Quarters cannot be raised in this Tracers or any other issues affecting the practice of nuclear medicine or the certification processes. Please email your comments to:

The ABNM welcomes comments from diplomates and residents regarding issues and problems affecting the practice of nuclear medicine. Comments or questions should be addressed to:

Communications Committee Chair, American Board of Nuclear Medicine

In-Training Exam

The question remains: where is the next assessment review environment will be?

About CertLink In-Training (IT)

CertLink Leave Policy has recently been updated...

Sign up to sit MOC Exam

Don't get distracted.

CertLink (MOC) FAQ

MOC Committee Chair, ABNM

The ABNM is searching for an Associate Executive Director to fulfill the ABNM requirements for re-certification. Certification processes include the addition of...
For most diplomates, the most significant interaction with the ABNM comes in the form of knowledge assessment, such as taking the initial certification or maintenance of certification exam, or participating in CertLink®, ABNM’s longitudinal assessment tool. All of these products comprise questions which represent the collective work of ABNM board members, both prior and current. The critical importance of having high quality questions is obvious. At the same time, creating excellent exam questions is no easy task.

At a fundamental level, examinations or CertLink questions are intended to focus on a key point of knowledge that is felt to be relevant to the contemporary practice of nuclear medicine. The question gives the diplomate an opportunity to demonstrate mastery of that key topic; or, alternatively, an opportunity to identify a topic which might not be fully mastered. In this sense, all questions represent an opportunity for ongoing learning. (Parenthetically: this is one of the unique advantages of using CertLink. Upon completion of each question, the key point is presented, along with one or more references which can be accessed to learn more about that topic. The hope is that this can facilitate the process of lifelong learning for all of us in busy clinical practices.)

But as we all know, clinical practice - and, for that matter, life in general - does not always have a single correct answer! This, among many other factors, increases the challenge and complexity of question creation. To this end: ABNM needs and appreciates your feedback. Every question, whether it be on a traditional exam or CertLink, offers the option to submit feedback. Diplomates are encouraged to use this route to send comments about individual questions. For example, if you suspect that a question potentially has two equally correct answers, please be sure to submit this feedback. Or, if you think a question was particularly useful / relevant to clinical practice, that feedback is helpful as well.

What happens to these comments after they are submitted? The ABNM reviews 100% of these comments! Each item of feedback is reviewed by at least one (and usually more) Board member(s). Comments with substantiated concerns (e.g., “two correct answers” being a prototypical example) will result in corrective action for that question, which might include discarding it entirely or rewriting it to improve its psychometric quality. Feedback regarding topic / question relevance to clinical practice are considered as well.

While logistics preclude the Board from replying to individual diplomates who submit comments, we want you to know that your comments are indeed received, reviewed, thoughtfully considered, and greatly valued. We want to sincerely thank you for your feedback: it is of vital importance and helps the ABNM to improve the quality of its products.

Ryan D. Niederkohr, MD
Chair
My mother always encouraged me to become a physician, and in high school, I enjoyed chemistry, physics, and mathematics. However, during medical school in Iran, I was disappointed and frustrated by the lack of a scientific approach in medicine.

I immigrated to the US in 1966 and trained in Internal Medicine before deciding on a final specialty. During this period, I became aware of applications of hardcore sciences in an evolving new specialty: nuclear medicine. I was also interested in medical imaging because of my desire to use spatial cognition to practice medicine. In 1969, I learned of Henry Wagner’s textbook and found that the field was very much in line with my interests. This specialty seemed perfect for me!

So, I enrolled in a NIH-funded Nuclear Medicine training program at the University of Pennsylvania. My mentor, David E. Kuhl, played a major role in exposing me to the great potential of this discipline. Dr. Kuhl was the pioneer in introducing tomography based on single gamma emitters such as Technetium 99m-labeled compounds. At that time, we were primarily interested in detecting blood-brain-barrier abnormalities since that was the only possibility with the SPECT instruments at Penn. The introduction of contrast enhanced CT by Hounsfield in 1973 made us aware of the limited applications of SPECT as a powerful modality. In December 1973, David Kuhl, Martin Reivich, and I discussed the potential of using positron emission tomography (PET) to enhance our ongoing research. At that time, C14-deoxyglucose was being used to assess glucose metabolism by autoradiographic techniques in animal models at Penn and the NIH. Therefore, we decided to pursue an approach that would allow labeling deoxyglucose with a positron emitting radioactive element such as C11 or F18. We approached Dr. Alfred Wolf at Brookhaven National Laboratory (BNL) who found the idea interesting, which eventually led to synthesizing Fluorodeoxyglucose (FDG) and transporting it to Penn for the first human study in 1976. My colleagues and I performed the first tomographic images of the brain as well as the total body with planar imaging (with a rectilinear scanner), starting a new era in medical imaging. I continued working with colleagues at BNL to generate pilot data in applications of FDG in various neurological disorders. The instruments employed to conduct these preliminary studies were designed by Dr. Ter-Pogossian at Washington University. Later, we were able to synthesize FDG at Penn by using a tandem accelerator initially, and then by installing a standard cyclotron by 1985. Establishing a major NIH-funded PET center at Penn substantially enhanced our abilities for research over the next 4 decades. I recruited Gerd Muehllehner who was interested in scintillation-based PET imaging, which allowed us to image the entire body with PET tracers.

Our initial research studies dealt with Alzheimer’s Disease and several other neurological disorders. We along with colleagues at NIH were also the first to use FDG to image brain tumors and initiate the path for employing FDG in other malignancies. By the early 1990s, investigators around the world could employ PET for assessing a variety of malignancies. I also realized the importance of FDG in inflammatory disorders including bacterial infection, especially in the musculoskeletal domains. During the past 20 years, my research activities have expanded to detection and characterization of atherosclerosis in normal aging as well as patients with high risk for this serious disease. While our initial research dealt with detection of inflammatory plaques with FDG, we have recently realized the potential of 18F-Sodium Fluoride (NaF) for detecting molecular calcification in the coronary and carotid arteries.

In addition, we have applied novel techniques for quantifying tracer uptake in numerous settings. We have developed novel approaches to generate a single number for assessing global disease activities in many diseases and disorders.

My career in Nuclear Medicine has been extremely rewarding and has brought me back to my dreams in high school and in medical school. In my view, molecular imaging with PET (combined with CT or MRI) will remain the most powerful methodology in medicine for the foreseeable future. These techniques will help in applying effective patient care, better understanding of body function and developing the most useful drugs and treatments. Therefore, I am very grateful to those who led me to this path.
In the challenging and growing world of nuclear medicine, achieving work-life balance has been an important journey for me. It’s not just about managing time; it’s about embracing a diverse range of interests that infuse vitality into multiple facets of my life.

Hobbies like 3D printing are a source of inspiration and innovation. The process of conceptualizing an object in 3D space and then bringing it to life through 3D printing embodies the essence of an engineer’s method – meticulous, creative, and solution-oriented. These moments spent in the realm of design and technology serve as a welcome get-away.

SCUBA diving and mountain biking are another get-away. They offer a break from the professional hustle and bustle and a chance to reconnect with nature. SCUBA diving, with its silent, weightless world beneath the waves, provides a constant reminder of the importance of precision and attention to detail. Mountain biking, on the other hand, brings the thrill of adventure and an opportunity to stay physically and mentally sharp.

To ensure that there’s room for both my professional commitments and personal passions, I’ve focused on being efficient. Work hours aren’t just about fulfilling duties; they’re an opportunity to stay informed and progress professionally by reading articles and keeping up with developments in industry. This strategic approach allows for a seamless transition from work to leisure at the culmination of the workday.

The ability to focus entirely on the task at hand is a skill that transcends professional boundaries. Whether it’s interpreting intricate imaging studies or maneuvering through challenging mountain trails, I bring the same focus to each endeavor. This capacity to fully immerse myself in the moment ensures that both work and personal pursuits receive the dedication and attention they deserve.

The journey to attaining work-life harmony is not solely about time allocation; it’s about seamlessly blending passions, skills, and a commitment to the task at hand. In my world, the lab coat and the wetsuit, the computer screen and the mountain trail all converge to create a life that’s not just balanced but wonderfully multifaceted.

So, for medical students, nuclear medicine residents, and young professionals embarking on their own journeys, I recommend each and every one of you find your enjoyments and spend time incorporating said enjoyments into your daily lives. I can attest firsthand to how difficult it is to incorporate leisurely activities into our busy lives but, trust me, you can – and it’s important that you do.

Remember that the pursuit of work-life balance in the field of medicine is not a rigid equation but a vibrant, ever-evolving choreography of blending interests and personal pleasures with patient care and productivity. It’s about finding your unique path where professional excellence coexists with personal fulfillment.
Executive Director’s Message

US Medical Schools with the Highest Number of Students Entering Nuclear Medicine Training

George M. Segall, MD – Executive Director, American Board of Nuclear Medicine

Nuclear medicine is the medical specialty with the most international medical school graduates. In 2021, international medical school graduates accounted for 82% of nuclear medicine residents, up from 59% in 2011. The ABNM wants to understand why so few US medical students pursue training in nuclear medicine. To identify the US medical schools providing the fewest nuclear medicine residents, the ABNM looked at applications for the certification examination over a 5-year period from 2018-2022.

Thirty-three percent of the 36 ACGME accredited nuclear medicine programs did not have any medical students from their affiliated universities matriculate into any nuclear medicine program in the United States. Another 36% percent had only 1 student matriculate into a Nuclear Medicine program during the same period.

The medical schools with the most graduates entering nuclear medicine training were Indiana University with 7 graduates, followed by Harvard medical school with 5 graduates. The medical schools at Duke and Vanderbilt universities each had 4 graduates entering nuclear medicine training. The ABNM also looked at medical schools with nuclear radiology programs and found that Case Western Reserve University had 4 medical students enter nuclear medicine training programs.

The ABNM will be reaching out to the nuclear medicines and nuclear radiology program directors at these medical schools to learn what they are doing to interest medical students in becoming nuclear medicine physicians. Interestingly, there were medical schools without nuclear medicine training programs who also had a relatively large number of students pursue nuclear medicine training, most notably University of California at San Diego with 5 students, plus Columbia University and Wayne State University, each with 4 students.

The ABNM will also contact the radiology program directors at these medical schools. It will be interesting to learn what these medical schools do differently from most schools with nuclear medicine training programs who had 0-1 students pursuing nuclear medicine training.

The ABNM will also contact the program directors at the less successful medical schools to understand the challenges that result in so few medical students being interested in nuclear medicine training. The ABNM will share what it learns so that everyone can consider changes at their institutions that encourage more US medical school graduates to pursue a career in Nuclear Medicine.
As in the past, the ABNM continues to review and consider all participant comments on the published questions. We appreciate this feedback, and it will strengthen the program as we move forward. An upcoming addition to the CertLink assessment review environment will be the addition of hyperlinked references on the question review page using PubMed®. PubMed is a free resource database containing more than 36 million citations and abstract of biomedical and life sciences literature with the aim of improving health–both globally and personally. Citations may include links to full text content from PubMed Central and publisher web sites. The National Center for Biotechnology Information (NCBI), at the US National Library of Medicine (NLM), located at the National Institutes of Health (NIH) maintains the PubMed database.

This new feature will enable participants to directly access the PubMed citations pertaining to the key point of each question for further reading. When you review the question, you will see in blue text the hyperlink for that question’s reference. To view the PubMed article, click the hyperlink which will open the PubMed article via your web browser.

This upgrade will begin with the new questions released in January 2024. Unfortunately, at this point, the upgrade will pertain only to new questions and will not be available on questions initially published in prior years (although the PubMed ID for reference citations is provided). As we continue to move forward, all new questions in future years will have this direct hyperlink functionality.

We hope the addition of this new feature will help you in your lifelong learning through the CertLink Assessment.
During the pandemic many organizations including the ABNM quickly adopted virtual environment to conduct day-to-day tasks and scientific or business meetings. The need for adequate tools to function properly, started a boom in virtual meeting software development and provided creative tools and new options, which were not available before. This experience provided new opportunities for the post-pandemic era and led to a change in business practices to take advantage of the newly available virtual tools.

During the 108th ABNM winter meeting the Board of Directors decided to convert one of the two annual meetings to virtual to sustain the discounted MOC fee for our diplomates, beyond the pandemic relief period.

In addition to the intended cost savings, this change also provided additional opportunities for the ABNM to reduce its carbon footprint by eliminating travel, hotel stays, and other means needed during in-person meetings. The ABNM constantly reevaluates its practices to continue providing excellent service to our diplomates in an environmentally friendly fashion.
The digital communications world has always been and will always be a rapidly changing environment. From Facebook to X (formerly Twitter), to Instagram, Snapchat, Mastodon, YouTube, TikTok, Reddit, LinkedIn, Doximity and now Threads it is difficult to follow the path of the nuclear medicine digital voices.

Recognizing that different cohorts of ABNM diplomates might favor one platform over another, we have tried to keep a parallel presence across a few of the major platforms. You can find us on Facebook, X (formerly Twitter), Instagram, LinkedIn and YouTube.

Let’s briefly explore some of the key features of a few of the more widely used platforms...

**LinkedIn**: LinkedIn is often considered the primary platform for professional networking and job searching. This platform is ideal for building and maintaining a professional online presence and connecting with colleagues, industry peers, and potential employers. Some people also use this platform to share articles on medical and scientific topics.

**X (formerly Twitter)**: Twitter is a real-time microblogging platform where users can share short messages with a wide audience. It’s useful for staying updated on industry news trends. Hashtags help categorize content and make it discoverable.

**Facebook**: While Facebook is known for personal connections, it can also be used professionally through Pages, Groups, and Marketplace. Facebook Pages allow businesses and professionals to create public profiles and share updates. Groups are valuable for niche communities and discussions.

**Instagram**: Instagram is primarily a visual platform but is used professionally by businesses, physicians, and other members of the nuclear medicine community. This platform is effective for showcasing visual content such as cases, conferences, and in-action photographs. IGTV allows longer-form video content, and Stories provide a separate place to enable time-sensitive updates.

**YouTube**: YouTube is a video-sharing platform that’s valuable for both educators and businesses. This platform is great for sharing tutorials, presentations, product demonstrations, and vlogs.

**TikTok**: TikTok is a short-form video platform known for its viral trends and challenges. This platform is best for professionals and brands targeting a younger audience.

**Snapchat**: Snapchat is a multimedia messaging app known for its disappearing content. It’s used for quick updates, especially for events and promotions.

**Reddit**: Reddit is a community-based platform with numerous subreddits dedicated to specific topics and interests. This is used for in-depth discussions, sharing expertise, and staying informed about niche industries.

The question remains: where is the next generation of Nuclear Medicine having conversations? We would love to hear from you about which platforms you prefer and how you might like to interact with us in the digital world. By connecting with each of you online, we can help educate our digital communities about nuclear medicine, share news and the remarkable successes of our field, engage with both students and educators, and build a solid digital media community.
The ABNM continues to offer the diplomates the traditional maintenance of certification examination and the web-based longitudinal assessment, CertLink®. This allows for a longitudinal evaluation by delivering questions regularly, providing immediate feedback on submitted answers, and tracking the users’ performance over time. Diplomates are strongly encouraged to participate in CertLink, and completion of the quarterly activities is needed to avoid unanswered questions being perceived as incorrect. The diplomat must update their MOC profile annually to ensure accurate communication between the board and diplomates and avoid negative impact on their certifications.

The CertLink Leave Policy has recently been updated (CertLink Leave Policy - ABNM) as follows:

During the 4-year cycle after initial certification, a diplomate participating in CertLink may be excused upon request from answering questions under the following circumstances:

1. One quarter (3 months) for any reason provided the request is made within 6 months of the end of the quarter and before the calendar year in which certification expires.

2. One additional quarter (3 months), when requested in advance (before the start of the quarter), for medical or family leave, natural disaster, or other situation beyond an individual’s control. Documentation must be provided.

During subsequent 5-year cycles after recertification, a diplomat participating in CertLink may be excused upon request from answering questions under the following circumstances:

1. One quarter (3 months) for any reason provided the request is made within 6 months of the end of the quarter and before the calendar year in which certification expires.

2. Three additional quarters (9 months), when requested in advance (before the start of the quarter), for medical or family leave, natural disaster, or other situation beyond an individual’s control. The quarters may be non-consecutive. Documentation must be provided.

Leave requests must be made in writing via email to certlink@abnm.org. If leave is not requested per this policy, or not granted, unanswered questions will be given a score of zero, and be included in a diplomate’s final score for the CertLink cycle used for recertification.

Nuclear Medicine program directors are asked to encourage new trainees to participate in CertLink® IT, which provides an important tool in preparation for the certification. The trainees are automatically enrolled in CertLink IT and can begin participating after taking the ABNM In-Training exam in January.
The American Board of Nuclear Medicine (ABNM) has certified 6,031 physicians in nuclear medicine (NM) from 1972 to 2022, of whom 3,733 are still active, meaning they are not retired or deceased and have maintained their ABNM certification (Fig. 1). This number has not changed significantly since 2015, indicating that the workforce is stable despite the decrease in the number of Accreditation Council for Graduate Medical Education (ACGME)-accredited NM programs from 43 to 36 during the same period.

There has been a marked decrease in the total number of residents in ACGME-accredited NM programs since 2009, when the number was 166 (Fig. 2). The decrease initially was due to an increase in the length of training from 2 to 3 y required by the ACGME in 2007, but this change could not explain the continuing decline until 2016, when the number reached a nadir of 74 before stabilizing. There are currently a total of 80 NM residents, which does not account for additional trainees in other pathways.

There was also a decrease in the number of physicians certified by the ABNM each year, but the decrease started later, and the percentage decrease was smaller (Fig. 3). More recently, there has been a significant increase in the number of diplomates certified by the ABNM without a significant change in the total number of NM residents. The reason is an increasing number of physicians in dual NM and diagnostic radiology (DR) training pathways that shorten NM training from 3 y to a minimum of 16 mo, as well as an increasing number of physicians who are designated by their training institutions as DR residents or NM fellows in non-ACGME-accredited positions during their NM training. For example, 20% of ABNM-certified physicians from 2018 to 2022 completed 16 mo of NM training during 4 y of DR training, equal to the percentage of physicians who completed 3 y of NM training.

Diagnostic radiologists who are also certified by the ABNM have always been a majority of physicians practicing NM. The...
average percentage over the past 20 y has been 54%, but the percentage over the past 5 y has increased to 70% (Fig. 4). The training pathways of candidates for the 2022 ABNM certification are shown in Figure 5. Twenty-eight percent of candidates completed 3 y of NM training, with an additional 7% having NM training outside the United States and Canada. Sixty-five percent of candidates had DR training, including 27% with 4 y of DR training plus an additional 1 y of NM or nuclear radiology training, and 26% with 16 mo of NM training during 4 y of DR training. Candidates with DR training had a pass rate of 96% on the 2022 ABNM certification examination, indicating a high degree of competence.

The average percentage of NM physicians certified in medical specialties other than radiology has decreased from 10% to 5% over the past 20 y. The ABNM and the American Board of Internal Medicine have a 4-y combined training pathway leading to certification in both specialties, but few physicians have used this pathway. In the future, there may be increased interest in this pathway because of the importance of NM in oncology, particularly theranostics.

There are opportunities and challenges in training the future NM workforce. Presently, there is an overreliance on international medical graduates. In 2011, international medical graduates accounted for 59% of NM residents. In 2021, that percentage increased to 82%. Thirty-three percent of the 36 ACGME-accredited NM programs did not have any medical students from their affiliated universities matriculate into any NM program in the United States, on the basis of candidates taking the ABNM certification examination in the past 5 y (2018–2022). Another 36% had only 1 student matriculate into a NM program during the same period. Recruiting medical students at the universities that have ACGME-accredited NM programs is an important opportunity.

The impact of dual training in NM and DR on the number of physicians who choose an academic career and do NM research is unknown. On the basis of self-reported information in 2020, 43% of ABNM physicians answered that they were in academic practice, 46% answered that they were in private practice, and 11% answered “other” (1). The percentage of NM physicians in academic practice seems robust, but the ABNM does not have any information about the amount of research being performed. The ACGME and the ABNM currently allow up to 6 mo of elective or research time during 3 y of training. There is an opportunity to engage the ACGME and other stakeholders to develop models that promote research during training and encourage residents to pursue academic careers (2).

Change is inevitable. NM will continue to evolve as a specialty. The ABNM will work with all stakeholders to meet the challenges and take advantage of the opportunities to ensure a bright future.

REFERENCES
2023 In-Training (IT) Examination Statistics

- Total Examinees: 138 US and Canada, 30 International

Counts by Location:
- US (Nuclear Medicine): 103
- US (Nuclear Radiology): 16
- Canada (Nuclear Medicine): 19
- Kuwait: 25
- Singapore: 3
- South Africa: 2