of the specialty	37.9
Career options not good enough	32.3
Unattractive residency programmes	31.1
Not enough available residency posts	27.6
Income not attractive	17.9
Unattractive working conditions in private practice	16.8

enough to replace those who have left the field (mainly because of retirement) and to meet the increasing demands of imaging services. Whereas radiologists accounted for 1.9% of all physicians in Switzerland in 1999, there was only a slight increase over the last ten years accounting for 2.6% in 2009 [3]. However, the increase of 0.7% in radiologists within the last 10 years could not compensate for the increased demand for radiologists, resulting in a significant shortage of radiologists in Switzerland. Concerns about an incoming shortage of young radiologists were also reported from the USA [2,12]: recent projections call for the shortage to become even more severe because the total workload of radiologists is expected to increase much faster than the number of available specialists. Only a small percentage of radiologists was reported to have completed any sub-specialisation in our and in the US survey, and even fewer women than men [5]. In terms of position at work and in the workplace, we did not find any gender-related differences. However, in the younger generation (resident and senior physician) there was a greater proportion radiologists who were female. A quarter of our study participants as well as of the entire SGR-SSR membership were women. These results are in line with the gender ratio reported in the American College of Radiology's 2003 Survey [5]. As seen in the Swiss Medical Association statistics [3], the percentage of female radiology residents achieving board certification fluctuated around 30% in the past ten years. In comparison with the similar numbers of women and men graduating from medical school a decade ago, women are still numerically under-represented in the field of radiology; this applies to Switzerland as well as to other Western countries [13,14].

4.2. Working status and workload

As observed in our study and reported in other investigations [2,5,15], female radiologists are more likely to work part-time than their male colleagues. For the part-time female specialists, child-care is the main reason. In the SwissMedCareer Study, a 2001 graduate cohort study, a working status of 50–70% was the preferred occupational situation of physician-mothers to balance work and family responsibilities [16]. Conversely, the main reason for part-time occupation among the male participants is pre-retirement [2,17].

Despite the European Working Time Directive (in effect since 2005), which limits the working week to 50 h, the study radiologists' workload per week reported for full-time employment is far above this limit. Other studies found that radiologists accommodate the increasing imaging workload by increasing the intensity of their work rather than by lengthening hours [6].

4.3. Reasons for specialty choice

Some publications show that gender and lifestyle issues influenced the specialty choice, resulting in radiology being considered to be among the better lifestyle specialties [18]. These studies mainly addressed medical workforce issues. In our study, the participants were questioned on the professional content of the specialty in addition to the structural issues. In terms of content, the technological side of radiology was ranked highly; however, the wide range of clinical work even achieved the top rank. This is striking, as radiology is often perceived as involving insufficient patient contact. One could argue that in our questionnaire the term "clinical work" was not clearly defined and might not necessarily imply patient contact, i.e. reporting a CT might be perceived as clinical work, but will not require direct contact with the patient.

Male radiologists assessed the technology factor as well as the financial attractiveness as being more important than their female colleagues did. For women, a good work-family balance and less

administrative work had more influence on their choice of radiology than for men. As also reported in other studies [19], specialty choice is partly influenced by gender stereotypes.

4.4. Sub-specialty fields

As explained above, the official Swiss specialty catalogue contains only paediatric radiology and neuro-radiology as sub-specialties of radiology. However, this does not mean that in practice there is no sub-specialisation in other fields of radiology.

In the ranking of the main fields of current interest in radiology, magnetic resonance imaging was placed at the top. In this field, the main technological and diagnostic progress has been achieved in the past few years. Therefore, this attracts more and more radiologists to further specialise in MRI.

Similar to the reasons for specialty choice mentioned, gender-associated preferences were found in the spectrum of current interests. Female radiologists were significantly more interested in women's imaging, while male radiologists gave preference to interventional and vascular radiology. This phenomenon is also reported in other studies [5].

4.5. Career success and career support

Compared with the American College of Radiology's 2003 Survey, reporting a higher percentage of female radiologists working in academia [5], we did not find major gender differences in terms of career aspired to or already pursued. However, female participants reported less career success measured by objective factors like research activities and academic career steps, a result also seen in the SwissMedCareer Study [10]. Even when the study participants subjectively assessed the career success of the other referents and their career satisfaction, women rated both criteria significantly lower than their male colleagues. As is known, many women tend to underestimate their abilities and success [10].

The main reasons given by female residents not to pursue an academic career were perceived difficulties in combining career and family responsibilities. Furthermore, lack of gender-sensitive career support and mentoring as well as lack of role models were the main career obstacles for women in academia [20]. Career support has several facets with networking being especially important. Women often excluded from 'the old boys' network' and less frequently mentored than men appeared to be disadvantaged in terms of career support [21].

4.6. Medical graduates' interest in radiology

Although medical students' choice of specialties has been recently changing in ways that seem to be influenced by lifestyle and income considerations [18], these changes have not resulted in a remarkable increase in graduates choosing radiology. Although the proportion of female radiology residents has increased, it is still behind the expected numbers in comparison to the number of female graduates.

Medical students develop opinions about residency choices during the early clinical years, and perceptions about radiology forming in this period seem to persist through graduation [4,22]. In our study, some crucial factors were highlighted that might have a negative influence on choosing radiology. Since the reform of the medical school curriculum (in effect since 2005), radiology has hardly been visible in (pre)clinical lectures. Students think of radiology as a specialty with less patient contact, a factor that is usually ranked at the top for specialty choice, working mainly at the monitor, providing medical services for other specialties. These impressions are also reported by other authors [4,22,23].

4.7. Measures to take to enhance the attractiveness of choosing radiology as a specialty

To overcome the upcoming shortage of radiologists in Switzerland, measures have to be taken to increase the number of medical school graduates who choose radiology as their specialty. Initiatives to improve the image of radiology should begin during the early years of medical school [24]. These measures should focus on several levels.

First of all, radiology has to be visible on medical school curricula, pointing out its central role in diagnostic and therapeutic procedures. Second, radiologists should actively address medical students, providing mentorship and gender-sensitive career support. In addition, our participants listed at the top the necessity to demonstrate to students that a radiologist works in an interdisciplinary setting, and is an equally important part in the chain of patient care. Furthermore, the fascination of the combination of technology and medicine for the patient's sake has to be conveyed. Finally, radiologists provide especially well-organised and structured residency programmes and mentoring [25].

For retention of trained radiologists in the profession, part-time work and a good work-family balance should be guaranteed. Gender-respecting career support is furthermore the key to attract female residents to radiology.

Residency programme managers should assume responsibility for providing sufficient job opportunities for graduates as well as structured training programmes that guarantee specialty training during the obligatory five-year training curriculum.

4.8. Study limitations

We acknowledge the following limitations. As the study was performed on the basis of data from the Swiss Society of Radiology, only radiologists belonging to the Society were included in the survey. However, it is estimated that nearly 95% of radiologists working in Switzerland are associated with this professional organisation. Another limitation refers to the response rate of the survey of 39% of all radiologists who had received the questionnaire. Our response rate, however, is typical of national survey studies of the members of physician societies [26]. As gender, age and language distribution of participants were not different from those of all SGR-SSG members, the results of this survey may be considered as representative.

In the present study, data from a subject population that chose to do radiology were analysed, and as such there is a natural bias introduced. As we are trying to determine what would attract medical students to radiology that have not necessarily made or thought about this choice, more powerful results would have been obtained by asking a cohort of them what their thoughts were, and the reasons for or against deciding on a career in radiology. In Switzerland however, there is no residency matching programme as in the USA. It is known, that more than fifty percent of Swiss medical school graduates enter clinical training not having decided for a certain specialty, which makes such comparative surveys difficult.

5. Conclusion

This survey has shown that the professional characteristics of radiologists working in Switzerland are similar to those of other countries. In Switzerland, more female radiologists work part-time than male ones, and there is less career success and support for women. In order to make radiology more attractive for medical graduates as their medical specialty choice, better visibility on medical school curricula, structured residency programmes and reliable gender-respecting career support are needed.

If the number of graduates interested in radiology cannot be increased in time, the need to recruit radiologists from abroad to cover the rising demand for imaging services will further increase. Concerns arise that to date over one third of professionally active radiologists in Switzerland are graduates from foreign medical schools. When training conditions and the financial attractiveness of radiology are improved in our neighbouring countries, fewer young radiologists will be willing to come to Switzerland.

Conflict of interest

We confirm that there is no conflict of interest.

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References

- [1] Iglehart JK. Health insurers and medical-imaging policy—a work in progress. *NEJM* 2009;360(10):1030–7.
- [2] Sunshine JH, Cypel YS, Schepps B. Diagnostic radiologists in 2000: basic characteristics practices issues related to the radiologist shortage. *Am J Roentgenol* 2002;178(2):291–301.
- [3] Foederatio Medicorum Helveticorum: Schweizerische Ärztstatistik. *Schweizerische Ärztezg* 2010;91(11):431–4.
- [4] Potterton VK, Ruan S, Sunshine JH, Applegate K, Cypel Y, Forman HP. Why don't female medical students choose diagnostic radiology? A review of the current literature. *J Am Coll Radiol* 2004;1(8):583–90.
- [5] Lewis RS, Bhargavan M, Sunshine JH. Women radiologists in the United States: results from the American College of radiology's 2003 survey. *Radiology* 2007;242(3):802–10.
- [6] Bhargavan M, Kaye AH, Forman HP, Sunshine JH. Workload of radiologists in United States in 2006–2007 and trends since 1991–1992. *Radiology* 2009;252(2):458–67.
- [7] Sunshine JH, Meghea C. How could the radiologist shortage have eased? *Am J Roentgenol* 2006;187:1160–5.
- [8] Buddeberg-Fischer B, Stamm M, Buddeberg C, Klaghofer R. Career-success scale—a new instrument to assess young physicians' academic career steps. *BMC Health Serv Res* 2008;8(120).
- [9] Abele A, Stief M. Selbstregulationskompetenzen und beruflicher Erfolg. In: Wiese B, editor. *Individuelle Steuerung beruflicher Entwicklung: Kernkompetenzen in der modernen Arbeitswelt*. Frankfurt: Campus; 2004. p. 61–89.
- [10] Buddeberg-Fischer B, Stamm M, Buddeberg C, et al. The impact of gender and parenthood on physicians' careers—professional and personal situation seven years after graduation. *BMC Health Serv Res* 2010;10:40.
- [11] Blicke G, Kuhnert B, Rieck S. Laufbahnförderung durch ein Unterstützungsnetzwerk: Ein neuer Mentoringansatz und seine empirische Überprüfung. *Zeitschrift für Personalpsychologie* 2003;2(3):118–28.
- [12] Sunshine JH, Maynard CD, Paros J, Forman HP. Update on the diagnostic radiologist shortage. *Am J Roentgenol* 2004;182:301–5.
- [13] Baerlocher MO, Walker M. Does gender impact upon application rejection rate among Canadian radiology residency applicants? *Can Assoc Radiol J* 2005;56(4):232–7.
- [14] Angtuaco TL, Macura KJ, Lewicki AM, Rosado-de-Christenson ML, Rumack CM. Radiologic history exhibit: the American Association for Women Radiologists (AAWR): 25 years of promoting women in radiology. *Radiographics* 2008;28(2):573–82.
- [15] Chertoff JD, Bird CE, Amick 3rd BC. Career paths in diagnostic radiology: scope and effect of part-time work. *Radiology* 2001;221(2):485–94.
- [16] Stamm M, Buddeberg-Fischer B. How do physicians and their partners coordinate their careers and private lives? *Swiss Med Wkly* 2011;140, w00250.
- [17] Meghea C, Sunshine JH. Retirement patterns plans of radiologists. *Am J Roentgenol* 2006;187(6):1405–11.
- [18] Dorsey ER, Jarjoura D, Rutecki GW. The influence of controllable lifestyle and sex on the specialty choices of graduating U.S. medical students, 1996–2003. *Acad Med* 2005;80(9):791–6.
- [19] Gjerberg E. Gender differences in doctors' preference – and gender differences in final specialisation. *Soc Sci Med* 2002;54:591–605.
- [20] Buddeberg-Fischer B, Stamm M, Buddeberg C. Academic career in medicine – requirements and conditions for successful advancement in Switzerland. *BMC Health Serv Res* 2009;9:70.

- [21] Sambunjak D, Straus SE, Marusic A. Mentoring in academic medicine. A systematic review. *JAMA* 2006;296:1103–15.
- [22] Roubidoux MA, Packer MM, Applegate KE, Aben G. Female medical students' interest in radiology careers. *J Am Coll Radiol* 2009;6(4):246–53.
- [23] Kazerooni EA, Blane CE, Schlesinger AE, Vydareny KH. Medical students' attitudes toward radiology: comparison of matriculating and graduating students. *Acad Radiol* 1997;4(8):601–7.
- [24] Poller W. Why don't female medical students choose diagnostic radiology? A review of the current literature. *J Am Coll Radiol* 2005;2(386).
- [25] Halsted MJ, Donnelly LF, Strife JL. Radiologist recruitment and retention: how can we improve? *J Am Coll Radiol* 2005;2(4):369–75.
- [26] Kuerer HM, Eberlein TJ, Pollok RE, et al. Career satisfaction, practice patterns and burnout among surgical oncologists: report on the quality of life of members of the Society of Surgical Oncology. *Ann Surg Oncol* 2007;14:3043–53.