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RADIOLOGICAL EDUCATION

# Radiologists and nuclear medicine physicians are looking forward to a cross-curricular training

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## Abstract

**Objectives** To obtain an overview of the attitudes toward interdisciplinary further education of residents and consultants in radiology and nuclear medicine and preferences regarding a future joint training curriculum in Switzerland.

**Methods** A 34-item questionnaire was sent electronically (SurveyMonkey online survey tool) to 1244 radiologists and nuclear physicians (residents and consultants) in Switzerland. The items asked about the motivation for further education in each other's specialty and preferences regarding a joint further education curriculum in radiology and nuclear medicine.

**Results** Overall, 370 questionnaires were analyzed (370/1244, 30%). There were 280 (76%) board-certified physicians in either radiology (238/370, 64%) or nuclear medicine (42/370, 12%) and 65 (18%) residents (radiology 54/370, 15%; nuclear medicine 11/370, 3%). More than half of all residents (34/65, 52%) stated their conviction that a wide range of expertise in both disciplines could be fully guaranteed through adequate cross-curricular training. For responders already at a consultant level in radiology or nuclear medicine, the willingness to undergo further training in each other's specialty significantly increased with a shorter training period. The preferred option for a possible future joint training curriculum was a combination of a 5-year radiology training program with 2 years of further training in nuclear medicine.

**Conclusions** Both residents and board-certified physicians in Switzerland are highly interested in a cross-curricular training curriculum in radiology and nuclear medicine.

**Key Points**

- *A systematic survey was conducted to obtain information on interest in cross-curricular training in radiology and nuclear medicine and preferences regarding a future joint training curriculum.*
- *More than half of radiology and nuclear medicine residents would be interested in further training in the other specialty.*
- *There is a strong desire for a shorter training program when combining training in both radiology and nuclear medicine.*

**Keywords** Surveys and questionnaires · Curriculum · Radiology · Nuclear medicine · Motivation

**Abbreviations**

| | |
|---|---|
| CT | Computed tomography |
| ESR | European Society of Radiology |
| MRI | Magnetic resonance imaging |
| PET | Positron emission tomography |
| PET/CT | Positron emission tomography and computed tomography |
| PET/MRI | Positron emission tomography and magnetic resonance imaging |
| SPECT | Single photon emission computed tomography |
| SPECT/CT | Single photon emission computed tomography and computed tomography |

## Introduction

The field of biomedical imaging in both radiology and nuclear medicine has grown rapidly over the last three decades. Imaging is now a major area of biomedical research and has become a multidisciplinary process, with radiologists and nuclear medicine

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physicians working not only with physicians from other disciplines but also with biochemists, physicists, physiologists, and bioengineers [1, 2]. Therefore, an appropriate training curriculum in the two disciplines is crucial to ensure optimal patient care [3–7]. The European Society of Radiology (ESR) has revised the European Training Charter for Clinical Radiology. In this revised version, molecular imaging and other nuclear medicine techniques are comprehensively integrated into basic and advanced diagnostic radiology residency training, and an option to subspecialize in molecular imaging is offered during the last 2 years of the 5-year program [8]. In Switzerland, as in most European countries, clinical radiology and nuclear medicine are separate medical specialties. Both disciplines can combine their complementary skills to work toward a common goal of the interdisciplinary development of hybrid imaging, such as positron emission tomography and computed tomography (PET/CT) and PET and magnetic resonance imaging (PET/MRI). In this context, training periods in one of the disciplines can be credited at least proportionally in the other discipline. As an example, 1 year of training in nuclear medicine can be credited to an overall 5-year radiology residency anytime during the radiology training period. Moreover, a fully trained radiologist needs only a further 3 years of training in nuclear medicine to complete the full training in nuclear medicine. Little is known about the interest and willingness of radiologists and nuclear medicine physicians at different stages of their professional life to undergo further training in the complementary field. We therefore conducted a questionnaire survey to obtain an overview of the demand for interdisciplinary further education of residents and consultants in radiology and nuclear medicine and their preferences regarding a possible joint future training curriculum in Switzerland.

## Materials and methods

We developed a 58-page questionnaire (two language versions: German and French) with a total of 34 items to conduct an anonymous and comprehensive survey of the demand for interdisciplinary further education of residents and board-certified physicians in radiology and nuclear medicine in Switzerland (see Tables 1, 2, and 3). The questionnaire was sent electronically (SurveyMonkey online survey tool) between August 2016 and January 2017 to 1244 radiologists and nuclear medicine physicians (residents and consultants) in Switzerland. Electronic addresses were provided by the Swiss Society of Radiology.

## Results

A total of 370 questionnaires were analyzed, 30% of the total of questionnaires sent. Among them, 76% were from board-certified physicians in either radiology (64%) or nuclear medicine (12%), and 18% were from residents (radiology, 15%; nuclear medicine, 3%; see Tables 4 and 5).

**Residents in radiology** Of all residents in radiology who responded (54 residents, 100%), 56% would in general be interested in completing further specialist training in nuclear medicine, 22% were still undecided, and another 22% were not interested in interdisciplinary further training in nuclear medicine. Of great interest were the topics of PET/CT (50%), PET/MRI (40%), and scintigraphy and SPECT/CT (37%). A mixed picture of interests across the entire evaluation range (from very great to no interest) was seen for research activities. The main motivating factors were an expansion of the diagnostic capabilities with 24 entries and the personal need for continuous further training with 20 entries. Of moderate interest in terms of motivation were better employment chances with 16 entries. Twenty-seven responders expressed their preference regarding a training program for obtaining a double medical specialist title in radiology and nuclear medicine. 52.0% of these radiology residents (see Fig. 1) opted for the concept of "4 years in radiology and 2 years in diagnostic nuclear medicine" with their motivation being to also perform diagnostic nuclear medicine besides radiology. Another 41.0% of these radiology residents favored "4 years of radiology, then another 3 years of nuclear medicine". The concept of "4 years of nuclear medicine, then another 4 years of radiology until both specialist titles are attained" was supported by only 7%. Overall, 98.6% of the radiology residents were in favor of a training period of 6 or 7 years to specialize in both disciplines.

**Residents in nuclear medicine** Of the 11 residents (100%) in nuclear medicine who responded, 63.3% were interested in completing additional specialist training in radiology, 1 resident (9.1%) was still undecided, and 3 residents (27.3%) were not interested in additional radiology training. The areas of oncological imaging, cardiac/thoracic radiology (with 7 entries for each), and abdominal radiology (with 6 entries) were of greatest interest to those who responded. Interest was more divided for neuroradiology, research activities, musculoskeletal radiology, and pediatric radiology (with 4 entries for each). Emergency radiology, breast imaging, and interventional radiology were of minor interest. The motivation pattern was mostly similar to that of radiology residents, expansion of the diagnostic capabilities with 6 entries and personal need for interdisciplinary further training with 5 entries. In the middle of the motivation scale (7 entries each) were the better chances of employment as well as the long-term safeguarding of employment.

According to the current training curriculum for obtaining a double medical specialist title, of the 7 responses received (see Fig. 1), 71.4% of the responders were in favor of the concept of "4 years in radiology and 2 years in diagnostic nuclear

**Table 1** Summary of the common questions for radiologists and nuclear medicine physicians

| | Questions | Answers |
|---|---|---|
| 1 | Language choice | • German<br>• French |
| 2 | Age category | • 23–28, 29–32, 32–40, 41–50, 51–60, over 60 y |
| 3 | Gender | • Male/female |
| 4 | Workplace | • University hospital<br>• Cantonal hospital<br>• Regional medical service center<br>• Practice (in urban area or in rural area)<br>• Other field of activity |
| 5 | Working position | • Residents<br>• Consultant physicians |
| 6 | Training year | • 1 -, 2 -, 3 -, 4 -, 5 -, over 5 y |
| 7 | How satisfied are you with your previous training in your field? | • Perfectly happy <-> Very unhappy (6 scalars) |
| 8 | Do you think it's possible, both in the field of Rad and NM to be well trained in the broad spectrum of both disciplines? | • Yes<br>• No<br>• I cannot conclusively assess |
| 9 | Which of the following training program can you imagine under the framework of a new training concept? | • 5 y: 3 y basic education +2 y Rad = specialist title in Rad, then no further specialization.<br>• 5 y: 3 y basic education +2 y NM = specialist title in NM, then no further specialization.<br>• 7 y: specialist title in Rad (5 y) + 2 y training in NM.<br>• 7 y: specialist title in NM (5 y) + 2 y training in Rad.<br>• 6 y: specialist title in Rad (including 1 y of NR) + 1 y of NR.<br>• 6 y: specialist title in Rad (including 1 y PR) + 1 y PR.<br>• 7 y: specialist title in Rad (including 1 y of NR) + 1 y NR + 1 y INR.<br>• 8 y: specialist title in Rad and NR(6 y) and another 2 y of NM<br>• Other options? |
| 10 | Where do you see your long-term field of activity? | • University hospital<br>• Cantonal hospital<br>• Practice (in urban area or in rural area)<br>• Other field of activity |

*Rad*, radiology; *NM*, nuclear medicine; *y*, year(s); *m*, months; *PR*, pediatric radiology; *NR*, neuroradiology; *INR*, interventional neuroradiology

medicine". One resident (14.3%) supported the concept of "4 years in radiology, then another 3 years in nuclear medicine" and another participant voted for "3 years in nuclear medicine and 4 years in radiology" as an option. The concept "4 years of nuclear medicine, then another 4 years of radiology until both specialist titles are attained" was not supported. Of the 7 responses, 6 (86%) fell to a training period of 6 and 7 years, respectively.

**Preferences regarding a possible future joint training curriculum for residents in radiology and nuclear medicine** To obtain radiology and nuclear medicine residents' opinion regarding a joint training program, different variants were presented, also with regard to possible adjustments to the general conditions by the radiological society/nuclear medicine society in Switzerland. The following two options were preferred by residents in radiology and nuclear medicine taken together (53% of all residents; see Fig. 2).

- Specialist title in radiology after 5 years of training plus another 2 years of specialist training in nuclear medicine (38.2%)
- Specialist title in radiology and diagnostic neuroradiology in 6 years of training plus another 2 years of training in nuclear medicine (14.7%)

**Consultants in radiology** The first question referred to the willingness of board-certified radiologists to undergo further training in nuclear medicine according to the current training curriculum. Of the 238 consultants who responded, 7.3% would accept a training period in nuclear medicine of 3 years, 13.4% would invest a maximum of 2 additional years, and 32.8% a maximum of 1 year in subareas of nuclear medicine. Of great interest (multiple answers were possible) were the modalities of PET/CT (93.4%), scintigraphy, and SPECT/CT (50%).

**Table 2** Summary of the questionnaire for radiologists

| | Questions | Answers |
|---|---|---|
| 1 | You are currently working as a resident in Rad. In principle, can you imagine completing the specialist training in NM as a supplement? | • Yes<br>• No<br>• I do not know yet |
| 2 | What motivation do you have to complete additional training in NM? | Very high motivation <-> No motivation (6 scalars). |
| 3 | What is your interest in the following areas (NM)? | • PET-CT<br>• PET-MRI<br>• Scintigraphy<br>• SPECT-CT<br>• Thyroid diagnosis and therapy<br>• Research activities |
| 4 | Imagine, you are at the beginning of your training in Rad. How much time are you willing to spend on your entire training (RAD and NM)? | • 5 -, 6 -, 7 -, 8 y |
| 5 | Imagine that you already intend today to pursue medical training in both Rad and NM. According to today's conditions, which modular possible training curriculum would you choose the most? | • First 4 years of Rad, then another 3 y of NM until achieving both advanced training titles.<br>• First 4 y of NM, then another 4 y of Rad to achieve both training titles.<br>• 4 y of Rad and 2 y of NM.<br>• More options? |
| 6 | Imagine, instead of a complete training in the field of NM, you could only select individual subareas with a shorter training time. Which area would you be interested in (multiple answers possible)? | • PET-CT (12 m)<br>• Scintigraphy and SPECT-CT (12 m)<br>• Thyroid diagnosis and therapy (12 m)<br>• Complete training<br>• Other own training suggestions |
| 7 | What motivation could prompt you to complete additional training in NM? | • Acquisition of a broader range of diagnostic skills<br>• Better employment opportunities<br>• Long-term assurance of Employment<br>• Monetary motives<br>• Personal need for continuous development |
| 8 | How high would you rate your interest in the following areas of NM? | • PET-CT (6 scalars)<br>• Scintigraphy and SPECT-CT (6 scalars)<br>• Thyroid diagnosis and therapy (6 scalars)<br>• Research activities (6 scalars) |
| 9 | Imagine, instead of a complete training in the field of NM, you could only select individual subareas with a shorter training time. Which area would you be interested in (multiple answers possible)? | • PET-CT (12 m)<br>• Scintigraphy and SPECT-CT (12 m)<br>• Thyroid diagnosis and therapy (12 m)<br>• Complete training<br>• Other own training suggestions |
| 10 | You are a consultant physician in Rad. According to the continuing education curriculum to date you would spend another three years complete advanced training in the field of NM. Are you willing to invest these 3 y or if necessary only partial areas of it? | • Yes, I would accept a 3-y training period<br>• I would rather invest a maximum of 2 y in sub-areas in NM<br>• I would rather invest a maximum of 1 y in sub-areas in NM<br>• I have no need for further training in NM |
| 11 | Imagine that instead of complete further training in NM, you could also choose individual sub-areas with a limited period of further training in a modular manner (and then also bill the health insurance companies for this activity). In which area would you be interested (multiple answers possible)? | • PET-CT (12 m)<br>• Scintigraphy and SPECT-CT (12 m)<br>• Thyroid diagnosis and therapy (12 m) |
| 12 | Imagine, you would have the opportunity to become a specialist in NM within 2 y after completing a new continuing education curriculum. Would you be willing to invest these 2 y or only parts of them? | • Yes, I would accept 2 y of further training<br>• No, I would still prefer to invest a maximum of 1 y in sub-areas in NM<br>• I have no need for further training NM |

*Rad*, radiology; *NM*, nuclear medicine; *y*, year(s); *m*, months

A total of 108 consultant radiologists (45.4%) expressed no interest in further training in nuclear medicine. Presented with the option of obtaining the title of nuclear medicine specialist in 2 years according to a possible future joint training program, 69 respondents (29.0%) would be willing to invest this time. Another 74 respondents (31.1%) would be prepared to invest a maximum of 1 year in subareas of nuclear medicine. The remaining 86 respondents (36.1%) would not be

**Table 3** Summary of the questionnaire for nuclear medicine physicians

| | Questions | Answers |
|---|---|---|
| 1 | You are currently working as a resident in NM. In principle, can you imagine completing the specialist training in Rad as a supplement? | • Yes<br>• No<br>• I do not know yet |
| 2 | What motivation do you have to complete additional training in Rad? | Very high motivation <-> No motivation (6 scalars). |
| 3 | What is your interest in the following areas (Rad)? | • Musculoskeletal radiology<br>• Abdominal radiology<br>• Cardiac - / thoracic radiology<br>• Emergency radiology<br>• Neuroradiology<br>• Pediatric radiology<br>• Interventional radiology<br>• Breast Imaging<br>• Oncological Imaging<br>• Research activities. |
| 4 | Imagine, you are at the beginning of your training in NM. How much time are you willing to spend on your entire training (NM and Rad)? | • 5 -, 6 -, 7 -, 8 y |
| 5 | Imagine that you already intend today to pursue medical training in both NM and Rad. According to today's conditions, which modular possible training curriculum would you choose the most? | • First 4 years of NM, then another 4 y of Rad until achieving both advanced training titles<br>• First 4 y of Rad, then another 3 y of NM<br>• 4 y of Rad and 2 y of NM.<br>• More options? |
| 6 | Imagine, instead of a complete training in the field of Rad, you could only select individual subareas with a shorter training time. Which area would you be interested in (multiple answers possible)? | • CT (6 m, 12 m)<br>• MRI (6 m, 12 m)<br>• Ultrasound (6 m, 12 m)<br>• Breast Imaging (6 m, 12 m)<br>• Interventional radiology (6 m, 12 m)<br>• Complete training<br>• Other own training suggestions. |
| 7 | What motivation could prompt you to complete additional training in Rad? | • Acquisition of a broader range of diagnostic skills<br>• Better employment opportunities<br>• Long-term assurance of Employment<br>• Monetary motives<br>• Personal need for continuous development |
| 8 | How high would you rate your interest in the following areas of Rad? | • Musculoskeletal radiology (6 scalars)<br>• Abdominal radiology (6 scalars)<br>• Cardiac - / thoracic radiology (6 scalars)<br>• Emergency radiology (6 scalars)<br>• Neuroradiology (6 scalars)<br>• Pediatric radiology (6 scalars)<br>• Interventional radiology (6 scalars)<br>• Breast Imaging (6 scalars)<br>• Oncological Imaging (6 scalars)<br>• Research activities (6 scalars) |
| 9 | Imagine, instead of a complete training in the field of Rad, you could only select individual subareas with a shorter training time. Which area would you be interested in (multiple answers possible)? | • CT (6 m, 12 m)<br>• MRI (6 m, 12 m)<br>• Ultrasound (6 m, 12 m)<br>• Breast Imaging (6 m, 12 m)<br>• Interventional radiology (6 m, 12 m)<br>• Complete training<br>• Other own training suggestions |
| 10 | You are a consultant physician in NM. According to the previous curriculum you would need another 4 y for a complete further education in Rad. Would you be willing to invest these 4 y or only parts of them? | Yes, I would accept a 4-y training period.<br>• I would rather invest a maximum of 3 y in sub-areas in radiology.<br>• I would rather invest a maximum of 2 y in sub-areas in radiology.<br>• I would rather invest a maximum of 1 y in parts of the subject radiology.<br>• I have no need for further training in radiology. |
| 11 | | • CT (6 m, 12 m) |

**Table 3** (continued)

| | Questions | Answers |
|---|---|---|
| | Imagine that instead of complete further training in Rad, you could also choose individual sub-areas with a limited period of further training in a modular manner (and then also bill the health insurance companies for this activity). In which area would you be interested (multiple answers possible)? | • MRI (6 m, 12 m)<br>• Ultrasound (6 m, 12 m)<br>• Breast Imaging (6 m, 12 m)<br>• Interventional radiology (6 m, 12 m). |
| 12 | Imagine that after a new training curriculum you would have the opportunity to become a specialist in NM and obtain a medical specialist title in Rad within 2 y. Would you be willing to invest these 2 y or only parts of them? | • Yes, I would accept 2 y of further training<br>• I would prefer to invest only a maximum of 1 y in parts of the subject Rad.<br>• I have no need for further training in Rad |

*Rad*, radiology; *NM*, nuclear medicine; *y*, year(s); *m*, months

interested in further training in nuclear medicine even according to a possible new curriculum.

**Consultants in nuclear medicine** The first question referred to the willingness of board-certified physicians in nuclear medicine to undergo further training in radiology according to the current training curriculum. Of the 40 board-certified nuclear medicine physicians who responded, 30.0% would be willing to invest four years for the specialist title in radiology, 7.5% preferred a maximum radiology training period of three years, 25.0% favored two years, and 12.5% one year. Of great interest (multiple answers were possible) were the areas of MRI (94.4%) and CT (72.2%).

Twenty-five percent of consultants expressed no need for further training in radiology. Regarding the answer to the option of obtaining the title of radiology specialist in two years according to a possible future joint training program, 55.3% will agree to invest this time, 18.4% would agree to invest a maximum of one year in subareas of radiology, and another 26.3% did not show any interest in further education in radiology, even according to a possible new curriculum. This number was the same compared with those who were not interested according to the existing curriculum.

**Table 4** Participant structure of the survey: gender, age, and region

| | *n* (%) |
|---|---|
| Gender (**n* = 321) | |
| Male | 246 (76) |
| Female | 75 (24) |
| Age (years **n* = 328) | |
| 23–28 | 17 (5.2) |
| 29–32 | 33 (10.1) |
| 33–40 | 80 (24.4) |
| 41–50 | 88 (26.8) |
| 51–60 | 76 (23.2) |
| > 60 | 34 (10.4) |
| Region (**n* = 370) | |
| German-speaking Switzerland | 309 (84) |
| French-speaking Switzerland | 61 (16) |

**n*, data given of *n* participants

## Discussion

Radiology and all specialties related to imaging science, including nuclear medicine, are changing rapidly. Radiologists and nuclear medicine physicians are threatened by both internal and external challenges [9–14] that may diminish our role in health care and limit our ability to attract outstanding trainees and to optimize advances in imaging research. One possible solution to strengthen our position is for radiology and nuclear medicine to combine their complementary skills

**Table 5** Participant structure of the survey: current position, years of training (for residents), and current workplace

| | *n* (%) |
|---|---|
| Current position (**n* = 345) | |
| Residents in Rad | 54 (15) |
| Residents in NM | 11 (3) |
| Consultant physicians in Rad | 238 (69) |
| Consultant physicians in NM | 42 (13) |
| Years of training (residents, **n* = 65) | |
| 1st year | 12 (18.5) |
| 2nd year | 11 (16.9) |
| 3rd year | 10 (15.4) |
| 4th year | 12 (18.5) |
| 5th year | 10 (15.4) |
| More than 5 years | 7 (10.8) |
| No answer | 3 (4.6) |
| Current workplace (**n* = 341) | |
| University hospital | 120 (35.2) |
| Cantonal hospital | 81 (23.8) |
| Regional hospital | 34 (10.0) |
| Private or group practice | 77 (22.6) |
| Others | 29 (8.5) |

**n*; data given of *n* participants. *Rad*, radiology; *NM*, nuclear medicine

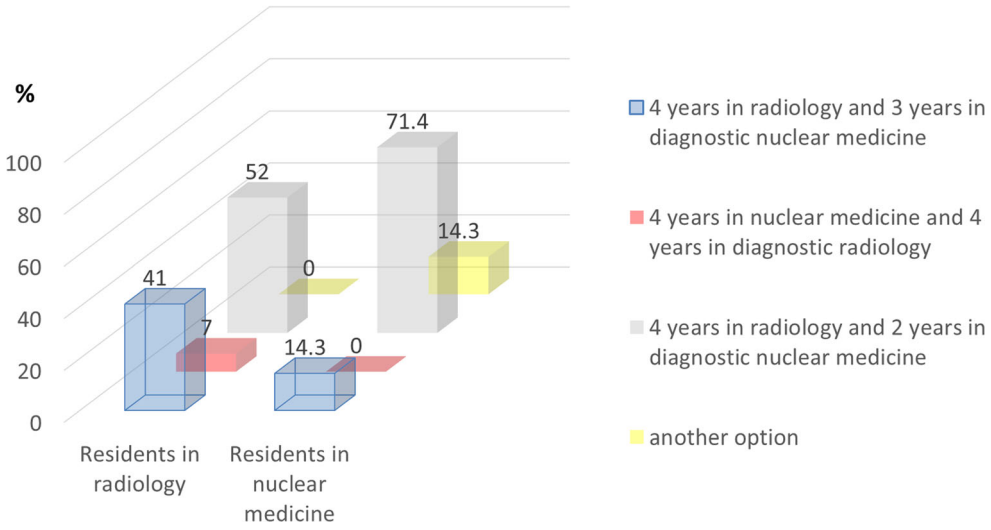


**Fig. 1** Residents' preferences concerning the current training curriculum for obtaining a double medical specialist title ($n = 27$ answers from radiology residents; $n = 7$ answers from nuclear medicine residents)

and work toward a common goal in the multidisciplinary development of molecular imaging. The first step is to set up a combined new cross-curricular training curriculum for residents in both specialties, which will improve competence in advanced medical imaging and knowledge of molecular imaging.

**Residents in radiology and nuclear medicine** More than half of all residents (52%) in either radiology or nuclear medicine participating in our survey believe that comprehensive expertise in both disciplines can be ensured through adequate cross-curricular training (see Fig. 3). At present, neither radiology nor nuclear medicine training alone in Switzerland prepares residents optimally for future advances in molecular imaging. Radiologists and nuclear medicine physicians should face this problem and realize that we live in an era of transition that requires new approaches to tackle the changes our specialties are facing.

Another interesting result of our survey among residents is that the willingness to undergo further training in the other's specialty is higher among nuclear medicine residents than among radiology residents. Residents who initially start specialist training in nuclear medicine would like to do

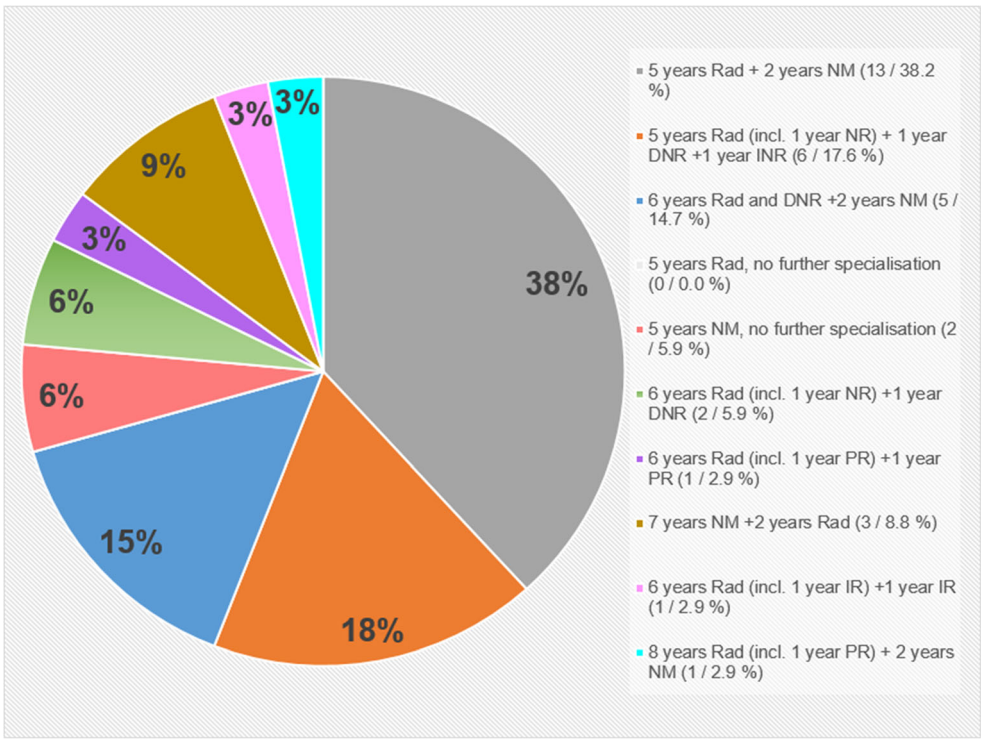


**Fig. 2** Participants' preferences concerning possible future joint training curricula. Rad, radiology; IR, interventional radiology; NM, nuclear medicine; NR, neuroradiology; DNR, diagnostic neuroradiology; INR, interventional neuroradiology; PR, pediatric radiology

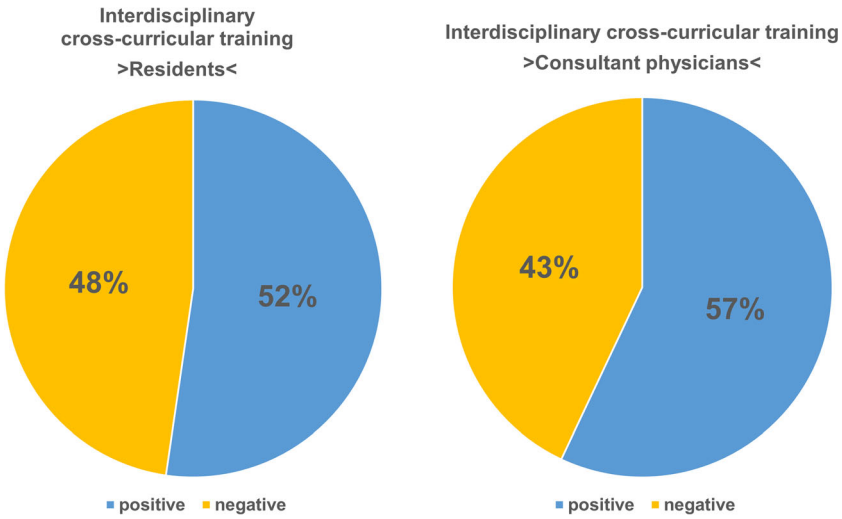


**Fig. 3** Responses of residents and consultants regarding their attitudes toward interdisciplinary cross-curricular training in radiology and nuclear medicine

further specialist training later in radiology with a higher percentage (63.3%) compared to radiology residents (56%). In fact, there is some concern that both the fields of radiology and nuclear medicine may face an uncertain future unless more medical students can be attracted to both specialties [6, 12–14].

**Preferences regarding a possible joint training curriculum for residents in radiology and nuclear medicine** Only a small percentage of respondents from either radiology or nuclear medicine (5.9%) showed no eagerness for further training in each other's specialty. More than half of all respondents would be willing to invest 2 more years of training in subareas of nuclear medicine (53%, see Fig. 2). This illustrates how extensive the interest in the other discipline in both radiology and nuclear medicine is.

**Consultants in radiology and nuclear medicine** Almost half of the consultants in radiology (46.6%) and a quarter of consultant physicians in nuclear medicine (25.0%) had no interest in further training in a cross-curricular training (43%, see Fig. 3). While, at first sight, this might suggest a lack of interest in each other's specialty, results by age show that this is in part attributable to higher age, when further training is no longer considered worthwhile (see Fig. 4). Other participants already had a double medical specialist title or had practical experience in the interpretation of hybrid imaging data. Other reasons given were a loss of income during further education, high existing workloads, and an enormous expenditure of time.

Interestingly, we found that the willingness of consultants in radiology or nuclear medicine to do further training in each other's specialty increased significantly with shortening the training period to 2 years. This observation suggests that the

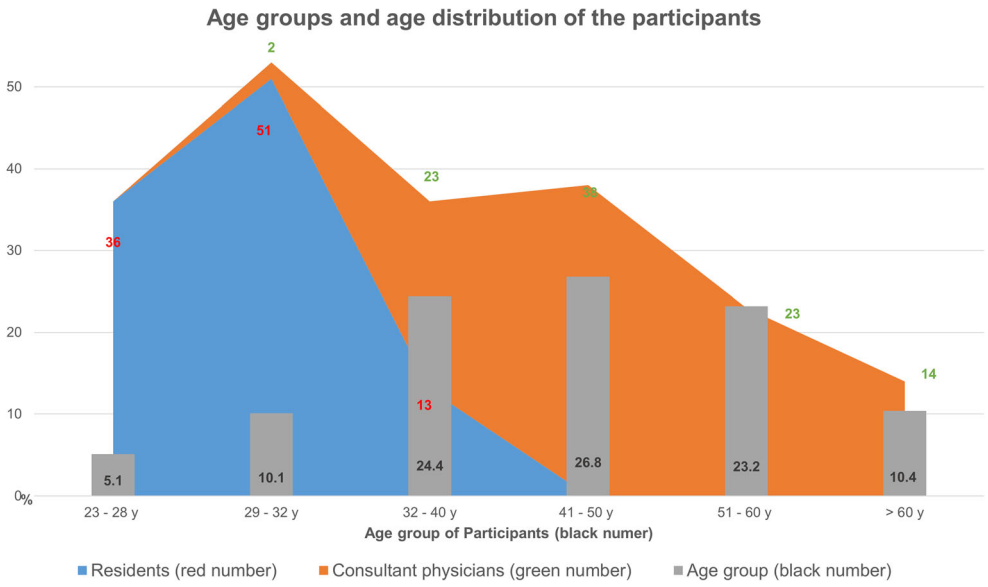


**Fig. 4** Overview on different age groups of the participants and age distribution in the participating residents and board certified physicians in radiology and nuclear medicine

duration of specialty training plays a key role in the decision to undergo interdisciplinary further education.

There are some limitations to our study. It is always desirable to have a large number of respondents. However, physicians are less likely to participate in surveys possibly because of their heavy workload. Our return rate of 30% is moderate but corresponds to the return rate of questionnaire surveys that can be expected according to Jepson et al [15]. It even exceeds the return rate in other surveys in radiology [16, 17].

Some bias may have resulted from the fact that mainly radiologists participated in the survey. Relatively fewer nuclear medicine physicians responded (14%). We cannot claim that our data provide a comprehensive overview of the current demand for interdisciplinary further education of residents and board-certified physicians in nuclear medicine in Switzerland, but our study nevertheless provides interesting insights into the demand for interdisciplinary further education from two medical specialties.

## Conclusion

Our survey indicates that residents and consultants in radiology and nuclear medicine have a great interest in further training in each other's specialty. Regarding a possible future joint training curriculum for residents in both specialties, gaining a specialist title in radiology in 5 years plus 2 years of specialist training in nuclear medicine is the most popular concept. This demand should be considered in new cross-curricular training programs which should incorporate the principles and all modalities of both specialties.

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### Compliance with ethical standards

**Guarantor** The scientific guarantor of this publication is Martin Maurer, Bern University Hospital, Inselspital, University of Bern, Switzerland.

**Conflict of interest** The authors of this manuscript declare no relationships with any companies whose products or services may be related to the subject matter of the article.

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**Informed consent** Written informed consent was not required for this study because no patient-related data was necessary for this study.

**Ethical approval** Institutional Review Board approval was not required because it is only an anonymized statistical data and no patient data was used for this study.

**Methodology**
- prospective
- observational
- performed at one institution



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