Integrated Residency in Radiology and Nuclear Medicine in The Netherlands

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The Dutch Societies of Radiology and Nuclear Medicine (DSR and DSNM, respectively) have merged their residencies into a combined residency with different outflow profiles, one of which is nuclear medicine (NM) and molecular radiology. The boards and residency review committees have also been merged. The new residency is in its third year of development, and the results are very promising. In our opinion, a combined future for radiology and NM will be a stronger future for medical imaging.

Over the past decade, intense discussions have focused on the future of residency training in radiology and NM, particularly in the United States (*1–4*). Various pathways to NM certification or dual certification have been proposed, some of which are rather complex (*5,6*). In The Netherlands, similar discussions have occurred, but we have chosen a different approach and have come to different conclusions. We are pleased to present our experiences to the readership of *The Journal of Nuclear Medicine*.

In 2011 the Dutch Board of Nuclear Medicine incorporated 12 months of radiology training into the NM residency training program, recognizing the growing importance of cross-sectional imaging modalities for hybrid imaging. Although at the time this seemed an adequate (short-term) solution for the needs of the next generation of NM physicians, it elicited a discussion between the leadership of the DSR and DSNM about the long-term future of medical imaging. As a result, a task force was instituted, including members from both societies.

Task Force

The mission of this task force was 2-fold: (1) to design a 12-month radiology training program for NM residents; and (2) to develop a long-term vision for the structure of the residencies of radiology and NM and for collaboration between both specialties. The working group started with a discussion about the future of radiology and NM. The question to be answered was: what would be the ideal setup for medical imaging in 10–15 years, without taking into consideration the fact that radiology and nuclear medicine are currently 2 separate specialties?

The majority of discussants agreed fairly quickly that there was no way to envision radiology and NM still being 2 distinct and separate medical specialties in the future, considering the current and expected major developments in hybrid, multimodality, and molecular imaging. The conclusion was that, in the long term, a complete integration of radiology and NM would provide the best opportunities for optimal and comprehensive medical imaging, collaboration with clinical colleagues, and quality of patient care.

The task force presented a proposal including 4 components: (1) a merger of the radiology and NM residencies, with different graduation profiles for the various subspecialties, one of which was NM and molecular imaging; (2) a 12-month radiology program for current NM residents, in which they could obtain independent competency levels for several well-defined hybrid imaging procedures; (3) a 2–3-month introductory NM program for current radiology residents, without an independent competency level; and (4) crossover training for current NM physicians and radiologists who wish to obtain independent competency levels for several well-defined hybrid imaging procedures.

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This proposal was accepted by the leadership of both societies for presentation to their members. After ample discussion in several consecutive meetings of both societies, the proposal was accepted in early 2013: 68% of the membership of the DSNM voted in favor, whereas the vote was almost unanimous in favor (98.5%) in the DSR. A second task force was then formed to implement the 4 components of the proposal.

Task Force 2

The most comprehensive task of the new working group was to develop a combined residency curriculum that could accommodate sufficient training in both general and subspecialty radiology and in NM. Numerous challenges had to be faced during this process. We briefly review the main discussion points and choices here.

Structure of residency. The new residency has a duration of 5 years and includes 2 phases, each of which lasts 2.5 years: a "common trunk" phase and a "differentiation" phase. The common trunk phase is the same for all residents and is dedicated to general radiology. In the differentiation phase, each resident chooses 1 or 2 subspecialty fields in which he or she gains additional experience.

The residency is organized along 8 themes, both in the common trunk and in the differentiation phase, corresponding to the generally accepted subspecialty fields of radiology: cardiothoracic, abdominal, musculoskeletal,

neuro/head and neck, interventional, breast, pediatric, and NM. These themes may also be chosen as differentiations, which differ in length: a differentiation may have a length of 18, 12, or 6 months (Table 1). The differentiations of 12 or 6 months may be combined up to a maximum of 18 months. The remainder of the differentiation phase, with a minimum of 12 months, is dedicated to general radiology.

Nuclear medicine as a separate differentiation. Initially, several discussants, both radiologists and NM physicians, advocated the complete spreading of NM procedures over the various organ subspecialty fields. However, after some discussion, it was clear that a separate NM differentiation should be included. The new NM practitioner should have specific expertise in radionuclides, pharmacokinetics, biomarkers, molecular imaging, dosimetry, nuclear physics, NM equipment, etc., as well as in radionuclide therapies, and should provide services in areas of radiology in which subspecialists have no independent NM competence. We have labeled this differentiation "nuclear medicine and molecular radiology."

Nuclear medicine as part of other differentiations. A particular challenge was how to divide NM procedures over the various other differentiations, especially because the frequency of NM procedures is an order of magnitude smaller than that of radiologic procedures. We concluded that NM procedures should not be dispersed among all differentiations but, instead, should be performed only by radiologists in subspecialty fields in which the frequency of NM procedures is sufficiently high to allow for maintenance of adequate expertise on an individual level. Therefore, NM procedures were implemented at an independent competence level only in the following organ differentiations and only for the NM procedures within that particular subspecialty field: cardiothoracic, abdominal, and musculoskeletal radiology. The more advanced and infrequent NM procedures will be performed by or in collaboration with the NM physician or (in the future) the nuclear radiologist (i.e., the radiologist who has completed a differentiation in NM and molecular radiology).

Table 1
Duration of Training in Various Differentiations

Subspecialty field	Duration of differentiation (mo)	Total nuclear medicine during residency (mo)*
Cardiothoracic radiology†	18	6
Abdominal radiology†	18	6
Interventional radiology	18	2
Nuclear medicine and molecular radiology	18	20
Neuro/head and neck radiology	12	2
Musculoskeletal radiology†	12	5
Breast radiology	6	2
Pediatric radiology	6	2

*2 months of nuclear medicine during common trunk phase.
†Including competency for independent practice of nuclear medicine in subspecialty field.

Different lengths of differentiations. In the previous radiology residency curriculum all differentiations had an equal duration of 12 months, and cardiac and chest radiology were separate. There were several reasons to prefer different lengths for different differentiations in the new curriculum, as well as to combine cardiac radiology and chest radiology into a single differentiation: (1) Our experience was that previously some differentiations were chosen by relatively few residents, thus resulting in insufficient expertise in these subspecialties among graduating radiologists. This was the case for cardiac, chest, breast, and pediatric radiology; (2) In several differentiations, a considerable amount of time had to be allocated to NM; (3) There was a need for a higher level of competence in graduates with a differentiation in interventional radiology; and (4) There was a need in the marketplace for young radiologists with 2 differentiations rather than 1.

General radiology. In the new residency, a minimum of 3.5 years is devoted to general radiology: 2.5 years in the common trunk phase and a minimum of 1 year in the differentiation phase. For this purpose, we have redefined the term "general radiology" as radiology in which special emphasis is placed on frequent, emergent, and primary care procedures in all subspecialty fields. This means that at the end of the residency all graduates are general radiologists and all have additional expertise in 1 or 2 subspecialty fields.

Residency program directorship, structure of the board, and residency review committee. In The Netherlands, each residency training program has a program director and a vice program director, normally both from the same specialty. In collaboration with the Dutch Board of Medical Specialties, we devised a structure in which 1 of the 2 is a radiologist and the other is an NM physician. In most programs that offer both radiology and NM training, the new program director is the former radiology program director and the vice program director is the former NM program director.

The Dutch Boards of Radiology and Nuclear Medicine have been merged into a combined board under the auspices of the leadership of both professional societies and the Dutch Board of Medical Specialties. For the next several years this board will oversee the existing programs of radiology and NM as well as the combined program. The residency review committees have also been merged. Collaboration within these groups is generally excellent. The first president of the new board was a radiologist, and the current president is an NM physician (the authors of this article).

Name of the combined specialty. Another important topic was the choice of a name for the new residency, which in the longer term will become the name of the new specialty.

The intention initially was to choose a name that would reflect both specialties, such as radiology and NM, medical imaging, radiation imaging, diagnostic and therapeutic imaging—even the term "medical iconology" was considered. However, important considerations were that the name should be clear to both the medical community and the general public and should be concise and in line with international usage. In the end, consensus was reached to use "radiology" as the name for the combined specialty; this is already an umbrella term and essentially signifies the entire field in which radiation is used to diagnose and treat patients.

Start of the new residency. The formal start of the new residency was July 1, 2015. First-year residents (start date July 1, 2014, or later) could switch to the new program, and almost every first-year resident did so. On January 1, 2017, these residents began their differentiation phase. The early indications are that sufficient numbers of junior residents are interested in choosing NM for their differentiation.

Future of societies. A third task force is currently exploring the future of the DSR and DSNM. The boards and residency review committees have already been merged, and several committees are working closely together (education committees, quality committees). The expectation is that the societies will merge at some point in the foreseeable future.

Conclusion

In this short communication we cannot provide a detailed description of all the topics that were discussed during this exceptionally complex undertaking. The future structure of the profession of medical imaging is of the utmost importance to providing the best quality, service, and value for money in patient care. In our opinion, a combined future for radiology and NM is a stronger future for medical imaging. We see a number of advantages, including but not limited to:

- A solid basis in general radiology for all future imaging specialists;
- Better and more efficient communication with clinicians because of integral interpretation of subspecialty imaging procedures by a single imaging specialist, both on an individual level and in multidisciplinary conferences;
- A better integration of NM practitioners in imaging departments, including more efficient use of personnel during office hours as well as in call services;
- No turf battles between radiology and NM as separate specialties;
- Better opportunities to recruit bright and motivated young individuals to choose a career in NM. The best target group for this is junior radiology residents, because they are in the best position to see and appreciate the great opportunities NM has to offer;
- A better starting point for collaboration in multimodality research; and
- A stronger position in negotiations with government and societal organizations.

The new residency is now in its third year of development. Although minor hiccups in collaboration between program directors have been noted in some residency programs, we have not encountered any major problems. Acceptance has generally been broad in both the radiology and the NM communities. We are still in the early stages of the combined future of medical imaging, and it remains to be seen which problems or disadvantages may surface in the longer term, but so far the experiences have been very promising. The DSR and DSNM are proud to have reached this consensus and are convinced that the future of patient care will be better served by an integrated specialty in medical imaging.

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