VOL 5 • NO 2

ePATIENT

NUCLEAR MEDICINE & MOLECULAR IMAGING

THE FREE NUCLEAR MEDICINE & MOLECULAR IMAGING EDUCATIONAL MAGAZINE AVAILABLE WORLDWIDE

Women in nuclear medicine

NUCLEAR MEDICINE MADE SIMPLE

MÉDECINE NUCLÉAIRE SIMPLIFIÉE

MEDICINA NUCLEAR EN PALABRAS SENCILLAS

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PANGEA PROJECT

PANGEA

TECHNEGAS™
FUNCTIONAL LUNG IMAGING

BENEFITS
V/Q SPECT TECHNEGAS™

Proven diagnostic accuracy
with high sensitivity and specificity [1]

Minimally invasive
aiding patients's confort and compliance [2]

Detects subsegmental
Pulmonary Embolism (PE) [3]

Low radiation burden
26-36 times less absorbed dose to breast of females [4]

Technegas™ has minimal exclusion criteria and may be administered to most patients[4-6] including:
Renal impaired | Contrast allergy | Diabetics
Chronic Obstructive Pulmonary Disease (COPD) | Critically ill
Pregnant

V/Q SPECT TECHNEGAS™
IN NUCLEAR GUIDELINES

The EANM Guidelines[7] strongly recommend ventilation-perfusion single photon emission computed tomography (V/Q SPECT) as it allows the diagnosis of PE with accuracy even in the presence of COPD and pneumonia.

The CANM Guidelines[8] consider Technegas™ as the agent of choice in COPD population because it has less central airway deposition, better peripheral penetration and it does not wash away quickly as traditional aerosols. Only a few breaths are sufficient to achieve an adequate amount of activity in the lungs, reducing time and personnel exposure.

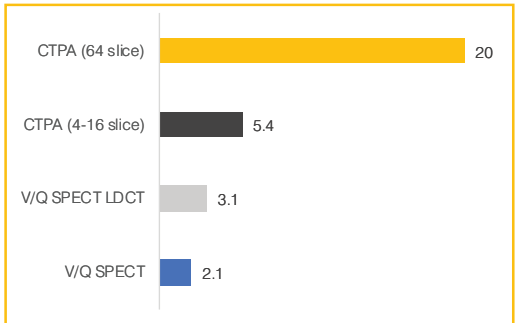

Table 1: Radiation exposure [8] (mSv)
(adapted from CANM guidelines, 2018)

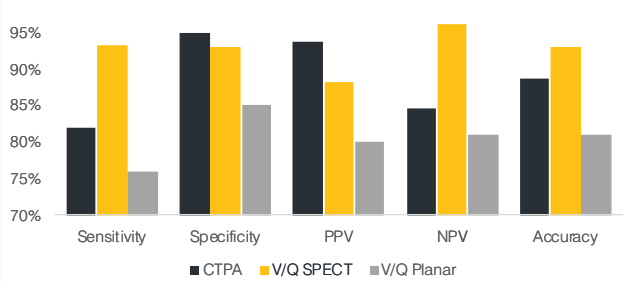

Table 2: Diagnostic ability of CTPA, V/Q SPECT and V/Q Planar to detect PE (adapted from Hess et al, 2016)

All PE's should have a final control 3 months after diagnosis to assess final reperfusion and to benefit from the availability of a baseline exam in case of recurrent symptoms. Low radiation exposure allows repeated studies (*table 1*).

With the uptake in SPECT imaging, V/Q SPECT results are seen as being superior to planar imaging and computed tomography (CTPA) when comparing sensitivity, negative predictive value and accuracy (*table 2*).[1]

Therefore, in situations of acute PE, chronic PE, pregnancy, paediatrics and the COPD population, V/Q SPECT can be considered as a first-line investigation due to its high sensitivity and specificity, low radiation and no adverse reactions.[8]

TO LEARN HOW TO PERFORM A V/Q SPECT STUDY WITH TECHNEGAS™, VISIT: https://bit.ly/2PZDDii

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Technegas™ is not yet available for sale in the USA.
Last revision (A4): v.2.1 (14/Apr/2021)
For more information please visit **www.cyclomedica.ca** or email **technegas.sales@cyclomedica.ca**

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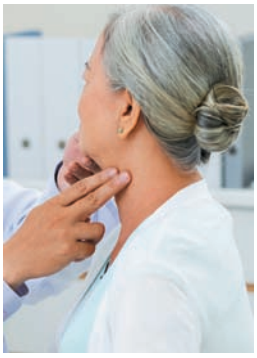

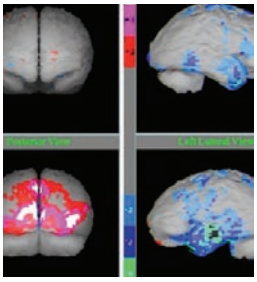

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Don't miss our next issue on Quantification and the second part of Theranostics (neuroendocrine tumors).

EDITORIAL BOARD

I am thrilled to introduce our outstanding editorial board members. Through our travel and NM lecturing around the globe, I have met terrific scientists and colleagues. Most, if not all of them, are really passionate about and true advocates for the field of nuclear medicine. They strongly believe in the power, usefulness and safe use of NM diagnostic and therapeutic procedures for the betterment of public healthcare worldwide. I am delighted that the following leaders have embraced the concept of the Pangea-ePatient magazine and accepted to share their invaluable expertise and experience with patients, referring colleagues, health care administrators, government agencies and insurance companies.

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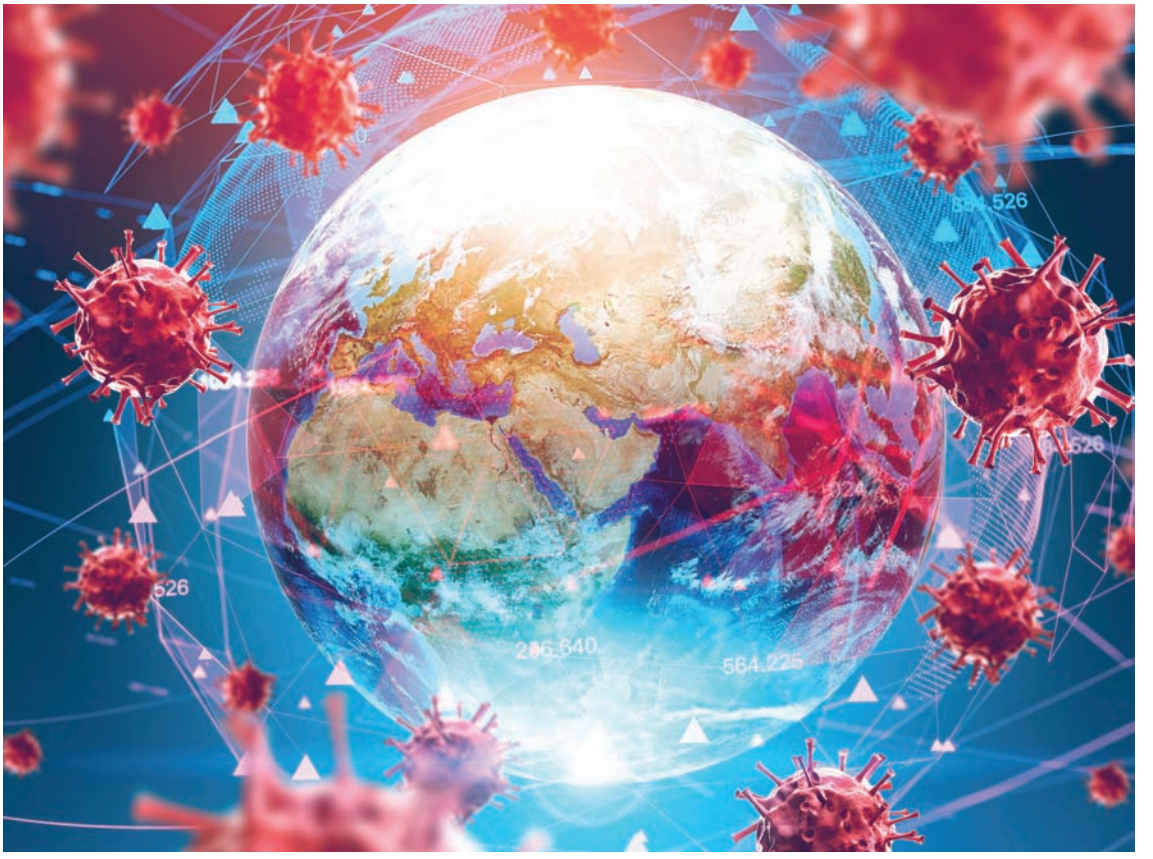


LES AVANCÉES MÉDICO-PHARMACOLOGIQUES
MEDICAL AND PHARMACOLOGICAL ADVANCES

LES VIRUS
CETTE CINQUIÈME COLONNE MALÉFIQUE

Les virus ces délétères mutants tentent continuellement de nous assaillir. Ce sont des spécialistes de la confusion, du furtif.

La cellule humaine se compose d'un noyau dépositaire de l'acide désoxyribonucléique ou ADN. Les messages du noyau de la cellule aux différents éléments du cytoplasme de la cellule sont convoyés par un vecteur l'acide nucléique ou ARN. Comme par exemple pour permettre a la cellule de se reproduire ou de se multiplier.

Les virus lorsqu'ils pénètrent dans une cellule ont la capacité de modifier ou de se substituer à l'ARN original de la cellule pour coder son propre message et amorcer rapidement une multiplication effrénée du virus. Une usine de multiplication extrêmement efficace de production exponentielle de virus est mise en marche. Beaucoup de ce type de virus souvent appelés RIBOVIRUS sont des experts de cette confusion. Par exemple les coronavirus sont de cette famille.

« Contre ces envahisseurs l'organisme humain n'a souvent qu'une seule possibilité de défense soit les anticorps. Ces anticorps c'est comme une CLEF DANS LA SERRURE (ici le virus), c'est spécifique au type de virus. »

VIRUSES
THIS EVIL FIFTH COLUMN

Viruses, these deleterious mutants are constantly trying to attack us. They are stealthy and confusion.

The human cell consists of a nucleus that stores deoxyribonucleic acid or DNA. Messages from the nucleus of the cell to the different elements of the cell's cytoplasm are conveyed by a vector – nucleic acid or RNA. These messages allow the cell to reproduce or multiply.

Viruses, when they enter a cell, have the ability to modify or substitute the original RNA of the cell to encode its own message. Once the virus takes over, it sets in motion a highly efficient unbridled multiplication factory of exponential virus production. Many of the viruses often referred to as RIBOVIRUS are experts at this confusion. Coronaviruses are from this family.

Against these invaders the human body often has only one possibility of defense – antibodies. These antibodies are like a **KEY IN THE LOCK** and are specifically generated to combat each virus.

Contre ces envahisseurs l'organisme humain n'a souvent qu'une seule possibilité de défense soit les anticorps. Ces anticorps c'est comme une CLEF DANS LA SERRURE (ici le virus), c'est spécifique au type de virus.

Après un contact avec le virus les cellules lymphocytes T étudient le virus, l'identifie, le décode et commence a produire ses propres soldats, les anticorps spécifiques a l'envahisseur. Ce processus de défense atteint souvent son efficacité maximale qu'environ 2 mois ou 8 semaines après le premier contact. Pendant cette période ou les défenses sont limitées le virus lui se multiplie rapidement tentant éventuellement de submerger le déploiement des anticorps en production.

LES HUMAINS ONT SUBI A DE MULTIPLES REPRISES L'ASSAUT DE CES MALÉFIQUES ENVAHISSEURS VIRAUX ET DANS CHACUNE DE CES SITUATIONS ILS ONT RÉUSSI A LES VAINCRE.

Que ce soit la grippe espagnole (un coronarovirus), la poliomyélite, la variole, la grippe aviaire ou le SARS par exemple.

Certains autres virus peuvent subrepticement coloniser les cellules de l'être humain pour des années et même pour toute la vie de l'être infecté.

Par exemple après en jeune âge d'une attaque de varicelle le virus peut demeurer pour toute la vie du porteur et se remanifester en âge plus avancée sous forme d'une atteinte douloureuse de terminaisons nerveuses comme dans le ZONA.

D'autres virus pourront aussi demeurer à vie dans un être humain comme le virus de l'herpès labial et se remanifester à répétition. Certains autres, comme les papillomavirus, coloniseront à vie des cellules de l'épiderme et réapparaîtront de façon intermittente sur la peau sous forme de verrues. Le virus du SIDA probablement le plus furtif de ces mutants est particulièrement délétère. Il peut demeurer silencieux pendant plusieurs années et en profiter pour affaiblir et même complètement détruire les capacités des lymphocytes T, les producteurs d'anticorps, et ainsi annihiler la seule ligne de défense efficace . Éventuellement il n'y a plus de production de troupes d'assaut, LES ANTICORPS . Dans le cas du SIDA l'être infesté meure finalement de complications comme par une infection bactérienne ou encore par exemple de tuberculose.

La maladie la plus fréquente au monde c'est une maladie virale communément appelée la grippe. L'Organisation Mondiale de la Santé évalue a 650 000 le nombre annuel de décès dans le monde dû à la grippe saisonnière. On tente bien que mal de combattre ces agresseurs, ces mutants très sophistiqués, qui modifient continuellement leur codage génétique. C'est pourquoi à chaque année

After contact with the virus the T-cells study the virus, identify it, decode it and start to produce their own soldiers, the antibodies specific to the invader. This defense process often reaches its maximum effectiveness only about two months to eight weeks after the first contact. During this period when defenses are limited, the virus multiplies rapidly, eventually overwhelming the deployment of antibodies in production.

HUMANS HAVE BEEN REPEATEDLY ASSAULTED BY THESE EVIL VIRAL INVADERS AND IN EACH OF THESE SITUATIONS THEY HAVE SUCCEEDED IN DEFEATING THEM.

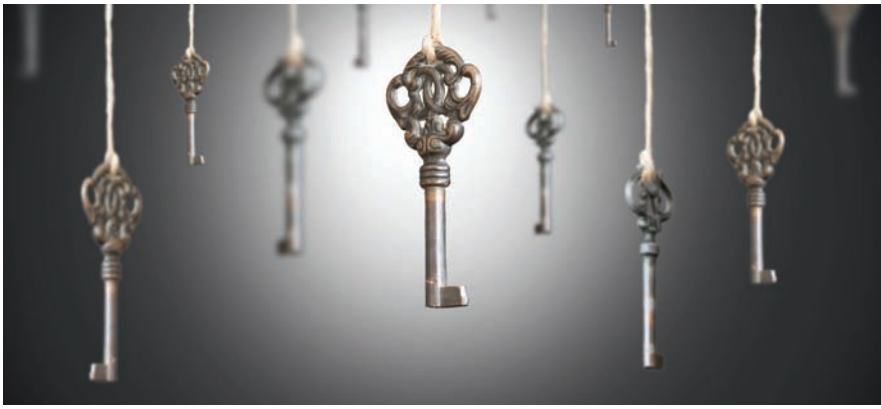
Whether it is the Spanish flu (a coronavirus), poliomyelitis, smallpox, avian flu or SARS for example, some other viruses can surreptitiously colonize the cells of the human being for years and even for the whole life of the infected person.

For example, after a chicken pox attack at a young age, the virus can remain for the entire life of the carrier and reappear in later life in the form of painful nerve endings as in Shingles.

Other viruses, such as the cold sore virus, can also remain in a human being for life and repeatedly re-occur. Some other viruses, called papillomaviruses, will colonize epidermal cells for life and reappear intermittently on the skin as warts. Probably the stealthiest of these mutants, the AIDS virus, is particularly deleterious. It can remain silent for several years and take advantage of its concealment to weaken and even completely destroy the capacities of the T-lymphocytes, the producers of antibodies, and thus annihilate the only effective line of defense. Eventually there is no more production of assault troops, THE ANTIBODY. In the case of AIDS, the infected person finally dies of complications such as bacterial infection or tuberculosis.

The most abundant viral disease in the world is commonly called influenza. According to the World Health Organisation the seasonal influenza kill 650 000 persons in the world annually. There is little attempt by the body to fight these aggressors, very sophisticated mutants that are constantly changing

" Against these invaders the human body often has only one possibility of defense – antibodies. These antibodies are like a KEY IN THE LOCK and are specifically generated to combat each virus. "



« Mais ces experts de la mutation tenteront toujours de nous envahir pour assurer leur multiplication. L'être humain est un hôte idéal pour assurer leur survie et se multiplier. Car un virus seul sans coloniser une cellule ne peut survivre. »

on doit étudier attentivement le génome du virus et y adapter un nouveau vaccin qui permettra par les lymphocytes T la production d'anticorps spécifiques, LA CLEF, et seulement ceux-ci seront efficaces. Mais les lymphocytes T ont besoin de temps pour produire efficacement ces anticorps.

C'est pourquoi lorsqu'une attaque de grande envergure survient, la période de 2 mois ou 8 semaines peut expliquer un type de courbe à surveiller.

D'autres virus s'attaquent également à l'être humain que l'on pense aux virus responsable de l'hépatite A ou B ou encore de la fièvre hémorragique, l'ÉBOLA.

L'humanité a eu, a et aura toujours à subir périodiquement l'assaut de ces envahisseurs mutants maléfiques. Certaines batailles ont été gagnées par l'homme. Certaines mesures de protection sont régulièrement mises en place comme les VACCINS.

Mais ces experts de la mutation tenteront toujours de nous envahir pour assurer leur multiplication. L'être humain est un hôte idéal pour assurer leur survie et se multiplier. Car un virus seul sans coloniser une cellule ne peut survivre.

VOILA LE VRAI ENNEMI DE L'HOMME PAS SES CONGÉNÈRES HUMAINS.

Bien sûr on vit presqu'en symbiose avec ces méchants mais certains virus peuvent devenir nos amis et nos alliés.

Comme les virus bactériophages qui eux attaquent de façon très efficace des bactéries comme par exemple les escherichia coli qui chez certains individus peuvent provoquer des diarrhées mortelles.

On vaincra cette attaque virale sans précédent. Pour la première fois l'ensemble de l'humanité réalise que l'être humain sera toujours en guerre contre cet envahisseur. Seulement une attention continuelle, actuelle et future permettra à l'homme de sortir vainqueur contre chacun de ces assauts viraux.

" However, these mutation experts will always try to invade us to ensure their existence. Humans are an ideal host to ensure their survival and multiplication. After all, a virus alone without colonizing a cell cannot survive. "

their genetic coding. This is why every year the genome of the virus must be carefully studied. Each year a new vaccine must be adapted to it, which will allow the T-lymphocytes to produce specific antibodies (THE KEY) that is specific only to that virus. The challenge for the human organism is that the T-lymphocytes need time to produce these antibodies efficiently.

This delay is why when a large-scale attack occurs, we must observe the infection curve over a period of two months or eight weeks.

Other viruses also attack humans, such as the viruses responsible for hepatitis A or B or the hemorrhagic fever, EBOLA.

Humanity has, and always will have, to suffer periodically from these evil mutant invaders. Some battles have been won by mankind. Humanity may attempt to intervene by placing certain protective measures in place such as the VACCINES.

However, these mutation experts will always try to invade us to ensure their existence. Humans are an ideal host to ensure their survival and multiplication. After all, a virus alone without colonizing a cell cannot survive.

THIS IS MAN'S REAL ENEMY, NOT HIS FELLOW HUMANS.

Of course, whilst we live as hosts to these parasitic these villains we also symbiotically live with others as both friends and allies.

An example of one of these friendly viruses to humanity are the bacteriophage viruses that attack bacteria in a very efficient and helpful way; for example, bacteriophages viruses help our body attack the Escherichia Coli that in some individuals can cause deadly diarrhea.

We will defeat this unprecedented viral attack of COVID-19. For the first time the whole of humanity realizes that human beings will always be at war with this invader. Only continuous attention, present and future, will enable mankind to emerge victorious against each and every one of these viral assaults.

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LE CERVEAU, LA MERVEILLE DE L'ÊTRE HUMAIN

Le cerveau de l'être humain demeure une grande énigme. Comment cette structure arrive-t-elle à gérer l'ensemble de l'activité de l'Homme? D'abord elle est le siège de la perception de tous les sens. En effet, on voit par les yeux mais on perçoit les formes et les couleurs par le cerveau. Il en est de même pour l'audition : les vibrations sonores sont véhiculées par l'ensemble des structures de l'oreille, mais le décodage de ces vibrations s'effectue à l'intérieur du cerveau. La motricité ne peut s'effectuer sans l'apport du cerveau dont le siège se situe dans le lobe temporal où l'on retrouve l'homunculus, une copie virtuelle d'un être humain renversé.

Pour des mouvements, des perceptions, des pensées ou des émotions, tout origine ou requiert l'apport du cerveau.

Le cerveau est également le siège de la mémoire. Dès le début de la naissance et tout au long de la vie, tout est enregistré à tout jamais comme dans des petits tiroirs. Les enfants sont de vraies éponges et ils gobent facilement d'énormes quantités d'informations. Par exemple, les enfants peuvent reconnaître beaucoup plus d'odeurs que les personnes âgées.

Certaines maladies en fin d'âge peuvent amener une perte des éléments récents et réactiver le souvenir de faits anciens.

MAIS COMMENT EST-CE POSSIBLE?

Principalement parce que le cerveau possède un arsenal extrêmement complexe et sophistiqué de structures mues par des échanges chimiques et

activées par l'équivalent d'une puissante centrale électrique. En effet, continuellement, jour et nuit voyagent dans le cerveau comme transmetteurs des courants électriques et des molécules chimiques.

Le cerveau est superbement protégé par une composante liquidienne, mais également par deux autres composantes protectrices, les méninges, et le tout dans une boîte osseuse, la voûte crânienne.

Il existe tout un réseau de canaux liquidiens, soit la circulation sanguine cérébrale et la circulation céphalo-rachidienne. Quant aux cellules, elles se comptent par dizaines et des dizaines de milliards.

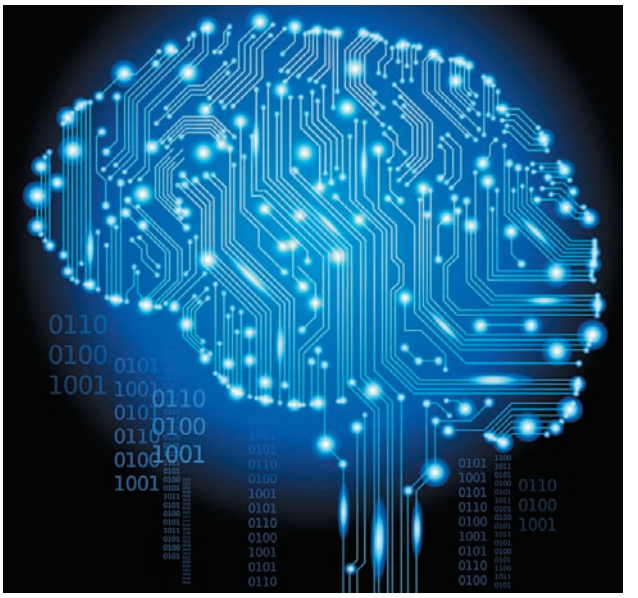
Cette structure de l'être humain est d'une complexité incroyable et c'est pourquoi, aussi, on a des experts médecins comme des neurologues, des neurochirurgiens ou des psychiatres, des pharmaciens, des psychologues et autres qui ont une grande connaissance et expertise des problèmes qui peuvent surgir dans cet incroyable univers.

Quelle merveille que ce cerveau! Jusqu'à maintenant ces richesses sont uniques et propres à chaque être humain et on ne peut en partager l'acquis en partie ou en totalité.

Mais peut-être qu'un jour? ■

NUCLEAR IMAGING OF THE BRAIN

The microcomputer revolution of the 20th century has forever changed the way we live and interact with our world and the universe. Desktop, laptops, smartphone and tablets have empowered human beings and unleashed their creative potentials to unimaginable levels. Essentially based on sophisticated computing, artificially intelligent and self-taught machines

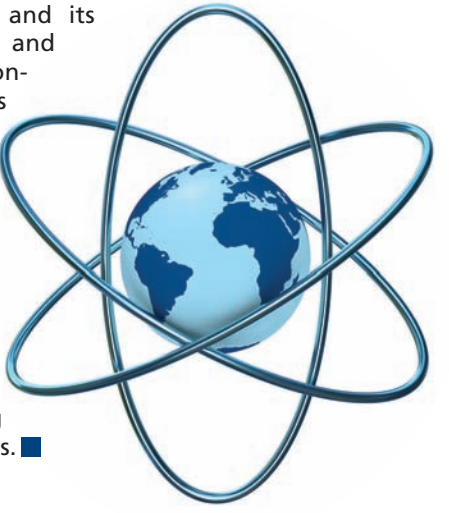


are now on the verge of another major revolution: the robots' revolution.

While the artificial intelligence machines that we design can help us better understand how the human brain learns and functions, we are far away from unravelling the fundamental secrets of the millions years old human natural intelligence.

CT scanners and MRI machines can provide minutes detail of the anatomy of normal and diseased brains. Functional MRI sheds light on the activity of the various parts of the brain. Molecular Imaging enables the characterization and the quantitation of the molecular processes that sustain the brain structure and function in normal and diseased states.

The unique ability of nuclear medicine to trace and quantify the distribution of minutes amounts of peptides, hormones, transmitters and organic molecules that are the very basis of the fundamental molecular mechanisms of the functioning of the brain and its disturbancies has been, is and will be the golden non-invasive tool to unravel its secrets.



In this and the upcoming issues of Pangea-ePatient you will find information and articles that detail the safe and useful use of medical isotopes and radiopharmaceuticals that are available to help diagnosing and managing patients with brain disorders. ■

Les femmes de la médecine nucléaire
Women in nuclear medicine

DR. BHAVANA BUDIGI

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

Marie Curie's relentless drive and determination led to her exceptional contributions to radiology and nuclear medicine which continue to revolutionize healthcare practices to this day. It was not an easy road for her especially given the gender bias and lack of expectations from women during her career span. Yet she persisted and succeeded. She is an inspiration to women physicians and women in all professions who continue to face challenges at their workplace to this day.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

My advice to women in medicine and all working women would be to prioritize themselves, be confident in your abilities and set professional boundaries. Do not be afraid to ask for your worth and do not shy away from letting your peers know what you bring to the table. Humility is a great virtue, but it always helps to ascertain the value you add at your workplace.

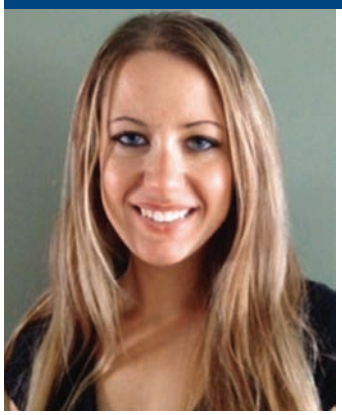
Budigi, Bhavana
MD Radiology-Neuroimaging, Wake Forest University , Baptist Medical Center, North Carolina, Usa

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging?

The latest advances in precision medicine offer great promise in their endless therapeutic capabilities and their ability to guide personalized treatment plans. I am excited to see these results translate into clinical practice in nuclear medicine particularly with cancer therapies. I hope this era of personalized medicine will bring better delivery systems, lesser healthcare costs and more effective therapies that can be easily implemented at the nuclear medicine clinic.

What is your recipe to balance a very active professional career and a happy and thriving family life?

I have one rule that I try my best to follow and that is to never take my work home. I try my very best to separate work from my personal life. I give my work my full concentration and dedication but once I leave the hospital I switch off and unwind with my family. As an international physician, I have always felt the distance from everything I knew growing up. It helps to make a home wherever you are in this world and build a community that is contributory to your mental growth. My other passion that keeps me grounded and conscious of myself as a human and woman is travel. It has helped me evolve constantly. 36 cities around the world so far, and I am just beginning to learn. ■



Tina M. Buehner, PhD, CNMT, NMTCB(CT)(RS), FSNMMI-TS
Woman Technologist, Scientist and Researcher
Proud Mother of two amazing children
Health Physicist for Rush University Medical Center
Adjunct Professor for Rush University
Current President, SNMMI-TS, USA

DR. TINA M. BUEHNER

In the 20th century it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist, nuclear medicine, technologist, scientist, nurse, nurse practitioner in the US?

Akin to most careers in medicine and allied health apart from nursing, early nuclear medicine technology was a role primarily dominated by male technologists. Gender-affiliated roles in medicine were often related to the perceived qualities required to perform their respective responsibilities. Early physicians and researchers who were expected to be perpetually poised in any situation were almost always men. The caretaker role of the nurse was often related to the perception of innate nurturing characteristics believed to be that of a woman. While there has been a positive paradigm shift in the diversity of applications and professionals in practice throughout all health professions over the years, these gender-biased preconceived roles still exist today. When a patient can, without much consideration, refer to a male nuclear medicine technologist as "Doctor" and in that same breath refer to

the female nuclear medicine physician as "nurse", we clearly need to do better in elevating the respect and equality of women in medicine and health care.

By the time I began my career as a nuclear medicine technologist in 2001, there was a growing trend of women entering the field of nuclear medicine technology compared to men. Despite this, the inequalities were still very real and often very clear in regard to compensation and roles in leadership and research. I believe this change must begin intraprofessionally before the rest of the world can meaningfully change their perceptions. I am grateful to the many women technologists before me who have paved the way for others, like myself in nuclear medicine technology and in research. The late Susan Weiss was a pioneer in pediatric nuclear medicine research and the first woman president of the Society of Nuclear Medicine Technologist Section. As I write this today, I am currently the 25th woman president in the 50-year history of the SNMMI-TS which is a significant indication of women's growth in nuclear medicine technology leadership. It is my hope that the women physicians and scientists in our profession will experience the same leadership growth that the technologist section has seen over the last few decades.

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

Madam Marie Curie was a pioneer in radioactivity, research and academia. After being denied admission to medical school in the late 19th century because women were not permitted entrance, she obtained a degree in physics. Madam Curie's contributions to nuclear physics and chemistry have led to modern day advancements in science and medicine that cannot be understated. Her numerous accolades which include being the first woman in France to defend her doctoral thesis, the first woman to win a Nobel prize, and the only woman to ever receive two Nobel prize awards, are a testament to her perseverance, strength, and courage in her work despite seemingly insurmountable challenges throughout her life and career.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

A professional woman mentor is an invaluable asset for other women seeking to establish themselves in all areas of clinical practice, leadership, research, and academia. Mentors can share real-world challenges and learning experiences for other women on the same path. Women mentors serve as navigators to help us along on our professional journeys, often offering precious recommendations for detours from bumps on the road to success that they have also encountered. They can also serve as a source of strength and resiliency when the obstacles that lay ahead are unavoidable and discouraging. There are many types of mentor-mentee relationships, but in my opinion the best ones are the ones that form naturally and effortless, as they are often the most fruitful both professionally and personally. The life-long bond created between myself and my doctoral research mentor and friend, Dr. Bital Savir-Baruch who is an amazing nuclear medicine physician and researcher, demonstrates the genuine benefit of a woman mentor-mentee relationship.

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

Mapping of the human genome allows us continued advancement in enhanced prediction, prevention, and treatment of disease. Women scientists are indispensable members of research teams around the world, and technological advancements that have increased the globalization of biomedical research can provide synergistically progressive discovery. The demand for woman scientists will continue to be a critical necessity in research as novel tracer development remains an integral component of molecular imaging and target therapeutic treatments in precision medicine.

What is your recipe to balance a very active professional career and a happy and thriving family life?

One of the most taxing experiences for me is the notion that successful woman professionals cannot have a good balance in all aspects of her life. Most often this relates to her family and the assumption that professional success must equate to a lack of commitment or presence at home. It is not uncommon for a successful woman to be questioned on how one's family "deals" with or "handles" their success, an inference that the family unit must suffer at the cost of a mother/wife's professional success. In contrast, it is exceptionally rare to hear a professional male counterpart of equal success being asked the same questions regarding the coping of his family or the need for him to defend his parenting skills against his accomplishments. This is another gender-biased stigma that is all too common among professional women and one that is exhausting for me as a professional and a mother.

I have read several well-established and professional magazines and their suggestive tips for busy professional women looking to find the best work-life balance, but often these recommendations are not applicable to women in medicine and health care. How does one "Find the time to disconnect" when we often cannot disconnect as part of our job of being professionals on-call 24/7? I do not believe there is one prescription for ensuring a good balance in all families. For me, finding balance starts with a reflection of gratitude every morning. It is an attempt for me to be more mindful and present throughout the day. It also includes seven interlinking electronic calendars with reminder alerts for each role in my life telling me where I need to be and when. At its simplest core, professional and personal success for me is the happiness and health of the 3 most important people in my life. It requires continued improvement from me in all areas including communication, patience, and learning to embrace imperfection. At the end of the day, the relationships I have with my family are the foremost motivators for my success, my greatest accomplishments, and yet another area in my life to require life-long learning and continued personal growth. ■

Valerie R. Cronin

In the 20th century, it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist/nuclear medicine/technologist/scientist/ nurse/nurse practitioner in the US?

When I entered the field in Nuclear Medicine, I realized early on that if you wanted to grow in your field you would need to become involved in our profession outside of your department walls. Doing so would allow you to meet other colleagues and to see what was being done in other parts of the country and where our field would be heading over the next several years. I started out becoming involved in the local chapter of SNMMI which was the Eastern Great Lakes Chapter. Being elected president allowed me to attend the national meetings which opened many doors for me in Nuclear Medicine. Women were not really encouraged to pursue such difficult careers. My own father son of Polish immigrants and a physician discouraged me when I said I wanted to pursue medical school. He said the course would be too long and hard for me and suggested instead that I become a dietician. Yet he encouraged both my brothers to pursue pre-med. I started out at university as a physics major and was the only girl in my class. Of course, initially my career was not intended to be such a big piece of my life. When my husband suffered a devastating stroke at the age of 49, I realized I was now the bread winner and head of the family. Also facing the additional costs of his care was frightening to me. Advancing my career became a necessity.

Valerie R. Cronin, CNMT, FSNMMI-TS, MSHSA
Past President of SNMMI-TS 2005-2006

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

I am especially proud that this publication has Marie Curie on the cover. Like her I am of Polish decent so have always followed her achievements not only as a professional in our field but also her as a Polish female scientist. Her remains along with her husbands are still sealed in lead lining in Paris. A few years back while visiting Paris I tried to visit her tomb but at the time it was under construction and unavailable for viewing. In preparation for this article, I did some research and found that Poland is ranked as one of the hardest working nations in Europe. Marie Curie's hard-working ethic kept her on track to discover two new elements despite everything else that was going on in her life. Her perseverance to obtain her education took dedication as it was not an easy path during those times especially for a woman. She devised a plan and stuck with it. Her love of family and marriage was evident when she was young and then again with her own marriage and family. Decisions were made but in keeping with loyalty to the family and to her homeland. Her approach to radioactivity was so unique that others did not believe that a woman could devise such original work. The extra hurdles she crossed for the profession were ongoing. She wanted her research but included her family at all times like women want to do today.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

Healthcare and medical imaging have faced so many changes over the years and now this Pandemic has caused even more changes. New people entering the career want more of a life balance and are choosing paths that provide that. Many technologists don't want all the overtime or on call pay they can get. They want their weekends and family time. Women are choosing careers that they can hand off their patient to someone else at the end of a shift and walk away to do what they want whether it be a family dinner or a daughter's soccer game. They are seeking employers that help support them with child care or flexible hours. It is also important to find a mentor and be a mentor. Network as much as you can and keep your contacts current and growing. To this day as President of the Board of the YWCA of the Niagara Frontier I work to empower young women and help domestic violence victims. As a Board Member of the Chamber of Commerce of the Tonawandas I started a GLOW (Growing Leadership Opportunities for Women) Task force. Other women are a great support to you as you go forward. The SNMMI has started a fantastic mentoring program for Women in Nuclear Medicine (WINM) to help. This group focuses on the promotion of professional and academic leadership. The technologist section of the SNMMI-TS also has a successful leadership academy.

What is your recipe to balance a very active professional career and a happy and thriving family life?

Know your limits. This is not avoiding what needs to be done but knowing when you have too much on your plate as you go forward. Also prioritizing what is important to you and not

getting bogged down by things that are not part of your plan or path. When I was President of the SNMMI-TS I was promoted to my first Vice President position as VP of Imaging Services which was quite a promotion. One Friday I left work to catch a plane to Dallas for a vendor workshop. My presence in Dallas was not critical. I remember driving to the airport with white knuckles on the steering wheel because of the snowstorm I was in, worried I'd miss my flight, worried I needed to be preparing for next week's meetings and presentations and when I got to the "Departing Flights" turn off I went straight. I said "I can't do this now I am overwhelmed" and I drove home for a quiet weekend to prepare for my new job. Get help if it makes sense…my husband was disabled so it didn't seem practical that I would get up and shovel my driveway at 5 AM to make a 6:30 meeting at the hospital so I contracted that out. I lived in Buffalo, New York and snow is a reality here. The year I was president of the Technologist section I travelled to 29 cities and made 3 trips to Asia. You can't take that kind of role on when you have a new born. My children were older and actually were able to travel with me from time to time. That amount of time commitment has to fit into where you are in your life and the support needed from employer to family. However, the pandemic has changed even that as meetings have become virtual this last year and travel reduced by all organizations. Always keep up your five-year plan and stay on track. Make the life you planned not the life you stumbled upon. The younger generation is coming into their careers wanting a balance in their lives maybe it'll be easier for them.

Denise Grady

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

Marie Curie possessed the human quality of strong will which she used to succeed against any obstacles placed in front of her. She exerted professional qualities, such as the ability to stand her ground for what she believed in. Alongside this was her determination to not allow men to overpower her because she was a female in the professional field. These two qualities worked in unison to allow Marie Curie to prosper with a successful career and pave the ground for a new field in medicine.

Denise Grady Nurse Practitioner
Nuclear Medicine Department
Wake Forest Baptist Medical Center

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

Education takes time, commitment and organizational skills to be successful. Finding a mentor that you can trust in the field is a key factor to succeed. A Combination of both education and mentorship will provide the best possible success in the medical field.

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

Theranostics is paving the way as the future of medical imaging and therapy. Nurse Practitioners will find a place in Nuclear medicine and theranostics to facilitate and coordinate radioactive therapies for patients. It is an exciting adventure for women in nuclear medicine to be a part of precision medicine as new therapies are approved by the FDA for treatment.

What is your recipe to balance a very active professional career and a happy and thriving family life?

The recipe to balance a very active professional career and a happy and thriving family life is one that needs to remain constant, however, is more often than not stretched to its limits. My father once told me that he was golfing with a friend who was in his 70's who said, "I wish I had made a scheduled date night once a week while I was married". The man was now divorced, with regrets of not having planned more time for his wife. We, as a society, are quick to get caught in the loop of the need to always complete tasks for work, answer constant emails, and return back phone calls. Everyone has a loop similar to this one and I am sure everyone can imagine what their loop may look like. If you spend all day in your loop, at the end of the day your family will be left feeling neglected and unimportant. Although it is difficult to get out of the loop, to maintain an effective family work-life balance, one must prioritize their family. I have discovered the key that works for me is scheduling time with family. We make time for what's on our schedule already, right? It could include watching Netflix, Amazon Prime, going out to dinner, taking a walk, as long as it is set aside time to spend with your spouse or children. There is no perfect plan of balance that will work for everyone because career path and family life differ between each individual, however I have found that family is most understanding when they know you have set aside time especially for them. As an end note, my father and mother have a date night every Wednesday and have been married for 50 years.

DR. ANITA THOMAS

In the 20th century it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist/nuclear medicine/technologist/scientist/nurse/nurse practitioner in the US?

Society has undergone dramatic changes since the time I entered medicine. Not so long ago, women were often faced with choosing between family and career. During my medical school interview, I was told that you could not have both and that women applying to medical school would get married and leave medicine behind. Fortunately, societal expectations have changed, and most young women now look forward to both. Institutions are slowly recognizing the value of contributions and experiences from differing sexes/sexual orientations as well as differing ethnic backgrounds and nationalities. Departments flourish when there is input from all.

Anita Thomas, MD
Associate Professor of Radiology/Nuclear Medicine
Wake Forest University/Baptist Medical Center

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

The two traits that come to mind are determination and a belief in her own abilities. Knowing how much discrimination against women in the professional world existed just 50 years ago, it was greatly magnified 120 years ago. Marie Curie persisted despite challenges of early life poverty, family losses, and early substandard laboratory working conditions. She remained focused on her love of science which led to revolutionary discoveries in the new field of radioactivity. It also helped that in that age she picked a partner who respected her intelligence and supported her work.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

First, I would congratulate anyone entering medicine on choosing a fascinating field that is ever evolving. Advances in medicine are accelerating at a rapid pace and the field will never become boring. One also must realize that sometimes the workload will be very heavy and the timing of work is not convenient as people get sick and injured 27/7. You will need to take care of critically ill patients sometimes in the middle of the night and on weekends. However, the personal rewards are worth the hard work as this is a profession that really makes a difference in patients' lives, often at their time of greatest need. I would also advise anyone entering medicine to take small steps along the way to expand your comfort zone. Women with traditional female upbringings are sometimes not at first comfortable with assertiveness and conflict, but confidence comes with experience.

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

The future of medicine is precision medicine and nuclear medicine leads the way. We image disease on the molecular level where a disease process can be seen earlier, as well as treated more appropriately. Artificial intelligence will continue to grow in importance. Men and women will share equally in new discoveries. It is encouraging to me now to look around and see so many differing backgrounds in the young trainees, quite different than when I was in training. I am happy to see more talented young girls being directed towards math and science in their early education. Although women in medical school have increased, the number in radiology and nuclear medicine have not increased proportionately. Sometimes there is a belief that we do not have much patient contact in nuclear medicine, but that is not the case. We are a valued member of the treatment team with theranostics and are able to spend time and get to know our patients and their families as we deliver direct patient care in the field of targeted oncologic treatments.

What is your recipe to balance a very active professional career and a happy and thriving family life?

First is self-care. You cannot take care of others if you don't take care of yourself. This is easy to forget with a very demanding schedule. Exercise and yoga have been helpful to me, although sometimes by necessity in small segments. Involve the family in these activities as much as possible.

Second, your house does not have to be perfect. Those of us in science and medicine have perfectionistic personalities and our professional work demands no errors either in the performance or interpretation of a study. However, at home it really does not matter if the house is sometimes messy, toys all over the place, and laundry piling up. Enjoy your family. There will come a time later in life to have an organized home, and then you will probably miss the hectic and cluttered years. ■

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Les femmes de la médecine nucléaire
Women in nuclear medicine

DR. HELEN NADEL

Helen R. Nadel
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Director of Pediatric Nuclear Medicine
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In the 20th century it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist/ nuclear medicine practitioner in Canada and in the US?

In medicine things have changed dramatically in the 35 years of my career and medical school classes are now 50% women. By sheer force of numbers, women have more chance to succeed and participate in leadership roles. It still takes a lot of work, passion, commitment, to help others and oneself advance the field with our patients always in our mind. In many ways, I was fortunate to be engaged in a relatively small field in nuclear medicine and then pediatrics. Some of the benefits of that allowed me to take advantage of opportunities to further my skills and interest and was able to get to know many people in my field who have been mentors, collaborators and most of all friends. I can't overemphasize how all of these roles in the people I have met along the way have been integral in my success. I think this is easier for women today than it would have been in Marie Curie's time. This benefits the field. My goal has always been to do the best for my patients and pass on the things I have learned along the way to make it easier for others to succeed. Just as I was successful, I now try to pay it forward to help others. These are some of the factors that have helped me become an expert in my field, help promote pediatric nuclear medicine, and help build a collaborative base for the future.

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine

Marie Sklodowska Curie was a unique human being who is in the limited distinguished group of people; and only woman; that have won two Nobel Prizes; one in Physics in 1903 with her husband Pierre Curie and Henri Becquerel; and a second in 1911 in Chemistry.

Her drive, work ethic and determination were unparalleled. She succeeded despite poor social situation of her family, barriers to her education, multiple barriers due to her gender which even included public social shaming. Her unequaled passion, drive, determination was her story despite these personal barriers and tragedy. She refused to allow this to deter her from her scientific goals. She must have had a great deal of confidence in her ideas and abilities that are more commonplace now but uncommon in her time. Her bringing radiology machines to the frontlines in World War 1 was a practical culmination of her life's scientific research and helped save countless lives. Her legacy continues with the success of her children and grandchildren in the scientific field.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

There is no greater gift than to have a passion and profession that allows you to help people. I encourage anyone, man or woman, who wants to devote their passion and conviction to a career in medicine. The way forward is to follow your compassion and conviction to enhance and enlarge your interests and carve out a niche over time by doing the best you can to push your field forward. I would encourage women to realize contributions to Professional Societies are a gift that gives back and helps make you a rounder, broader physician and offers a different opportunity for developing aspects of medicine that are not just clinical; to include medical scholar, leader, health advocate, communicator. Women often have to make choices early in their career to balance family, interests and needs while remembering that time is defined and that should not deter one from forging ahead. Women need to seek out meaningful mentors at various stages in their career.

Technological advances and the human genome project have brought the medical and scientific knowledge to

levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

The future of medical imaging is like the past; filled with change and opportunity. Medical imagers in the future will have to be more adept at learning new skills that have not necessarily been traditional such as new and different therapies and embracing a big part of the future that is artificial intelligence (AI) and genomics. Our specialty has always thrived on change and will continue to do this in the future as a collegial, collaborative part of the healthcare team. This will be necessary to provide the best care for our patients. Women are equal partners who realize that the future is filled with change and opportunities in an era of lifelong learning.

Should you be elected as Vice President-Elect of the SNMMI, what would be your major endeavors to establish and develop the field of Theranostics in the US.

I am honored to be nominated for the position of Vice President-Elect of the SNMMI and I am especially honored to follow four extraordinary women who have held this position, and one other Canadian. We are entering in a period of growth and expansion to be able to diagnose and treat our patients with advances in our field. I hope to be able to make a substantial contribution. There will be three main areas that I would direct my efforts:

1. Promoting a deeper understanding of the basic sciences that underpin out future as the leading practitioners of Theranostics and advocating for deeper collaboration with our allied health colleagues who help us advance our effort to help patients with these amazing techniques on a daily basis.

2. Expanding the SNMMI footprint in advocacy particularly around regulatory burden as the field increases in genomics, AI, bioethics. If we have learned anything in the past year of COVID-19, it has provided a model for how science, government, and private sector can radically shape the outcome of a public health issue. This is a template for how Theranostic development can be furthered in our field.,

3. Encouraging the development of comprehensive training programs for technologists, physicians, basic scientists.

Theranostics requires a broader and wider understanding of basic science. The radiation oncology aspects of therapy will be more and more demanding of nuclear medicine practitioners. No one specialist can know everything and there will be a greater need for collaboration with other specialties including Radiation Oncology, informatics, health physics, radiochemistry.

Professional associations including SNMMI with input from other societies such as CANM will lead the way in these three areas to ensure these life-altering therapies are accessible to all who need them. I am confident that we will accomplish this and more.

DR. JOLANTA KUNIKOWSKA
Professor of Nuclear Medicine
Warsaw Poland
President EANM

DR. JOLANTA KUNIKOWSKA

YOU ARE THE PRESIDENT OF the European Association of Nuclear Medicine (EANM). Could you succinctly describe the role of the EANM in the field od Nuclear Medicine?

The European Association of Nuclear Medicine (EANM) is the largest organisation dedicated to nuclear medicine, molecular imaging and theranostics in Europe. In this role, it has become the umbrella organisation which represents the whole sector (individuals as well as national societies) towards the European and international institutions. The EANM's vision is to optimise and advance science and education in nuclear medicine for the benefit of public health and humanity within the concept of personalised healthcare.

What have been the three most important changes that you have seen in the field of Nuclear Medicine over the last five years?

Nuclear Medicine over the last five years changed dramatically. First of all, new diagnostic radiopharmaceuticals were introduced to clinical practice. The best example is PSMA. Nowadays this is the main agent for prostate cancer imaging. PMSA, or glutamate carboxypeptidase II, was originally found to be specifically expressed in the epithelial cells of prostate

cancer cells. However, recent studies have shown that PSMA is also involved in angiogenesis in other cancer types, such as glioblastoma, gastric cancer, colon cancer, bladder cancer, HCC, clear cell renal carcinoma, breast cancer, ovarian cancer, melanoma, and mesothelioma. PSMA it not only a novel target for diagnosis but also for therapy.

And this is the second major change in the evolution of nuclear medicine - targeted therapy. In the last years somatostatin analogue labeled with lutetium-177 was registered for treatment of neuroendocrine tumors. Recently, results of the first randomized trial *Thera-P [^{177}Lu]Lu-PSMA-617 versus cabazitaxel in patients with metastatic castration-resistant prostate cancer* was published. So it will be a game changer in the treatment of prostate cancer.

Last but not least, alpha therapy was introduced to clinical practice. Starting with registered radium-223 for metastatic bone lesion as first agent not only improving quality of life but also prolong overall survival time of the patients.

How do you see the field of Nuclear Medicine evolving during the next 5 years?

The next five years will lead to the rapid expansion of new PET imaging biomarkers. That will be the first step to new theranostic approaches. Precision or personalized medicine is often described nearly exclusively in the context of genomics. Underlying this concept raised the hope that single oncogenic drivers could be identified and targeted successfully for most cancers.

How do you see the training of residents and technologists in our Nuclear Medicine training programs?

I am fully aware of the strength of our next generation of experts within EANM, whom we want and need to represent, and who deserve a fully fledged educational programme, that EANM offers through its educational wing ESMIT (European School for Multimodality Imaging & Therapy) and equal chances to develop and grow within the EANM Committees. We will need to be focused on the training of young people – physicians as well technologists, because we are partners in the further development of molecular imaging and metabolic radiotherapy.

That was one of the main reasons to modernize our ESMIT online learning platform. It will allow easy access via single platform to live webinars, self-paced and facilitated online courses, on-demand video material, course registrations and certificates. All is available for all residents as well nuclear medicine physicians, not only in Europe but around the world.

As president of the EANM, what is your greatest wish for the speciality of Nuclear Medicine?

My greatest wish for Nuclear Medicine is that it stays an independent specialization and that we work tougher for a further development of THERANOSTIC approach. ■

Ass. Prof. Jolanta Kunikowska is a nuclear medicine as well as internal medicine physician specialist. She is currently assistant professor at the Nuclear Medicine Department, Medical University, Warsaw/Poland. She has a broad interest in positron emission tomography (PET), molecular imaging applications in oncology and theragnostics (radionuclide therapy).

She has a particular interest in novel PET radiotracers, and theragnostic applications including prostate, neuroendocrine tumors and glioblastoma. She has authored over 90 peer-reviewed articles and several book chapters. She received several prestigious awards provided by various scientific communities including the Gold prize for Hisada award in 2018 and Marie Curie Award for outstanding scientific work presented at the 29th Annual Congress of the European Association of Nuclear Medicine (EANM) in Barcelona in 2016. She is currently the President of the EANM.

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甲状腺癌

甲状腺癌是内分泌系统和头颈部肿瘤中最常见的恶性肿瘤，其主要病理分型分为乳头状癌和滤泡状癌。近30年，除非洲地区因疾病诊断技术受限之外，世界大多数地区甲状腺癌发病率呈持续上升趋势。2016年，全球甲状腺癌新发病例数约为298 000例，死亡例数40 000例，虽有37%的新发病例来自欧美地区，但死亡主要发生在亚洲。我国甲状腺癌新发病例数占全球新发病例数的15.6%，死亡数占13.8%。2016中国肿瘤登记数据显示，2015年全国甲状腺癌发病率为4.12/10万，男性1.93/10万，女性6.42/10万；同期全国甲状腺癌死亡率为0.34/10万，男性0.23/10万，0.46/10万。近20年，我国甲状腺癌发病率一直呈上升趋势。中国肿瘤登记数据显示，2003-2012年甲状腺癌发病率逐年上升，死亡率较为稳定。

甲状腺癌大体分为分化型与未分化型，乳头状癌属分化型。分化型具有摄碘131功能，因此临床上用来治疗分化型甲状腺癌，特别是血行转移灶（肺、骨）。

碘-131治疗分化型甲状腺癌的指征推荐：
1、已知存在肺、骨等脏器的远处转移（M1），高危，强烈推荐进行碘-131治疗（提高疾病特异性生存率和无病生存率）；

2、术中肉眼可见肿瘤突破甲状腺包膜并侵犯皮下软组织、喉、气管、食管、喉返神经、椎前筋膜或包绕颈动脉和纵膈血管（无论肿瘤大小，T4），手术切除不完全，远处转移，高TG血症，个数不限但最大径大于或等于3厘米病理阳性的颈部淋巴结转移瘤，滤泡型甲状腺癌伴广泛血管侵犯（血管侵犯超过4处）。具备上述之一者即为高危，均强烈推荐进行碘-131治疗（提高疾病特异性生存率和无病生存率）；

3、原发肿瘤直径超过4厘米或镜下外侵（T3）、颈部淋巴结转移（N1），中危，应根据年龄、肿瘤外侵范围、淋巴结转移瘤数量和大小等选择性进行碘-131治疗；

4、虽然肿瘤没有突破甲状腺包膜且直径介于1—4厘米（T1b-2），低危，通常不建议行碘-131治疗，但若手术病理提示侵袭性组织学表现（如高细胞、柱状细胞、钉状细胞癌等）则可考虑进行碘-131治疗。

5、无外侵和转移的微灶癌（直径小于1厘米），无论单发还是多发病灶都应视为低危，不常规建议行碘-131治疗，除非有复发风险调整、疾病随访、患者意愿方面的考虑。

碘-131治疗分化型甲状腺癌的方法分类

严格来讲，广义的甲状腺癌术后碘-131治疗从实际方法和目的上可细分为三种具体情形，即残甲消融、碘-131辅助治疗和甲状腺癌碘-131治疗。

残甲消融，俗称“碘-131清甲”，是指通过口服碘-131的方法，使（术后残留）正常甲状腺组织受到靶向性电离辐射作用而坏死，充分实现甲状腺组织的去功能化。其作用在于降低术后甲状腺癌的复发、死亡风险并有利于进行疾病分期和随访（监测血清甲状腺球蛋白TG）。应该视残留甲状腺的大小和摄碘能力进行碘-131使用剂量决策，通常使用的碘-131剂量（活度）范围为30-150毫居里。

狭义的“甲状腺癌碘-131治疗”是指是指通过口服碘-131的方法，使甲状腺癌残留、复发、转移灶受到靶向性电离辐射作用而坏死，起到抑制甚至治愈甲状腺癌的作用。通常使用的碘-131剂量（活度）范围为150-250毫居里。

当然，在具体临床实践过程中，特别是首次收治时，部分患者同时存在残甲和潜在转移灶（或复发、残留）的可能。为了最大限度提高疗效、减少疗程数并降低辐射损害和医疗开支，在条件允许的情况下，可以使用碘-131治疗以同时起到残甲消融和辅助治疗甲状腺癌病灶的双重作用，此时就难以严格区分“消融”和“治疗”了，或者说两种情况可以同时进行，称为碘-131辅助治疗，通常使用的碘-131剂量（活度）范围为150-200毫居里。

TECHNEGAS™

IMAGERIE PULMONAIRE FONCTIONNELLE

AVANTAGES
V/Q SPECT TECHNEGAS™

Précision de diagnostic prouvée
avec une sensibilité et une spécificité élevées [1]

Minimalement invasif
aide au confort et à la collaboration des patients [2]

Détection sous-segmentaire
de l'embolie pulmonaire (EP) [3]

Faible radiation
26 à 36 fois moins de dose absorbée au sein chez les femmes [4]

Technegas™ a des critères d'exclusion minimaux et peut être administré à la plupart des patients[4-6], y compris:
Insuffisance rénale | Allergie aux agents de contraste | Diabète
Maladie pulmonaire obstructive chronique (MPOC) | Gravement malade
Femme enceinte

V/Q SPECT TECHNEGAS™ ET LES RECOMMANDATIONS EN MÉDECINE NUCLÉAIRE

Les recommandations de l'EANM[7] conseillent fortement la tomographie par émission de photons pour les études pulmonaires de ventilation-perfusion (V/Q SPECT) car elle permet le diagnostic de l'EP avec précision, même en présence de MPOC et de pneumonie.

Les recommandations du CANM[8] considèrent Technegas™ comme l'agent de choix chez les patients souffrant de MPOC puisqu'il y a moins de dépôts dans les voies aériennes centrales, une meilleure pénétration périphérique et il ne s'élimine pas aussi rapidement que les aérosols traditionnels. Seulement quelques respirations sont suffisantes pour atteindre une quantité adéquate d'activité dans les poumons, ce qui réduit le temps de la procédure et l'exposition du personnel.

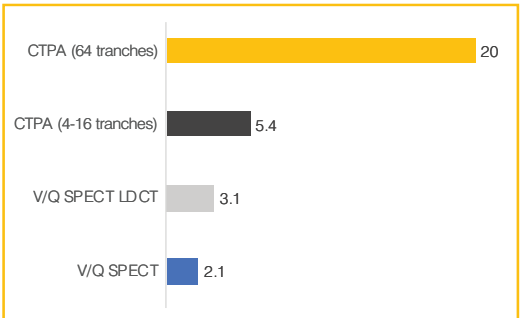

Tableau 1: Exposition à la radiation [8] (mSv)
(adapté des recommandations du CANM, 2018)

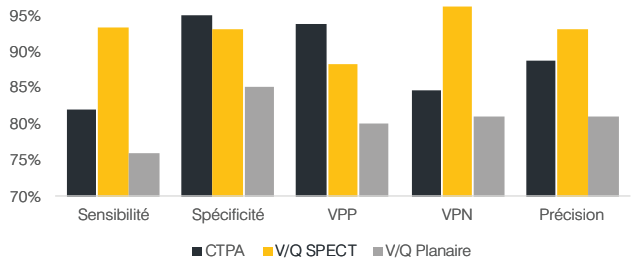

Tableau 2: Performances diagnostiques des différentes modalités à détecter l'EP (adapté de Hess et al, 2016)

Toutes les EP doivent avoir un contrôle final 3 mois après le diagnostic afin d'évaluer la reperfusion finale et pour bénéficier de la disponibilité d'un examen de base en cas de symptômes récurrents. Une faible exposition à la radiation permet des études répétées (tableau 1).

Avec l'adoption de l'imagerie SPECT, les résultats V/Q SPECT sont considérés comme supérieurs à l'imagerie planaire et à la tomodensitométrie (CTPA) lorsque l'on compare la sensibilité, la valeur prédictive négative et la précision de ces examens (tableau 2).[1]

Par conséquent, dans les situations d'EP aiguës, d'EP chroniques, de grossesse, de pédiatrie et de patients MPOC, l'imagerie V/Q SPECT peut être considérée comme une investigation de première ligne en raison de sa sensibilité et de sa spécificité élevées, de sa faible radiation et de l'absence d'effets indésirables.[8]

AFIN D'EN APPRENDRE DAVANTAGE SUR LA PROCÉDURE V/Q SPECT AVEC TECHNEGAS™, VISITEZ : https://bit.ly/2PZDDii

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Technegas™ n'est pas encore disponible à la vente aux États-Unis.
Dernière révision (A4): v.2.1 (14/avr/2021)

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¿MARIHUANA INNOFENSIVA?

La tendencia mundial a legalizar la marihuana ha causado una disminución de la sensación de que se trata de una droga dañina, un aumento del consumo y un inicio en adolescentes cada vez a menor edad. Esto ha causado un aumento en las consultas por complicaciones de su uso como falta de motivación (el síndrome amotivacional), bajo rendimiento académico, crisis de pánico, accidentes y aparición de una esquizofrenia en sujetos predispuestos.

En Medicina Nuclear contamos con el NeuroSPECT, un examen que muestra en una imagen tridimensional el flujo sanguíneo a las células del cerebro (la perfusión cerebral), lo que representa el funcionamiento de las distintas áreas cerebrales. Para facilitar su interpretación, voluntarios sanos se sometieron al NeuroSPECT con Tc99m-HMPAO para crear bases de datos normativas por grupo de edad. Al comparar la perfusión cerebral de cada paciente con la de sanos de su grupo de edad, es posible destacar las áreas que funcionan muy diferente en el enfermo, expresado en desviaciones standard del promedio de lo encontrado en los sanos.

Esta técnica es útil en diversas enfermedades neurológicas y psiquiátricas como por ejemplo en el diagnóstico de demencia, epilepsia, trauma encefálico, exposición a sustancias neurotóxicas (como alcohol, drogas ilícitas, pesticidas, solventes, etc.), enfermedad vascular cerebral, encefalomielitis miálgica/síndrome de fatiga crónica, déficit atencional, trastorno bipolar, esquizofrenia, depresión, trastorno obsesivo-compulsivo, síndrome de stress post-trauma y estudio de respuesta a tratamientos.

Un estudio en escolares consumidores exclusivamente de marihuana al menos hace 18 meses y con consumo cuatro veces en el mes previo, muestra en test psicológicos un significativo deterioro en la memoria, atención, concentración, organización y capacidad de planificación cuando se los compara con sus pares que no consumen drogas.

Se puede ver la comparación entre un NeuroSPECT normal (figura 1) y un NeuroSPECT de un escolar consumidor de marihuana estudiado en un día normal de clases (figura 2). Se muestra en color gris las áreas del cerebro con perfusión en el rango del 95% de los voluntarios sanos (± 2 desviaciones standard del promedio normal). En el normal predomina el gris y existe aumento de la perfusión cerebral en colores rojo, rosado y blanco por activación fisiológica de la corteza visual occipital durante el examen (posterior view). En el escolar consumidor de marihuana hay múltiples áreas de marcada disminución de la perfusión, especialmente severo en lóbulos temporales (incluye el hipocampo) en colores celeste, azul y verde a más de dos, tres y cuatro desviaciones standard por debajo del promedio de los normales respectivamente, o sea son áreas con significativa menor perfusión (que funcionan menos). El NeuroSPECT de todos los escolares consumidores de marihuana mostró múltiples áreas desorganizadas de disminución marcada de la perfusión cerebral, especialmente en áreas relacionadas con el ánimo (área 25 de Brodmann), con las funciones ejecutivas (áreas 10 y 11 de Brodmann) y con las habilidades cognitivas (lóbulos temporales, hipocampo) coincidiendo con los test psicológicos. Una imagen dice más que mil palabras.

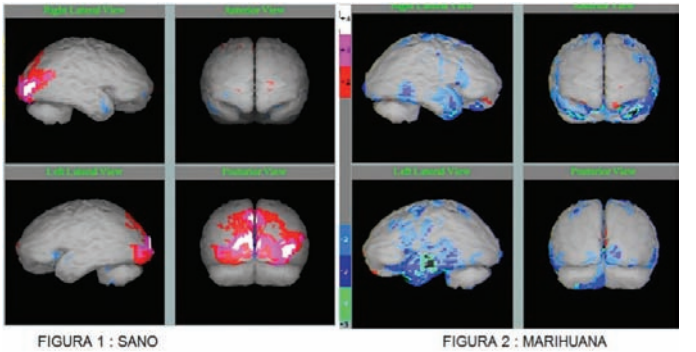

FIGURA 1 : SANO FIGURA 2 : MARIHUANA

El NeuroSPECT confirma que la marihuana no es inofensiva.


2022 Congress of the WFNMB
in Kyoto-Kanazawa, Japan
WFNMB 2022
JAPAN
WORLD FEDERATION OF NUCLEAR MEDICINE AND BIOLOGY
13th
Congress of the World Federation of
Nuclear Medicine and Biology
Summarize
the past half century
and
discuss
the next half century
of
WFNMB
Japan
World Federation of Nuclear Medicine and Biology
2022
September 7-11, 2022
Kyoto International Conference Center
Post-Congress Symposium
September 12-13, 2022
Kanazawa Art Hall
62nd Annual Scientific Meeting of the Japanese Society of Nuclear Medicine
42nd Annual Meeting of the Japanese Society of Nuclear Medicine Technology

WELCOME LETTER

Welcome

On behalf of the Japanese Society of Nuclear Medicine (JSNM), I would like to cordially invite you to Kyoto, the host city of the 13th Congress of the World Federation of Nuclear Medicine and Biology to be held in 2022 (WFNMB 2022). The 1st WFNMB Congress was realized in Tokyo and Kyoto in 1974 and was a great success. We firmly believe that WFNMB 2022 will be an equally good opportunity to gather once again in Japan in order to summarize the accomplishments of the WFNMB during the past half century and discuss strategies for the future of the WFNMB as well as of nuclear medicine itself in the next half century. Kyoto was the city where the closing ceremony of the 1st Congress was conducted, making it fitting that it will become the opening door to a new era of WFNMB.

JSNM would like to enhance mutual collaboration among colleagues of the nuclear medicine community throughout the world. In order to promote nuclear medicine in daily clinical practice as well as the research field, as many countries as possible should discuss together at a single table in the WFNMB Congress. One of the major missions of WFNMB is to provide opportunities for education, study and research especially to young fellows. It is very important for them to obtain information of these activities in a timely manner. The WFNMB Congress is one of the key resources for these purposes. Therefore, we would sincerely like to request your country to join it to promote the bright future of all of our young fellows.

Kyoto is the cultural heart of Japan and boasts over a millennium of history featuring a stunning total of 17 UNESCO World Heritage Sites all located less than 30 minutes apart. The best way to discover the "real Japan" is to include Kyoto in your itinerary. Kyoto has been voted the best travel destination in Japan by various travel magazines and web media. This friendly city of 1.5 million people offers endless opportunities to gain meaningful hands-on experience of rich Japanese culture through tea ceremony, sake brewing, kimono wearing, swordsmanship and many more activities.

Post-congress cultural social activities will be planned in Kanazawa located just 2 hours ride by express train from Kyoto. Kanazawa is an old city of Samurai Culture in contrast to the Court Culture in Kyoto. It was a great castle town ruled by influential lords from the late 16th century to second half of the 19th century. The area surrounding Kanazawa is famous for hot springs and its cuisine making use of fresh fish and vegetables. The rice wine (sake) produced in this region is of high quality, smooth and sweet, derived from the rice grown in Ishikawa Prefecture as well as the considerable precipitation of the Hokuriku region.

The Department of Nuclear Medicine, Kanazawa University, where I have been serving as chairperson since 2006, was established in 1973 as the very first department of nuclear medicine at a Japanese university. Therefore, the length of the history of my place closely coincides with that of WFNMB. This coincidence is another reason making Kanazawa a suitable place, in addition to Kyoto, to talk about both the past and future of nuclear medicine.

It is my heartfelt wish that you allow us to welcome you all to Japan. We will do our best to be able to offer you a great time in both Kyoto and Kanazawa. ■

Sincerely,

Seigo Kinuya

WFNMB2022 Congress Chair
Professor, Department of Nuclear Medicine,
Kanazawa University,
Japan

INTERVIEW WITH *DR. SEIGO KINUYA*

You are the chair of the NEXT CONGRESS OF THE WORLD FEDERATION OF NUCLEAR MEDICINE AND BIOLOGY (WFNMB) IN KYOTO JAPAN 7-11 SEPTEMBER 2022.

Could you GIVE US AN OVERVIEW OF THE EVENT.

We are preparing to have on-site face-to-face congress. I hope that the pandemic of COVID-19 with the progress made in vaccination throughout the world.

We will focus on what's going on in nuclear medicine by inviting prenarry speakers on the topics of theranostics, neurology, cardiology, molecular imaging, AI and so on. One of Japanese Nobel Prize winners, Dr. Koichi Tanaka who invented mass spectrometric analyses of biological macromolecules, will be invited. Recently, his group published a key article in Nature regarding liquid biopsy for Alzheimer's disease. As you know, therapeutic drug, aducanumab, for Alzheimer's disease was approved by the US FDA very recently. Amyloid PET is connected to these trend, and Dr. Tanaka's lecture will have great impact on nuclear medicine community in this regard.

One of the major missions of WFNMB is to educate young people in the field and promote the development of nuclear medicine in developing countries. For this sake, we wil prepare travel grants to join the congress. Our President Dr. Jean-Luc Urbain gave me a very good idea to have a session dedicated to the educational challenges.

One of highlights of the very first congress of WFNMB held in 1974 in Tokyo was the attendance of the then Crown Prince and Princess at the opening ceremony. We are negotiating with the authority to invite a member of the Japanese Imperial Family for the opening ceremony once again. Our request form is now on the table of the Cabinet office and I am sure that the nuclear medicine community in the world will be celebrated

We are expecting 4000 participants domestically and internationally. You will be one of them!

What have been the most important changes that you have seen in the field of Nuclear Medicine over the last 5 years!

Development of theranostics in the world is the biggest one. In my country Japan, not many people paid attention to targeted radionuclide therapy for many years although therapies such as radioiodine therapy for thyroid disease and 89Sr bone pain palliative therapy have been widely adapted in the clinic. It was a kind of niche field in medicine. However, many people began to recognize the successful achievement of PRRT for neuroendocrine tumors and PSMA therapy prostate cancer. Introduction of alpha therapy with ^{223}Ra for prostate cancer patients further pushed them toward this field. Then, successful story of ^{225}Ac-PSMA ignited their hearts. I have been involved in targeted radionuclide therapy for 35 years. Frankly speaking, I have not expected to see the current situation. I would sincerely appreciate the big efforts of our colleagues in the world.

How do you see the field of Nuclear Medicine evolving during the next 5 years!

The role of theranostics will get bigger and bigger in clinical practice. In Japan, Lutathera, ^{177}Lu-DOTATATE, is going to be approved. ^{131}I-MIBG for pheochromocytoma will follow. Clinical trial of ^{177}Lu-PSMA for prostate cancer is being prepared. Physician-led clinical trial of ^{64}Cu-ATSM for brain tumors is on the way.

In addition, clinical trials of targeted alpha therapy with ^{211}At (NaAt) for ^{131}I-refractory thyroid cancer and ^{211}At-MABG for pheochromocytoma are almost ready to be initiated.

PET imagings will also surely grow. Currently, we are doing clinical trial of ^{68}Ga-PSMA aiming governmental approval in my University hospital. We are also expecting that amyloid PET will be reimbursed after the domestic approval of Aducanumab.

How do you see the training of residents and technologists in our Nuclear Medicine training programs!

In order to offer patients with proper medical management, all professionals including physicians, nurses, technologists and nuclear physicists should collaborate at the high level. All of them should acquire updated technique and information. Furthermore, communication is quite important.

Task shifting in hospitals has been promoted by the Ministry of Health, Labour and Welfare (MHLW) in my country for more than 10 years. For this sake, we should understand the roles of each occupation. Mutual training program should be needed. For instance, Japanese Society of Nuclear Medicine (JSNM) has been discussing about JSNM Technology in this regard in response to the Governmental order.

As the chair of the WFNMB congress, what is your greatest wish for the specialty of Nuclear Medicine!

For the future of nuclear medicine, new technologies in both instruments and drugs are of course required. However, development of human resources is the most important thing. In addition, we need more young people than ever in order to keep growing. In my country, we have not succeeded to get a good number of young fellows in nuclear medicine for many years primarily due to the shrink of nuclear medicine examinations because of the alteration of medical care insurance system about 20 years ago. However, we have now very attractive tools of theranostics and PET imaging in our hands. WFNMB congress is a very good opportunity not only for the international development but also for the advertisement of nuclear medicine to young doctors in my country.

You are currently the president of JSNM. What are you doing to promote nuclear medicine in Japan and your neighboring countries in Asia?

Perhaps, Japan is one of the most underdeveloped countries in theranostics mean. Lutathera is just going to be approved 4 years after EU approval. ^{68}Ga-DOTATATE/DOTATOC is not available due to complicated regulations, and we have to use old-fashioned ^{111}In-octreotide instead. Patients go abroad to undergo PRRT or PSMA therapy to Europe or Australia. This situation is a shame of the Japanese nuclear medicine community. Five years ago, JSNM launched the National Conference for Nuclear Medicine Theranostics in which I have been serving as the president. Nuclear physicians, clinicians, patients and industrial people gather in this platform. Lobby activities or advocacy activities to the officials of Ministries and members of Parliament are going to bear fruit. Now, we have many supporters among representatives. Officials are getting to understand the necessity to develop radionuclide therapy in this country. Consequently, the word "targeted radionuclide therapy" was installed in the official statements of MHLW such as "Cancer Control Act" and "Requirements for Core Hospitals for cancer control ".

One of the biggest issues is a lack of domestic production of therapeutic radionuclides. After years of lobby activities, 2 representatives required a plan for domestic production of radionuclides, especially ^{225}Ac, at the occasion of parliament assembly on May 31, 2021. Four Ministers related to this issue responded affirmatively.

Public lectures are often provided to make people know the role of nuclear medicine in clinic. Many of ordinary people even do not know what nuclear medicine is. They cannot imagine what targeted radionuclide therapy is. We need to continue this activity at any occasion.

Mutual activities with other societies have been going on. We have MOU with SNMMI, EANM and the societies of Asian countries. JSNM proposes symposium in annual congress of SNMMI and EANM every year, and collaborative sessions are regularly prepared which have a good reputation.

Many of Asian countries are not well developed in nuclear medicine practice. So that, supporting educational activities is essential in this region. JSNM has been working together with Asia Oceania Association of Nuclear Medicine and Biology (AOFNMB), Asian Regional Corporative Council of Nuclear Medicine (ARCCNM) and so on.

The collaborative work with the International Atomic Energy Agency (IAEA) was initiated in 2018 by the leadership of the past president of JSNM, Prof. Jun Hatazawa. The Consortium of 11 Universities and Institutions in Japan has MOU with IAEA. This aims to provide young people in Asia with educational occasions. Workshops and hands-on meetings are set up in Japan. Although this activity is suspended now due to COVID-19, it will be resumed hopefully next year. ■

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Association canadienne de médecine nucléaire

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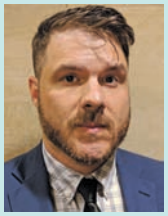

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SNMMI	11-14 june 2022	Vancouver
WFNMB	7-10 september 2022	Kyoto
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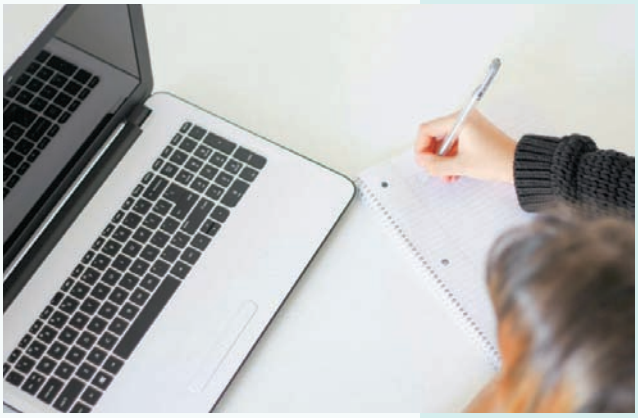
The Canadian Association of Nuclear Medicine strives for excellence in the practice of diagnostic and therapeutic nuclear medicine by promoting the continued professional competence of nuclear medicine specialists, establishing guidelines of clinical practice, and encouraging biomedical research. We work with all professionals in nuclear medicine to ensure that Canadians have access to the highest quality nuclear medicine services.



SISTER ORGANIZATIONS

SNMMI Society of Nuclear Medicine and Molecular Imaging · EANM European Association of Nuclear Medicine · World Federation of Nuclear Medicine and Biology · APES · ARCENM · ASNC · ARSNM Arab Society of Nuclear Medicine · AFNMB · IAEA International Atomic Energy Agency · alasbimn · South African Society of Nuclear Medicine · SFMN

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OANM UPDATE

Christopher O'Brien MDCM FRCPC
President, OANM

Today I would like to discuss the latest initiative of the Ontario Association of Nuclear Medicine (OANM):

Addressing the Shortage of Nuclear Medicine Technologists

Our members have been advising the OANM that they are having more and more difficulty in hiring technologists to fill vacant positions. This involves the larger University affiliated centers, the medium to large community hospital practice as well as the free standing clinics (the independent health facilities: IHFs).

As with most issues this problem is multifactorial.

1: Technologist Training Programs:

There is only one center that trains technology students in the field of Nuclear Medicine: the Michener Institute of Technology which is located in Toronto with no satellite campuses. A few years ago the Michener Institute moved away from a Diploma program to a University Affiliated Degree Program. During this transition there were no classes for the training of Nuclear Medicine technologists.

The degree program is now running successfully but there is still a gap between the number of grduates and the demand. The Michener Institute has recognized this problem and advised the OANM that the Institute will be increasing the class size to address this shortage though it will take a few years before graduates come into the market place.

Thus, shortages will continue for the next few years impacting patient access to Nuclear Medicine procedures and the situation will become worse as PET programs expand and isotope therapies become more mainstream.

2: EMPLOYMERNT OPPORTUNITIES

Once Nuclear Medicine technologists begin seeking employment to pursue a career in Nuclear Medicine jobs that allow for gainful employment must be available. In the past many Nuclear Medicine centers have been offering only part time or casual jobs when most technologist have been seeking full time employment. Many of these technologists take these part time jobs as a stepping stone to full time employment usually at another center.

Thus, the initial center would have spent time and resources to support a new graduate only to lose the gradual when a full time job becomes available. The OANM believes that there needs to be more full time job opportunities for technologists. Many technologists are presently working multiple part time jobs. This may be able to occur in large urban centers where job opportunities are more numerous but is a significant hurdle for centers located in smaller urban centers.

The OANM will be moving to work with Hospital Associations to attempt to address this issue. One approach could be funding for the technologist during the training program in return for a committed return of service. This may be able to address shortages in smaller urban centers.

3: TECHNOLOGIST PERSPECTIVE:

Many technologists wish to work in larger urban centers for many valid reasons; however, there appears to be a reluctance to look for employment opportunities beyond large urban centers. Smaller urban centers have reported that even when a full time job is offered there is no interest.

The OANM believes that some type of return of service program could address this issue partially, but Nuclear Medicine centers need to become more creative in their job offerings. In addition, Nuclear Medicine technologists need to be willing to look beyond the borders of a large urban center and seriously consider opportunities in small urban centers.

The OANM will be setting up meetings with the training institute in the new year as well as with Hospital associations and technologist associations to brainstorm on how to create an environment whereby technologists will be comfortable pursuing a career in Nuclear Medicine outside of larger urban centers.

OANM

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Grégoire Blais MD, FRCP
Médecin nucléiste / Nuclear Medicine Specialist
Centre de santé et de service sociaux de la Haute-Yamaska
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Venez consultez la page Facebook de l'association des médecins spécialistes en médecine nucléaire du Québec. Vous y trouverez de multiples informations concernant principalement la médecine nucléaire québécoise.

Nous y partageons des événements à venir, des articles intéressants et toutes nouvelles susceptibles d'intéresser la communauté de médecine nucléaire d'ici et d'ailleurs. Nous sommes aussi très fier de présenter les réalisations exceptionnelles de certains de nos membres.

N'hésitez pas à nous contacter si vous souhaitez nous partager une bonne nouvelle, une information, ou un article d'intérêt.

Grégoire Blais
Responsable de la page Facebook de l'AMSMNQ

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Visit the Facebook page of the Quebec Association of Nuclear Medicine Specialists. You will find a wealth of information there concerning nuclear medicine in Quebec.

This is where we share upcoming events, interesting articles and useful information with the nuclear medicine community at home and abroad. We are also very proud to showcase the exceptional accomplishments of some of our members.

Please do not hesitate to contact us if you have any good news, information, or article of interest.

Gregoire Blais
Manager of the AMSMNQ Facebook page

AMSMNQ

ASSOCIATION DES MÉDECINS SPÉCIALISTES EN MÉDECINE NUCLÉAIRE DU QUÉBEC

L'IMAGERIE PERSONNALISÉE PAR LA MÉDECINE NUCLÉAIRE

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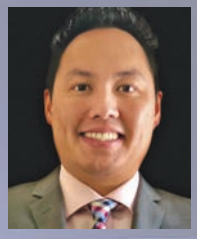
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ENTREVUE AVEC *Chantal Asselin*

CHANTAL ASSELIN, t.i.m.(E)

Vous êtes la responsable du programme de formation des technologues en médecine nucléaire du Québec, Canada. Pourriez-vous nous présenter un court résumé de votre parcours et de votre situation actuelle?

Enseignante au programme de Technologie de médecine nucléaire au Collège Ahuntsic depuis 1986 et Responsable de la coordination du département, des stages et Responsable de la radioprotection depuis 1997.

À titre de consultante en radioprotection, publication de plusieurs articles scientifiques, prestation de nombreuses formations et conférences dans plusieurs régions du Québec et provinces canadiennes ; réalisation de plusieurs avis ou normes pour l'Ordre des technologues en imagerie médicale et en radio-oncologie du Québec ; Technologue émérite en imagerie médicale depuis 2006 ; Mention d'honneur de l'Association québécoise de pédagogie collégiale (AQPC) en 2010.

Le centre de formation existe depuis quand et à ce jour combien de technologues en médecine ont été formés?

Depuis 1968 jusqu'à aujourd'hui, nous avons formé plus de 700 technologues qui travaillent dans une cinquantaine de services de médecine nucléaire aux quatre coins de la province.

Combien de professeurs (e) travaillent à la formation des étudiants ?

9 enseignant.e.s en Technologie de médecine nucléaire sont à l'emploi du collège Ahuntsic présentement et ils sont soutenus par 2 techniciennes de laboratoire.

L'excellence de nos technologues est reconnue dans le monde entier. En quelques lignes pourriez-vous nous décrire le parcours type d'un étudiant?

Durant les deux premières années du programme, les élèves apprennent à préparer les produits radiopharmaceutiques et à en contrôler la qualité grâce à la grande générosité de nos partenaires de l'industrie radiopharmaceutique. De plus, nos élèves s'entraînent à injecter des produits de façon sécuritaire, à produire des images de fantômes à l'aide de caméras et à analyser l'information recueillie à l'aide des mêmes logiciels que ceux utilisés dans les hôpitaux. Tout ce qui leur manque au collège, ce sont les patients !

Et ce sont les valeureux maîtres de stage et enseignants cliniques qui prennent la relève en centre hospitalier durant la troisième année du programme pour aider nos élèves à s'occuper des patients et à mettre en pratique ce qu'ils ont appris durant leurs deux premières années d'étude.

Nous sommes également très impliqués dans la planification et le placement de la main-d'œuvre. Sachez que nous avons augmenté le nombre d'admissions dans notre programme de 40 à 65 places ces dernières années. Toute l'équipe du collège travaille avec ardeur pour promouvoir notre profession et surtout pour favoriser la réussite des élèves.

Combien existe-il de technologues en médecine nucléaire actuellement actifs au Québec et dans combien de centres?

Environ 530 technologues en médecine nucléaire sont actuellement actifs au Québec et ils œuvrent dans une cinquantaine de services à travers la province.

Avec le développement accéléré de nouveaux radiotraceurs, de détecteurs hybrides et de la théranostique quels sont les défis les plus pressants auxquels vous êtes confrontée?

Le domaine de la médecine nucléaire est en constante évolution comme dans tous les domaines de l'imagerie médicale. De mon côté, je considère avoir vécu six grandes révolutions dans mes 35 années de carrière. Après l'arrivée des caméras gamma dans les années 70, j'ai débuté ma carrière de technologues avec l'arrivée des ordinateurs au début des années 80. J'ai participé à la formation des technologues lors de

l'arrivée des caméras tomographiques par émission monophotonique (TEMP) dans les années 90, suivie des caméras par émission de positrons (TEP) au début des années 2000 et par les caméras hybrides TEPM-TDM ou TEP-TDM au milieu des années 2000. La théranostique et la reconstitution des radiopharmaceutiques en milieu stérile sous hotte font partie des nouvelles formations que nous avons intégrées dans notre programme actuel et dans la formation sur mesure offerte aux technologues déjà gradués.

Aussi, depuis plus de 30 ans, le Collège Ahuntsic prend en charge la formation continue des technologues en offrant des formations théoriques et pratiques sur mesure portant sur les nouvelles technologies introduites dans notre domaine. Nous offrons également des formations à distance depuis déjà une quinzaine d'années, permettant ainsi de rejoindre les technologues de toutes les régions du Québec. Nous étions donc déjà prêts pour affronter le télétravail pandémique !

Quel serait votre plus grand souhait pour votre programme de formation des technologues en médecine nucléaire?

J'ai deux souhaits :

Améliorer l'attraction envers notre beau programme et cette magnifique profession afin d'obtenir plus de candidats en fonction des besoins des régions. À cet égard, nous allons entreprendre des démarches auprès du MSSS et des CISSS ou CIUSSS pour obtenir des bourses dédiées aux futurs technologues en médecine nucléaire pour pallier la pénurie de main d'œuvre qui sévit dans les différentes régions du Québec.

Que le ministère de l'Enseignement supérieur reconnaisse la valeur des équipements à la fine pointe de la technologie que nous possédons et que les budgets octroyés à la seule maison d'enseignement qui offre le programme soit à la hauteur de la qualité de la formation que nous offrons pour graduer des technologues compétents et autonomes prêts à intégrer le marché du travail à leur sortie de l'école. ■

INTERVIEW WITH *Chantal Asselin*

You are responsible for the training program for nuclear medicine technologists in Quebec, Canada. Could you give us a short summary of your background and your current position?

Teacher in the Nuclear Medicine Technology Program at Ahuntsic College since 1986 and Head of Department Coordination, Internships and Radiation Protection Officer since 1997.

As a radiation protection consultant, publishing several scientific papers, providing numerous trainings and conferences in several regions of Quebec and Canadian provinces; conducting several recommendations or guidelines for l'Ordre des technologues en imagerie médicale et en radio-oncologie du Québec (Quebec College of Medical Imaging and Radiation Oncology Technologists); Emeritus medical imaging technologist since 2006; Honorable mention of l'Association québécoise de pédagogie collégiale - AQPC (Quebec Association of College Education) in 2010.

How long has the training centre been in operations and to date, how many medical technologists have been trained?

From 1968 to today, we have trained more than 700 technologists who work in 50 nuclear medicine departments across the province of Quebec.

How many teachers work on student training?

9 teachers in Nuclear Medicine Technology are currently employed at Ahuntsic College and are supported by 2 laboratory technicians.

The excellence of our technologists is recognized around the world. In a few lines, could you describe a student's typical journey?

During the first two years of the program, students learn how to prepare and perform quality control of radiopharmaceuticals thanks to the collaboration with our partners from the radiopharmaceutical industry. In addition, our students practice injecting products safely, producing phantom images using cameras, and analyzing information collected using the same software utilized on a daily basis in hospitals. All they are missing at the college are the patients!

And it is the essential onsite supervisors and clinical teachers, who then take over in the medical center settings, during the third year of the program, to empower our students to develop their patient care skillset and put into practice what they learned during their first two years of the program.

We are also very involved in the planning and placement of the future workforce. Please note that we have increased the number of admissions to our

program from 40 to 65 places in recent years. The entire institution works hard to promote our profession and above all, to promote the success of our students.

How many nuclear medicine technologists are currently active in Quebec and in how many centres?

Approximately 530 nuclear medicine technologists are currently active in Quebec and work in about 50 departments across the province.

With the accelerated development of new radiotracers, hybrid detectors and theranostics, what are the most pressing challenges you face?

The field of nuclear medicine is constantly evolving as in all areas of medical imaging. For my part, I have witnessed six great revolutions in my 35-year career. After the arrival of gamma cameras in the 70s, I started my career as a technologist with the arrival of computers in the early 80s. I participated in the training of technologists with the arrival of Single Photon Emission Computed Tomography cameras (SPECT) in the 1990s, followed by Positron Emission Tomography cameras (PET) in the early 2000s and by the hybrid cameras SPECT-CT or PET-CT in the mid-2000s. Theranostics and the sterile compounding of radiopharmaceuticals in shielded isolators are amongst the new trainings we have integrated into our current program, and for the tailored training offered to post graduate technologists.

For more than 30 years, Ahuntsic College has been supporting the ongoing training of technologists by offering bespoke theoretical and practical training on new technologies that are introduced in our field. We have also been offering remote training for the past 15 years, allowing us to reach technologists from all regions of the Province of Quebec (1.5M km2). We were already prepared to face pandemic thanks to our remote capabilities!

6. What would be your greatest wish for your nuclear medicine technologist training program?

I have two wishes:

To improve the attraction to our exceptional program and this wonderful profession in order to get more candidates according to regional needs. In this regard, we will take steps with the Ministry of Health (MSSS), and Integrated Health and Social Services Centres (CISSS), and Integrated University Health and Social Services Centres (CIUSSS), to obtain grants dedicated to future nuclear medicine technologists to better address the labour shortage in the various regions of the Province of Quebec.

For the Ministry of Higher Education to recognize the value of the state-of-the-art equipment we have, and that the allocated budgets, to the only educational institution that offers the Nuclear Medicine Technology program in the Province, are aligned with the quality of the training we provide to ensure our students graduate as highly competent and autonomous technologists, ready to enter the nuclear medicine field. ■

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INTERVIEW WITH DR. RAYMONDE CHARTRAND

Until recently, few women held leadership positions in Nuclear Medicine. As a pioneer and scientist in this field, how have you been able to distinguish yourself so greatly as a nuclear physician?

In our Class of 1965, we were 15 women to graduate out of a total of 93 doctors. Times have greatly changed since then. After my residency in internal medicine, I completed one year at the Montreal General Hospital with Dr. Leonard Rosenthal in "Radioisotopes" as it was called at the time. The following year I embarked on a fellowship of the National Institutes of Health in the United States at Upstate Medical Center in Syracuse, NY with Dr. John G. McAfee (Canadian Radiologist from Toronto whose groundbreaking research led to major medical advances especially in blood cell labelling).

When I came back to Montreal in 1969, the Nuclear Medicine Specialty (distinct entity from Radiology) had just been created in the Province of Quebec. A first in Canada, and actually, in all of North America. In 1972, I passed the American Board of Nuclear Medicine exam. Four years later, in 1976, another board exam, this time at the Royal College of Physicians & Surgeons of Canada.

I have founded and opened the Hôpital St-Luc Nuclear Medicine Service in 1970 in Montreal. It required a lot of determination being a female physician, in charge, during this era. Being the only girl from a family of 5 siblings, I had quickly learned to defend my turf.

In 1976, Dr. François Lamoureux freshly back from London, after a Master of Science from university of London England, joined our service. He worked part time balancing his workload as he was also working at Hôpital Notre-Dame.

The Nuclear Medicine beginnings were extremely arduous due to the Quebec Government. Considered a quaternary specialty, the Ministry of Health had frozen all budgets to reduce spending. The freeze ended in 1978-1979.

I became President of the Pedagogic Committee and Director of the Nuclear Medicine Program, a position I held until 1990. From the small nucleus of colleagues since the very early days, we joined forces to establish a solid Nuclear Medicine program that would ensure medical coverage across the province including remote regions. We trained brilliant specialists. In parallel, the Ahuntsic College in Montreal, developed an excellent program for NM Technologists. These highly competent professionals play an essential role in a nuclear medicine service or department. This pivotal program utility was never doubted throughout the years.

I consistently evolved in a university environment alongside highly qualified physicians from all medical specialties. It was a stimulating environment where excellence and knowledge transfer were at the forefront. We educated the residents from the NM program but also to residents from all other specialties, general medical practitioners, technologists, nurses, and future pharmacists.

Through the years our hospital became part of the CHUM – Centre Hospitalier de l'Université de Montréal (merge of 3 major hospitals). The CHUM became a flagship institution for thyroid studies, especially cancers. I was extremely involved in the iodine therapies, the introduction of thyrotropin alfa, training all future NM specialists and an advisor to my colleagues throughout the province (NM physicians, endocrinologists, surgeons, etc.).

My involvement continued to evolve beyond the hospital and university settings. I became a Faculty Clinical Professor at Université de Montréal. I then

seated as chairman of the Royal College of Physicians & Surgeons of Canada, quickly followed by the Presidency of the Canadian Association of Nuclear Medicine. In 1987, I became an Ambassador Appointed from Le Palais des Congrès de Montréal after obtaining the 5th World Nuclear Medicine Congress in 1990.

I was always told that nature was generous with me. I continuously had tons of energy, enthusiasm, organization, and time-management skills. I am thankful for the support my family always provided: my husband, my 3 children, a loyal nanny for 25 years and last but not least, empathetic and devoted colleagues. My weekends were entirely focused on family and friends except, of course, when I was on-call at the hospital. I still remember my kids at a young age, with coloring books, with me, at the hospital while I was on duty…

Marie Curie is considered by many to be the mother of Nuclear Medicine. What human and professional qualities do you think she possessed to have succeeded in such a career and to lay the foundations for a new field of medicine?

Marie Curie was always present throughout my life and career (50 years) as a female Nuclear Medicine Specialist. I was never able to negate or forget the micro, milli and Curies, even though Becquerel later became the international metric unit for radioactive activity. For me, Marie Curie remains a model of determination and passion. She represents a strength of nature, being able to overcome life, adversity, confidence in her abilities and the willingness to excel sometimes to her own personal detriment.

As a medical professional, professor, and mentor what advice would you give to women interested in pursuing and succeeding in a medical career?

Any woman, nowadays, can become a doctor if that is her wish. It requires hard work, dedication, and perseverance. Our societies have greatly evolved for both men and women, now more than ever, individuals aim for a balance between professional, personal, and family life. In our field, female residents can start a family, extend their residency, if need be, without being penalized or impacted in their program. It certainly needs the support from the spouse or partner and family. That being said, this is no different than any profession or area of expertise.

How do you see the future of medical imaging and Nuclear Medicine? What role will women play in your opinion?

Nuclear Medicine never ceased to progress for the past 50 years considering the disappearing of certain studies and radiotracers but also, with the apparition of new compounds to allow for the detection of different conditions: for example, Parkinson's, cardiac amyloidosis, certain cancers, and the development of new therapies (theranostics).

The imaging devices also greatly improved from the days of rectilinear cartographs, to scintillation cameras to more advanced SPECT, SPECT-CT as well as PET-CT and PET-MR.

Informatics was slowly deployed in Nuclear Medicine in the 1980s and brought more possibilities. Speech recognition for example, was a game changer for physicians. Developments are happening every day, what will the future hold? What will the Artificial Intelligence bring?

Nuclear Medicine, even though, now combining anatomical modalities (with hybrid scanners) will always remain a separate field from Radiology due to its unique approach, focused on molecular markers for both diagnosis and treatment of disease. It is also a support field where we consistently contribute to all medical specialties, bringing valuable input with our state-of-the-art diagnostic services. The therapeutic aspect of Molecular Imaging will be revolutionary (not only from Iodine), but all the Theranostics where empathy and patient care will be of the greatest importance.

Women can tremendously perform in Nuclear Medicine: Applied sciences, physics, instrumentation, radiobiology, radiopharmacy are amongst the impressive list of areas that should not stop female candidates.

Finally after such a career in Nuclear Medicine what is your greatest wish for future nuclear physicians?

I have embraced my profession, my practice and more importantly my patients, I wish that all future Nuclear Medicine physicians bring dedication, enthusiasm, and passion at work in this great field while maintaining a good balance between their professional and personal lives.

Yes, this is my wish for the future of our field. The world pandemic, my age, and my children suggested that it was time for me to retire at 81 years old. ■

ENTREVUE AVEC DR. RAYMONDE CHARTRAND

Jusqu'à récemment, peu de femmes occupaient des postes de direction en médecine nucléaire. En tant que pionnier et scientifique dans ce domaine, comment avez-vous pu vous distinguer autant en tant que médecin nucléaire ?

Dans notre classe de 1965, nous étions 15 femmes à obtenir leur diplôme sur un total de 93 médecins. Les temps ont bien changé depuis. Après ma résidence en médecine interne, j'ai complété une année à l'Hôpital général de Montréal avec le Dr Leonard Rosenthal en « Radio-isotopes » comme on l'appelait à l'époque. L'année suivante, je me suis lancé dans une bourse des National Institutes of Health aux États-Unis au Upstate Medical Center de Syracuse, NY avec le Dr John G. McAfee (radiologue canadien de Toronto dont les recherches révolutionnaires ont conduit à des avancées médicales majeures, en particulier dans l'étiquetage).

À mon retour à Montréal en 1969, la spécialité de médecine nucléaire (entité distincte de la radiologie) venait d'être créée dans la province de Québec. Une première au Canada, et en fait, dans toute l'Amérique du Nord. En 1972, j'ai réussi l'examen de l'American Board of Nuclear Medicine. Quatre ans plus tard, en 1976, un autre examen du jury, cette fois au Collège royal des médecins et chirurgiens du Canada.

J'ai fondé et ouvert le Service de médecine nucléaire de l'Hôpital St-Luc en 1970 à Montréal. Il fallait beaucoup de détermination pour être une femme médecin responsable à cette époque. Étant la seule fille d'une famille de 5 frères et sœurs, j'avais rapidement appris à défendre mon territoire.

En 1976, le Dr François Lamoureux fraîchement revenu de Londres, après un Master of Science university of London England, rejoint notre service. Il travaillait à temps partiel pour équilibrer sa charge de travail puisqu'il travaillait également à l'Hôpital Notre-Dame.

Les débuts de la médecine nucléaire ont été extrêmement ardus à cause du gouvernement du Québec. Considéré comme une spécialité quaternaire, le ministère de la Santé avait gelé tous les budgets pour réduire les dépenses. Le gel a pris fin en 1978-1979.

Je suis devenu président du comité pédagogique et directeur du programme de médecine nucléaire, poste que j'ai occupé jusqu'en 1990. Du petit noyau de collègues depuis les tout premiers jours, nous avons uni nos forces pour établir un solide programme de médecine nucléaire qui assurerait une couverture médicale à travers la province, y compris les régions éloignées. Nous avons formé de brillants spécialistes. En parallèle, le Collège Ahuntsic à Montréal, a développé un excellent programme pour les Technologues NM. Ces professionnels hautement compétents jouent un rôle essentiel dans un service ou un département de médecine nucléaire. Cette utilité centrale du programme n'a jamais été mise en doute au fil des ans.

J'ai constamment évolué dans un environnement universitaire aux côtés de médecins hautement qualifiés de toutes les spécialités médicales. C'était un environnement stimulant où l'excellence et le transfert de connaissances étaient au premier plan. Nous avons formé les résidents du programme NM mais aussi les résidents de toutes les autres spécialités, les médecins généralistes, les technologues, les infirmières et les futurs pharmaciens.

Au fil des années, notre hôpital est devenu une partie du CHUM – Centre Hospitalier de l'Université de Montréal (fusion de 3 grands hôpitaux). Le CHUM est devenu une institution phare pour les études sur la thyroïde, notamment les cancers. J'ai été extrêmement impliqué dans les thérapies à l'iode, l'introduction de la thyrotropine alfa, la formation de tous les futurs spécialistes en NM et un conseiller auprès de mes collègues à travers la province (médecins NM, endocrinologues, chirurgiens, etc.).

Mon implication a continué d'évoluer au-delà du milieu hospitalier et universitaire. Je suis devenu professeur clinicien à l'Université de Montréal. J'ai ensuite occupé le poste de président du Collège royal des médecins et chirurgiens du Canada, rapidement suivi par la présidence de l'Association canadienne de médecine nucléaire. En 1987, je suis devenu Ambassadeur Nommé du Palais des Congrès de Montréal après avoir obtenu le 5e Congrès mondial de médecine nucléaire en 1990.

On m'a toujours dit que la nature était généreuse avec moi. J'ai continuellement eu des tonnes d'énergie, d'enthousiasme, d'organisation et de compétences en gestion du temps. Je suis reconnaissante pour le soutien que ma famille m'a toujours apporté : mon mari, mes 3 enfants, une nounou fidèle depuis 25 ans et enfin des collègues empathiques et dévoués. Mes week-ends étaient entièrement consacrés à la famille et aux amis, sauf, bien sûr, lorsque j'étais de garde à l'hôpital. Je me souviens encore de mes enfants à un jeune âge, avec des livres de coloriage, avec moi, à l'hôpital pendant que j'étais de service…

Marie Curie est considérée par beaucoup comme la mère de la médecine nucléaire. Quelles qualités humaines et professionnelles pensez-vous qu'elle possédait pour avoir réussi une telle carrière et jeter les bases d'un nouveau domaine de la médecine ?

Marie Curie a toujours été présente tout au long de ma vie et de ma carrière (50 ans) en tant que femme spécialiste en médecine nucléaire. Je n'ai jamais été capable de nier ou d'oublier les micro, milli et Curies, même si Becquerel est devenu plus tard l'unité métrique internationale pour l'activité radioactive. Pour moi, Marie Curie reste un modèle de détermination et de passion. Elle représente une force de la nature, capable de surmonter la vie, l'adversité, la confiance en ses capacités et la volonté d'exceller parfois à son détriment personnel.

En tant que professionnel de la santé, professeur et mentor, quels conseils donneriez-vous aux femmes intéressées à poursuivre et à réussir une carrière médicale ?

Toute femme, de nos jours, peut devenir médecin si tel est son souhait. Cela demande un travail acharné, du dévouement et de la persévérance. Nos sociétés ont beaucoup évolué tant pour les hommes que pour les femmes, aujourd'hui plus que jamais, les individus visent un équilibre entre vie professionnelle, personnelle et familiale. Dans notre domaine, les résidentes peuvent fonder une famille, prolonger leur résidence, si besoin est, sans être pénalisées ou impactées dans leur programme. Il a certainement besoin du soutien du conjoint ou du partenaire et de la famille. Cela étant dit, ce n'est pas différent de n'importe quelle profession ou domaine d'expertise.

Comment voyez-vous l'avenir de l'imagerie médicale et de la médecine nucléaire ? Quel rôle les femmes joueront-elles selon vous ?

La Médecine Nucléaire n'a cessé de progresser depuis 50 ans compte tenu de la disparition de certaines études et des radiotraceurs mais aussi, avec l'apparition de nouveaux composés permettant de détecter différentes pathologies : par exemple, la maladie de Parkinson, l'amylose cardiaque, certains cancers, la développement de nouvelles thérapies (théranose).

Les dispositifs d'imagerie se sont également considérablement améliorés depuis l'époque des cartographies rectilignes, des caméras à scintillation aux SPECT plus avancés, SPECT-CT ainsi que PET-CT et PET-MR.

L'informatique s'est lentement déployée en médecine nucléaire dans les années 1980 et a apporté plus de possibilités. La reconnaissance vocale, par exemple, a changé la donne pour les médecins. Des évolutions se produisent chaque jour, que nous réserve l'avenir ? Qu'apportera l'Intelligence Artificielle ?

La médecine nucléaire, même si, maintenant, combinant des modalités anatomiques (avec des scanners hybrides) restera toujours un domaine distinct de la radiologie en raison de son approche unique, axée sur les marqueurs moléculaires pour le diagnostic et le traitement de la maladie. C'est également un domaine de soutien où nous contribuons constamment à toutes les spécialités médicales, apportant une contribution précieuse avec nos services de diagnostic de pointe. L'aspect thérapeutique de l'imagerie moléculaire sera révolutionnaire (pas seulement de l'iode), mais de tous les théranostiques où l'empathie et les soins aux patients seront de la plus grande importance.

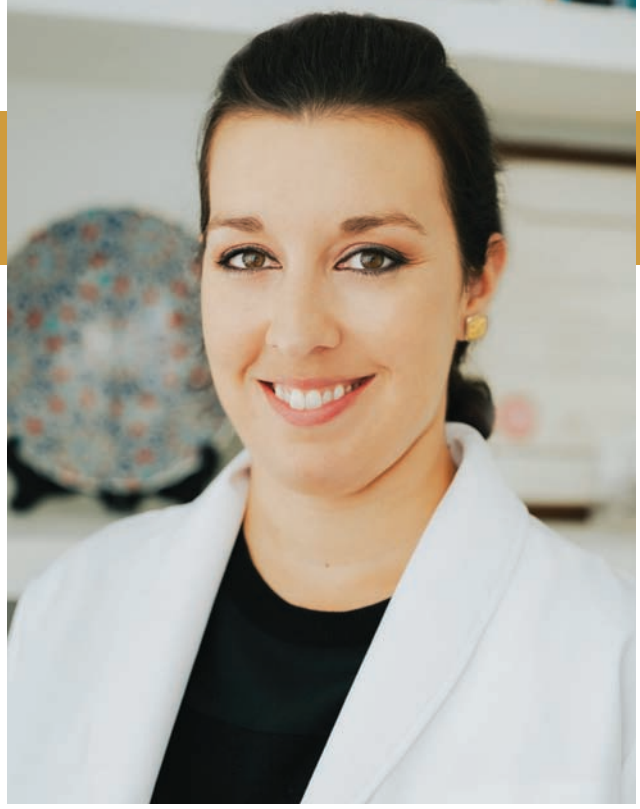
Les femmes peuvent être extrêmement performantes en médecine nucléaire : les sciences appliquées, la physique, l'instrumentation, la radiobiologie, la radiopharmacie font partie de la liste impressionnante des domaines qui ne devraient pas arrêter les candidatures féminines.

Enfin, après une telle carrière en Médecine Nucléaire, quel est votre plus grand souhait pour les futurs médecins nucléaires ?

J'ai embrassé ma profession, ma pratique et surtout mes patients, je souhaite que tous les futurs médecins en médecine nucléaire apportent dévouement, enthousiasme et passion au travail dans ce grand domaine tout en maintenant un bon équilibre entre leur vie professionnelle et personnelle.

Oui, c'est mon souhait pour l'avenir de notre domaine. La pandémie mondiale, mon âge et mes enfants ont suggéré qu'il était temps pour moi de prendre ma retraite à 81 ans. ■

ENTREVUE AVEC DR KARINE PROVOST



Dr. Karine Provost
MD, FRCPC
Nucléiste, Centre Hospitalier de l'Université de Montréal
Chargée d'enseignement de clinique,
Faculté de Médecine, Université de Montréal

Dr Provost pourriez-vous nous résumer votre parcours depuis le début de votre entrée en faculté de médecine jusqu'à ce jour?

J'ai complété mon cours de médecine à l'Université McGill en 2013. Par la suite, j'ai effectué ma résidence en médecine nucléaire de 2013 à 2018 à l'Université de Montréal. En complément à ma spécialité, j'ai quitté le Québec pour un fellowship en neuroimagerie moléculaire pour l'évaluation des démences à l'Université de Californie à San Francisco en 2019-2020, et je suis en voie de compléter une Maîtrise en recherche sur le même sujet. Je suis de retour au Québec depuis juillet 2020, où je pratique à temps plein au Centre Hospitalier de l'Université de Montréal.

À peine après avoir complété votre spécialité en médecine nucléaire vous occupez ou occuperez déjà plusieurs postes clefs dans le domaine de la médecine nucléaire. Pourriez-vous nous les indiquer et nous décrire ce qui vous motive pour assumer toutes ces responsabilités?

En effet, j'ai été élue en 2020 pour siéger à titre de conseillère sur le Conseil d'administration de l'Association des médecins spécialistes en médecine nucléaire du Québec (AMSMNQ). Je devenais ainsi la première femme élue au Conseil d'administration de cette association depuis sa formation. En me présentant pour ce poste, ma motivation principale était d'apporter de nouvelles idées et un dynamisme à l'Association, mais également de représenter mes consoeurs nucléistes.

J'ai également été nommée au poste de Présidente élue au Comité de spécialité de médecine nucléaire du Collège Royal des médecins et chirurgiens du Canada en juillet 2021. Ainsi, je serai la prochaine Présidente du Comité de spécialité à compter de juillet 2023, succédant au Dr. Antoine Leblond. Ce sea pour moi un grand honneur, ayant moi-même été formée par Dr. Leblond, qui a toujours été un modèle de leadership et d'engagement envers la spécialité.

Quels seront pour les 3 prochaines années les principaux développements en médecine nucléaire?

À mon avis, le changement le plus important qui est à l'horizon pour notre spécialité est l'arrivée de multiples nouvelles thérapies, notamment pour le cancer de la prostate. Plusieurs molécules à visée thérapeutique qui étaient accessibles uniquement via des protocoles de recherche deviendront rapidement accessibles en clinique, ce qui changera radicalement le portrait de notre pratique. Je crois également que parallèlement à ceci, l'imagerie par TEP prendra de plus en plus de place, en lien avec la croissance de la théranostique, mais également le développement de nouvelles molécules ciblées pour divers types de cancer, l'Alzheimer, etc.

Que diriez-vous aux jeunes étudiantes et étudiants en médecine pourquoi elles ou ils devraient considérer la spécialité de médecine nucléaire?

Il s'agit pour moi de la spécialité la plus complète, intéressante et qui est en constante évolution! On touche à tous les systèmes du corps humain et on côtoie divers types de maladies (infection, inflammation, cancer, maladies dégénératives), ce qui nous force à être toujours au fait des connaissances et des développements dans presque tous les domaines de la médecine. L'aspect diagnostique où l'on travaille davantage en solo est bien balancé par le travail multidisciplinaire et la thérapie, qui nous permet d'avoir un contact privilégié avec les patients. Également, puisqu'il s'agit d'une relativement "petite" spécialité, nous avons l'avantage de bien connaître nos collègues nucléistes, mais également toute l'équipe des technologues qui travaille avec nous et nos patients au quotidien. C'est une spécialité qui vaut vraiment la peine d'être découverte pour les étudiants!

Au Québec qu'elle est actuellement le ratio femmes-hommes en médecine nucléaire?

Actuellement, un peu moins de 25% des nucléistes au Québec sont des femmes. Cette proportion risque de changer au cours de prochaines années, puisqu'on retrouve la parité hommes-femmes dans la plupart des cohortes de résidents en formation au Québec.

Finalement chère docteure Karine Provost quel est votre plus grand souhait pour la spécialité de médecine nucléaire?

Mon plus grand souhait serait de voir grandir la spécialité et le nombre de résidents formés afin d'assurer la relève et la qualité des soins aux patients dans les prochaines années. Ceci sera l'un de nos plus grand défi avec l'augmentation de la demande en thérapie, qui nécessitera davantage de main d'oeuvre spécialisée.

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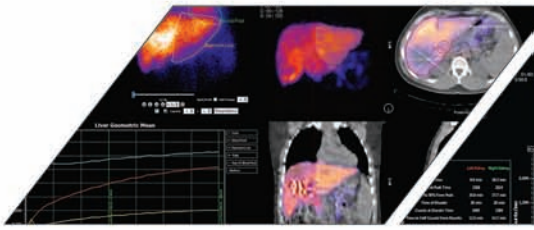
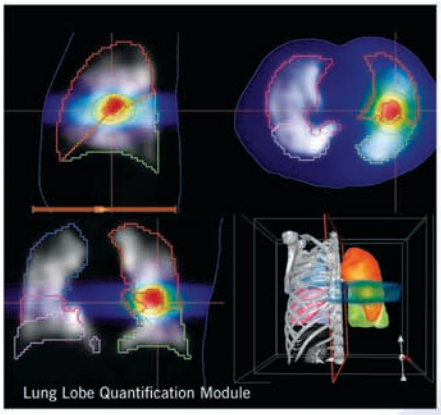


ENTERPRISE CLASS SOLUTIONS FOR MOLECULAR IMAGING

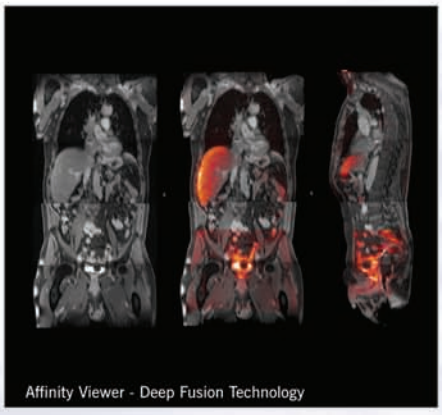
With more than 40 years of recognition for Clinical Excellence and innovation in Molecular Imaging, HERMES delivers Enterprise Class systems and software for integrating, visualizing, processing, reporting and archiving imaging data from different imaging modalities and devices within Molecular Imaging and Radiology. HERMES solutions are empowering physicians by enabling faster and more accurate diagnosis and treatment of patients, thereby improving patient outcomes and increasing efficiency. HERMES leadership within Molecular Imaging has been built on leading technological innovation, financial stability, and historical success. HERMES is committed to the continuous development of cutting-edge accessible software solutions for clinical environments, academic institutions and industry partners. HERMES will continue to offer its customers and proSPECTive clients, the most comprehensive Enterprise Molecular Imaging solutions available for diagnosis and treatment planning as healthcare moves into the new frontiers of Precision Medicine.

DISPLAYED BY HERMES™

Historically, nuclear medicine has benefited from excellent software but, rarely on a single platform. One computer is generally used to display a certain type of exam, another to archive the data and, another is used for specific or dedicated applications. This lack of integration and the non-uniformity of components, continues to cause serious workflow obstacles for professionals working in imaging departments.



Lung Lobe Quantification Module



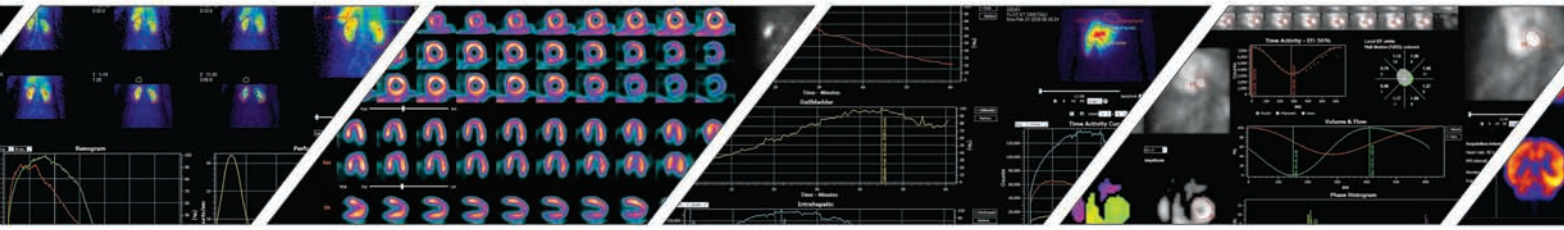
Affinity Viewer - Deep Fusion Technology

With crucial input from customers around the world, nuclear medicine pioneers, the HERMES R&D team has developed Hybrid Viewer PDR™ and Affinity Viewer: A unique and user-friendly software suite for Processing, Display and Reporting (PDR). This all-in-one tool allows the display of all medical imaging modalities (including angiography and ultrasound), image fusion (SPECT-PET-CT-MR) including analysis of this data, processing of conventional nuclear medicine and, the ability to generate medical reports. This technology is used on 6 continents and present in a majority of state-of-the-art NM Departments.

The raw and processed data is stored in a metadata VNA in DICOM, native format, MS-Word™, MS-Excel™, .wav audio files, Adobe PDF™, etc. fully integrating with existing equipment in today's departments under a single master worklist.

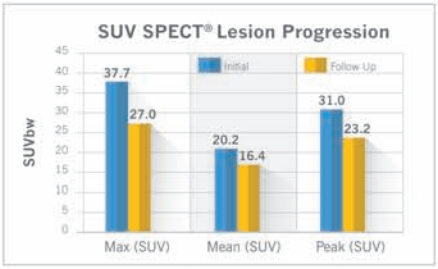
CONNECTED BY HERMES™

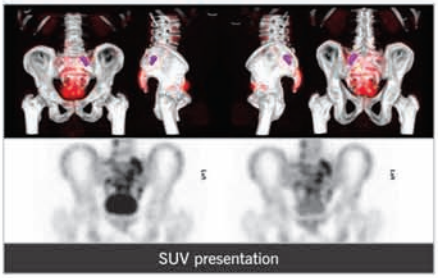
From the early days of nuclear medicine, quantification has been a key aspect; self-defining the practice and at the same time distinguishing from other imaging modalities. The arrival of Positron Emission Tomography (PET and its SUV scale) certainly contributed to advances in the field, but the essence of nuclear medicine still remains the SPECT environment for a vast majority of medical centers. The new breed of cameras coupled with CT components and optimized with advanced reconstruction tools started paving the way for the day when a SUV scale, similar to the one used in PET, would help us quantify images obtained from SPECT-CT scanners. Despite the increasing availability of PET, the number of specific tracers used with this technique is still suboptimal. Absolute SPECT-CT quantification (SUV) is now available and opens the door to a plethora of possibilities with dozens of proven tracers already in use.



RECONSTRUCTED BY HERMES™

The HERMES SUV SPECT® revolutionizes quantitative imaging by exploiting the use of SPECT's full potential in regions where a large portion of the population still does not have access to PET and/or associated reimbursements. HERMES SUV SPECT® software algorithms enable a conversion of the recorded counts per voxel into activity per unit volume with SUV calculations, providing essential and accurate quantitative results.





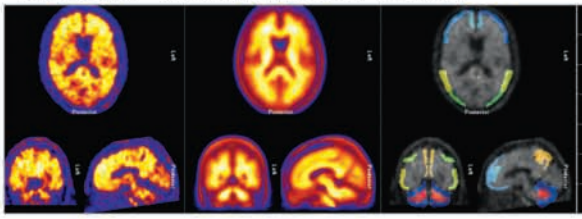
SUV presentation

Combined with attenuation correction from a hybrid SPECT-CT scanner or SPECT-only camera (utilizing an independent CT) and a Monte Carlo-modeled scatter correction, HERMES SUV SPECT® brings SPECT-CT scanners from any manufacturer to the next level.

QUANTIFIED BY HERMES™

Mostly used for teaching purposes or display modelling, 3D applications enable automatic lesions detection or the ability to establish more accurate diagnostics in comparison with still largely used 2D tools. These amazing results can be obtained with the help of advanced segmentation methods especially useful with quantitative pulmonary studies. The Hybrid Viewer™ 3D module proceeds with an automatic co-registration of the SPECT-CT (and separate diagnostic CT if needed), an automatic L/R Lung and airways segmentation, a quick inter-lobar fissure definition, a fissure definition quality control, a lobar ventilation and perfusion quantification and an automatic report generation. Knowing that accurate results can drastically change the optimal surgical approach, comparative studies have been conducted between current 2D techniques (planar anterior image or real anterior reprojection divided in 6 segments) and 3D segmentation techniques. Preliminary results have shown differences ranging between -10% to +48% in the assessment of accurate volume calculation in ml. Similar tools for automatic hepatic and kidney segmentation are now available and will help promoting for a closer collaboration between quantitative imaging and surgical departments.

HERMES BRASS™ Quantification with NeuraCeq™ from Isologic



Region Name	SUVr (Z)
Average SUVr	1.65 (2.13)
L Frontal Ctx	1.52 (2.92)
R Frontal Ctx	1.68 (4.24)
L Ant Cingulate	2.15 (5.50)
R Ant Cingulate	2.31 (5.12)
L Occipital Ctx	1.30 (1.00)

HERMES is extremely proud to participate in high-level research to support healthcare professionals in the detection and treatment follow-up of diseases such as epilepsy, brain tumors, schizophrenia, Parkinson's and most recently Alzheimer's. The market debut of NeuraCeq™, recently approved by Health Canada and commercialized by Isologic, synergizes HERMES efforts in assisting nuclear medicine physicians in university facilities as well as in community hospitals, by providing them with normal templates for a precise and reliable quantification of the patient illness state. This Isologic-HERMES partnership facilitates the utilization of the renown BRASS™ (Brain Registration & Analysis Software Suite) application, appearing in more than 350 scientific publications and presentations around the world and validated with over 2 million patients.

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HERMES VNM™ includes HERMES VNA (Vendor-Neutral Archive) combined with the power of a complete clinical medical imaging platform, tailor-made for multi-vendor sites/multi-facilities integration. HERMES provides cost effective solutions worldwide from enterprise-wide architecture & infrastructure to storage, reading, analysis and processing services on its systems or via HERMES cloud, TeleHERMES™.

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HERMES provides its expertise by employing a solid team, dedicated to quantitative molecular imaging Worldwide. Company offices are located in Sweden, the United Kingdom, China, the United States and Canada.

ENTREVUE AVEC *Kristy Owen*

Kristy Owen, RTNM

À la suite de ses études à la faculté des sciences de University of British Columbia (UBC) de Vancouver au Canada, Madame Owen a obtenu son diplôme du programme de Technologie de médecine nucléaire du British Columbia Institute of Technology (BCIT) en 2006. Enseignante et coordonnatrice clinique à BCIT (faculté des sciences de la santé – médecine nucléaire) depuis plus de 10 ans, elle occupe également divers autres postes. En 2020, elle fut élue à titre de Directrice, membre du conseil d'administration de l'Association Canadienne des Technologues en Radiation Médicale (ACTRM) ainsi que membre ex officio du conseil consultatif de la même association pour la Colombie-Britannique. En juillet 2021, Mme Owen ajoutera le poste de co-responsable du programme de médecine nucléaire de BCIT à son CV.

En plus de sa présence sur de nombreux comités de leadership, publication de plusieurs articles scientifiques et implication dans la communauté de la médecine nucléaire, Kristy fut la récipiendaire de nombreux prix de reconnaissance tel que le Bowers Medical Suppliers Scholarship (BCIT), le BCIT Health Sciences Dr. Joseph Cohen Award for Outstanding Academic Performance, le UBC Entrance Scholarship for Outstanding Academic Performance et le Ministry of Education Provincial Scholarship.

POURQUOI MON TRAVAIL EN MÉDECINE NUCLÉAIRE EST COMME CETTE DESTINATION VACANCES FAVORITE QUE VOUS VOULEZ GARDER SECRÈTE ?

Avez-vous déjà déniché la plus magnifique des destinations vacances ? Parfaitement calme, météo optimale, privée, peu fréquentée, bon prix, disponible au moment idéal ? Si convoitée que vous hésitez à la partager avec vos amis de peur qu'ils ne vous la volent ? C'est ce que je ressens lorsque je pense à ma carrière en médecine nucléaire. Une carrière que je me considère choyée d'avoir trouvée. Avec seulement quelques recherches, je fus intriguée : un mélange de soins aux patients, une technologie de pointe, la science du rayonnement, la physique et le travail de laboratoire. Ce que je n'avais pas réalisé, c'est à quel point une journée dans la vie d'un technologue en médecine nucléaire est excitante, à quel point j'allais acquérir des connaissances en imagerie, à quel point l'avenir serait fascinant pour la détection et le traitement des maladies, comment cela aurait un impact direct sur la santé des patients, combien d'emplois diversifiés il y aurait et à quel point la communauté de la médecine nucléaire est dynamique. Une communauté dont je ferai toujours partie. Je n'avais jamais envisagé que bien des années plus tard, je me sentirais toujours comblée et fière de ma croissance personnelle et professionnelle. Permettez-moi donc de partager mon secret avec vous ...

Les technologues en médecine nucléaire commencent habituellement leur journée dans le « laboratoire chaud (radioactif) » où ils manipulent des produits radiopharmaceutiques (produits pharmaceutiques radioactifs), les testent pour en vérifier la qualité et les préparent à être administrés aux patients. L'immense variété d'études réalisées dans un département de médecine nucléaire peut être attribuée au fait que l'aspect fonctionnel de chaque système de corps humain peut être imagé pour détecter une série de maladies telles que l'infection, l'inflammation, ou le cancer. Au fur et à mesure que les patients arrivent tout au long de la journée, un ou une technologue administrera un traceur radioactif spécifique par voie intraveineuse, sous-cutanée, orale ou par inhalation. Chaque traceur est choisi et créé chimiquement pour mettre en évidence une fonction spécifique du corps des patients et est ensuite visualisé à l'aide d'une caméra hybride. Les caméras hybrides, comme la tomographie par émission monophotonique/tomodensitométrie (TEMP/TDM en français ou SPECT/CT en anglais) et la tomographie par émission de positons (TEP/TDM en français ou PET/CT en anglais), créent des images hautement sensibles et spécifiques qui sont évaluées et examinées de façon approfondie et dans un souci de qualité, par l'œil méticuleux d'un ou d'une technologue. Les technologues sont les experts de ce métier et peuvent souvent reconnaître des changements subtils sur une image avant qu'un médecin ne valide les informations. Cela signifie que le technologue a un impact direct et crucial sur les résultats d'examen et de l'état de santé de chaque patient. Des habiletés marquées de soins au patient

et un niveau élevé d'attention aux détails sont essentiels car les patients peuvent potentiellement être dans un état critique. Afin d'optimiser davantage les résultats pour les patients, les technologues en médecine nucléaire font partie intégrante de l'équipe de soins de santé et travaillent dans un environnement interprofessionnel avec d'autres modalités d'imagerie, des médecins, des infirmières et bien d'autres professionnels de la santé.

La physique des sciences de la radiation est une partie importante de l'ensemble des compétences des technologues en médecine nucléaire. Les rayonnements ionisants, historiquement associés à la peur et à l'hésitation, sont explorés en profondeur dans leur formation. La connaissance et l'éducation dans ce domaine sont primordiaux et les technologues maîtrisent les procédures de sécurité requises pour se protéger et protéger leurs patients. Au cours de leur formation exhaustive, les craintes sont démystifiées et la vérité sur les avantages et les risques associés aux différents types de rayonnement sont clarifiés. Des appareils de mesure personnelle du rayonnement sont portés pour vérifier leur diligence lors de la manipulation des rayonnements ionisants. La sécurité des patients, sous tous les aspects, est leur responsabilité et ils en sont perpétuellement responsables. Le rayonnement en médecine nucléaire est essentiel et sauve des vies tous les jours !

La médecine nucléaire va de l'avant à un rythme incroyable grâce à l'avancement de l'équipement technologique et le développement de nouveaux radiotraceurs. Les caméras hybrides ont apporté la capacité de parfaitement localiser les changements fonctionnels au niveau cellulaire dans le corps, la détection précoces des maladies, et ce avec précision et acuité. La technologie TEP/TDM, axée principalement sur l'oncologie, a eu un impact majeur sur les résultats de millions de patients atteints de cancer. Les nouveaux radiotraceurs TEP peuvent évaluer le cancer du sein et de la prostate ainsi que de nouveaux traceurs neurologiques de TEP qui peuvent diagnostiquer la maladie de Parkinson, la maladie d'Alzheimer et l'ENC (encéphalopathie traumatique chronique). La théranostique, véritable révolution en médecine nucléaire, ouvre de nouvelles voies pour des diagnostics et des traitements ciblés du cancer. La recherche dans ces domaines est continuelle et abondante. Les caméras TEP/TDM et TEMP/TDM surgissent partout au Canada générant un besoin criant de technologues pour les utiliser.

Après avoir obtenu votre diplôme d'une école accréditée et réussi un examen de certification, vous devenez technologue certifié en médecine nucléaire. Alors que plusieurs prennent leur retraite dans ce même rôle, la possibilité d'une variété de carrières vous attend. Au sein de mon réseau, des collègues technologues ont reçu une formation croisée pour effectuer d'autres procédures d'imagerie diagnostique comme la TDM, l'IRM et l'échographie. Certains sont passés à l'industrie et travaillent pour des fournisseurs d'équipements et de logiciels, des sociétés d'accréditation ou des organismes de réglementation. D'autres sont devenus gestionnaires, responsables de la pratique, enseignants, doyens, opérateurs de cyclotrons ou agents de radioprotection. Certains ont quitté le Canada pour travailler à l'échelle internationale. Fait intéressant, les technologues formés au Canada sont reconnus et très recherchés à l'échelle mondiale pour leur niveau de formation élevé. Trouver une niche dans cette industrie qui vous captive est non seulement gratifiant, mais aussi tout à fait accessible.

Qu'est-ce qui fait que tant de gens restent dans le domaine de la médecine nucléaire ? Eh bien, dans mon cœur, je crois que c'est la communauté que nous avons créée. À l'échelle provinciale, nationale et internationale, il y a un sentiment d'inclusivité et de lien entre les diplômés en médecine nucléaire de tous les niveaux. J'ai été directement témoin de la passion, de la sensibilisation, de la promotion et de la fierté de notre discipline lors d'événements partout dans le monde. En tant qu'enseignante au Programme de médecine nucléaire du British Columbia Institute of Technology – BCIT (l'Institut de technologie de la Colombie-Britannique) et Directrice, membre du conseil d'administration de l'Association Canadienne des Technologues en Radiation Médicale (ACTRM), mobiliser les nouveaux membres de ce domaine en pleine croissance et de cette communauté florissante est quelque chose dont je suis extrêmement fière. Attirer les futurs diplômés dès le début en les présentant aux principaux partenaires et intervenants leur offre de belles occasions d'établir des liens. Qu'il s'agisse de bénévolat, de participation à des conférences ou tout simplement partager l'excitation autour des innovations de la médecine nucléaire, ces nouveaux diplômés sont déjà investis dans notre communauté. Dans cette industrie, les gens se sentent connectés, et quand ils se sentent connectés à quelque chose de plus grand, cela leur donne un sentiment d'appartenance. Je crois que c'est ce sentiment d'appartenance qui crée une telle satisfaction au travail.

Que vous débutiez en tant que nouveau diplômé ou que vous soyez dans le domaine depuis des décennies, la médecine nucléaire offre des possibilités illimitées d'apprendre et d'explorer. Trouvez ce créneau parfait. Connectez-vous à d'autres personnes. Faites cette différence. Bien qu'aucune carrière ne puisse remplacer la destination vacances de vos rêves, si belle et parfaite, je peux vous assurer que cette discipline est précieuse et essentielle. La science fascinante, la technologie impressionnante, l'optimisation des soins aux patients et les résultats des traitements, le travail dans un milieu multidisciplinaire en constante évolution ne sont que quelques-unes des raisons pour lesquelles j'ai pu apprécier à quel point cette carrière m'a apporté une telle satisfaction personnelle jusqu'ici. ■

DR. LIZETTE LOUW

In the 20th century it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist/nuclear medicine/technologist/scientist/nurse/nurse practitioner in the US?

There has been a gradual increase in the awareness of the value and qualities that female leaders bring to the table, which men cannot. With this awareness, there has been an increase in the support offered to women by men in positions of power, as well as more public acknowledgement of women's success. It is a very slow process to change cultural perceptions on the roles (and limitations) of females in the workplace, but every small victory is a step forward.

It has been difficult for me, especially on an emotional level. It has often been very demotivating to experience resistance to my growth and success from within my own community and even my own department. It made me realize how deep the subconscious bias lies with regards to female roles and behaviour. This sparked my passion in advocating for women in healthcare.

I became president of our national nuclear medicine society within five years of qualifying and connected with several international leaders in the process. Those connections and the support and encouragement they offered me on a personal level enabled me to branch out onto the international playing field to where I am today – the president elect of the World Federation of Nuclear Medicine and Molecular Biology (WFNMB).

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

Not much is written about her personality, so it's difficult to postulate. She had a very supportive husband, who insisted that she be acknowledged and accredited for her own work. I have often experienced that I can accomplish more if there is a male voice speaking up for me, or vouching for me. My dream is that we can continue to evolve to a point in time where a woman can accomplish her goals and be recognized for them without the additional voice of a supportive male figure.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

You will have to work hard to accomplish success, and then you will have to continue working hard to maintain what you managed to accomplish. It's not easy, but it is incredibly rewarding. Just keep going – it is the collective impact of your daily efforts and actions that pays off.

Dr. Lizette Louw
Nuclear Physician,
Netcare LINKSfield Hospital PET-CT,
South Africa

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

I hope to see more collaboration in the medical imaging field. Not only collaboration between radiology and nuclear medicine, but also between imaging specialists and clinicians. That is the only way we can move forward and achieve true "patient centered care". It is well known that women are good at mediation, collaboration and establishing personal connections. It will be to the advantage of all to tap into these inherent qualities to achieve better interdisciplinary collaboration and ultimately better patient care and outcomes.

What is your recipe to balance a very active professional career and a happy and thriving family life?

My approach in life is to do every single task that comes my way to the best of my ability, no matter how big or small. It sounds so simple, but looking back over my journey I can see where small tasks ended up being the foundation for bigger and better things.

I apply the same principles in my personal life as well. Maintaining a balance as a single working mom is not always easy and I find myself constantly prioritizing and re-prioritizing as I go through my day. Multitasking skills are essential, and I could not achieve my career goals without the love and support of my children. Coming home to a hug and a cuddle makes up for anything bad that happened at work! ■

INTERVIEW WITH MEGAN BRYDON

Nuclear medicine technology is a fascinating and evolving profession. I think the breadth of the modality entices individuals with a passion for a dynamic (pun?) work environment. There are so many areas of expertise from radiopharmacy, patient care, quality, research, to radiation protection and applications/post-processing, that nuclear medicine technologists can really carve out a niche in their respective departments.

Skilled in adapting our work to meet both patient needs as well as ensuring first-class image quality and diagnostic product, while maintaining the principles of ALARA means that nuclear medicine technologists are adept at juggling demands and interests.

Personally, this aspect of my experience as nuclear medicine technologists helped form the basis of my leadership identity. Actively triaging and working to get the best possible outcome with limited resources or challenging conditions (15 years of working in a pediatric facility makes for some creative problem solving), are skills that apply not only clinically, but in the leadership realm as well.

The catch is that the foundation of these skills (complex troubleshooting, diligence etc) also translate well to other career opportunities. We see nuclear medicine technologists easily transition to management and leadership positions, become educators or researchers, working as senior policy analysts in government and executive directors of health networks, as well as becoming key players in industry and nuclear safety organizations.

Working at the intersection of technology and care has spurred my research interest about the empathy, compassion and resilience of medical radiation technologists (MRTs). Recently my team completed an integrative review of the role of Virtual Reality in eliciting empathy in carers. We're currently investigating the relationship between intrapersonal traits (empathy, compassion, and resilience) and willingness of MRTs to work during pandemic.

With molecular imaging and treatment, and some impressive new(er) cyclotron produced isotopes, the future of nuclear medicine in highly personalized medicine is very bright. ■

Megan Brydon MSc, BHSc, RTNM, MRT(N)
PACS Application Specialist, IWK Health Centre Nova Scotia;
President-elect for Canadian Association Medical Radiation Technologists (CAMRT)

CAMRT ACTRM

INTERVIEW WITH HEATHER CHALMERS

Heather Chalmers is the President and Chief Executive Officer for GE Canada, and President for GE Healthcare Canada. The world's foremost Digital Industrial company, GE Canada has produced industrial solutions for over 129 years and employs thousands of Canadians across multiple sectors.

Heather Chalmers is passionately committed to leading businesses that consistently deliver Canadian innovation and outcomes to customers in Canada and globally.

As of 2018, Heather leads GE Canada as they work to serve customer needs in the Aviation, Healthcare, Power and Renewable Energy Sectors. She heads GE businesses that partner with business and government leaders to reposition the Canadian economy for the future with a focus on climate change, digital, AI and Additive Manufacturing.

Throughout her extensive 25-year career with GE, Heather has consistently developed and led high performing teams that are industry leaders in bringing innovative technology and digital solutions to solve complex challenges in both Canadian and global markets.

Heather first joined GE Plastics where she took on multiple commercial roles. In 2007 she took a leadership role at GE Healthcare and was promoted to President of the Healthcare business in 2014.

She holds a Chemical Engineering degree from Queens University, an MBA from the Rotman School of Business and is a director on the C.D. Howe Institute Board, Business Council of Canada Board, Ontario Brain Institute Board and St. Elizabeth Health Foundation Board. She is also member of the Rotman School of Management's Healthcare and Life Sciences Advisory Council and is part of the GTA United Way Cabinet and former Director of the Medtech Canada Board.

Heather Chalmers
President & CEO, GE Canada President, GE Healthcare Canada

You are the President and CEO, GE Canada; President, GE Healthcare Canada. Could you give us a little glimpse of your background before becoming the President and CEO?

• First, it is my pleasure and honour to be part of the discussion today. Nuclear medicine is critical to the efficacy of our healthcare systems in Canada and this will help raise the awareness of its value in improving the lives of patients.

• For those who may not be aware, GE in Canada is focused on the Energy Transition, Precision Healthcare, and the Future of Flight. A Chemical engineer by training, I've had the privilege of working for GE for over 26 years in our former Plastics business, Healthcare, and now as CEO of GE Canada.

• Our goal is to invent technologies and solutions that help transform lives. It's a pretty special company.

What have been the three most important changes that you have seen in the field of Nuclear Medicine over the last five years?

Normally we talk about technology first, but Covid has exposed the fragility of our incredible health human resources. With that in mind, I'm going to start on the changes that help make their lives easier.

1 - Greater focus on Operator Workflow. Nuclear Medicine has long depended on its operators to deliver quality care to patients. But as healthcare systems ask more of them, our equipment must also take some of the work off their plate. Especially important within Nuclear Medicine where we have hybrid scanners, incorporating SPECT or PET functional imaging with CT anatomical imaging in one system, and one exam. The technology incorporated in the systems today make it possible for clinical teams to image more patients, more effectively, and provide a more comfortable, patient focused environment.

2 - Digital Detector Technology in PET and SPECT. The advancement in Digital Detector Technology with today's PET/CT and SPECT/CT systems are being widely adopted in Canada. Analog equipment is more vulnerable to noise, and in Nuclear Medicine imaging, noise typically requires more time or more dose to ensure good image quality. Today's digital–

based scanners are reducing exam times for higher throughput and departmental productivity. This helps to reduce wait times and increases access to critical diagnostic procedures to more patients. Today's scanners can also increase diagnostic confidence and help enable physicians to see disease earlier and more accurately.

3 - Artificial Intelligence – Our customers are some of the most talented clinicians in the world, but everyone benefits from a helping hand. AI is being incorporated into almost every step of the imaging process. AI based tools help ensure optimized and consistent protocoling and patient positioning for faster procedures and more consistent results. They improve the quality and diagnostic accuracy of the image data. Complex processing and time-consuming data analysis can now be done in moments, significantly expanding the scope of what's possible with "routine" imaging.

How and in what extent has GE been involved in this evolution of Nuclear Medicine

We are proud to share that GE has been an innovator in many of the advances that clinicians have demanded in Nuclear Medicine for many years, and that continues today.

• Introduced Hybrid Imaging over 20 years ago by adding CT to our functional imaging scanners (SPECT/CT and PET/CT). Hybrid imaging helps increase diagnostic confidence with accurate anatomical localization of the functional data from SPECT and PET.

• First to bring Digital CZT (Cadmium Zinc Telluride) detector technology to general purpose Nuclear Medicine systems, enabling exceptional resolution, which is an important factor in helping physicians detect diseases at an earlier stage.

• GE is taking a comprehensive, wing to wing approach in supporting Molecular Medicine. The relationship between radiochemistry (imaging agents) and Nuclear Medicine technology is symbiotic. As new agents are developed, technology needs to evolve to support their full potential.

• GE Healthcare contributes to every aspect of the Molecular Imaging pathway. This allows us to recognize and invest in key areas for innovation much earlier and throughout the entire chain.

How do you see the field of Nuclear Medicine evolving during the next five years and what could be the contribution of GE?

• The initial phase of leveraging innovation is typically focused on doing what we've done before, but better and faster. We're excited to see the transition beginning to the next phase, where people are exploring new frontiers on not only detecting disease but treating it more effectively.

• Theranostics, the use of Nuclear Medicine to diagnose, monitor, and treat disease, will be an exciting place to be for years to come and we look forward to collaborating with innovative clinicians to help advance patient care in this and other spaces.

• GE is involved in many areas that help bring the promise of Theranostics to routine clinical practice– Hardware and software development, AI and Deep Learning based innovations, in every aspect of Radiopharmaceutical development and production, imaging technologies, and advanced data analytics.

As President and CEO, what is your greatest wish for the specialty of Nuclear Medicine?

• Advancements in Nuclear Medicine are driven by the latest radiopharmaceutical innovations in combination with the technology advancements discussed earlier. Unfortunately, many of the radiopharmaceutical innovations do not make it past the research applications to routine commercialization or patient access, mainly due to a challenging reimbursement landscape.

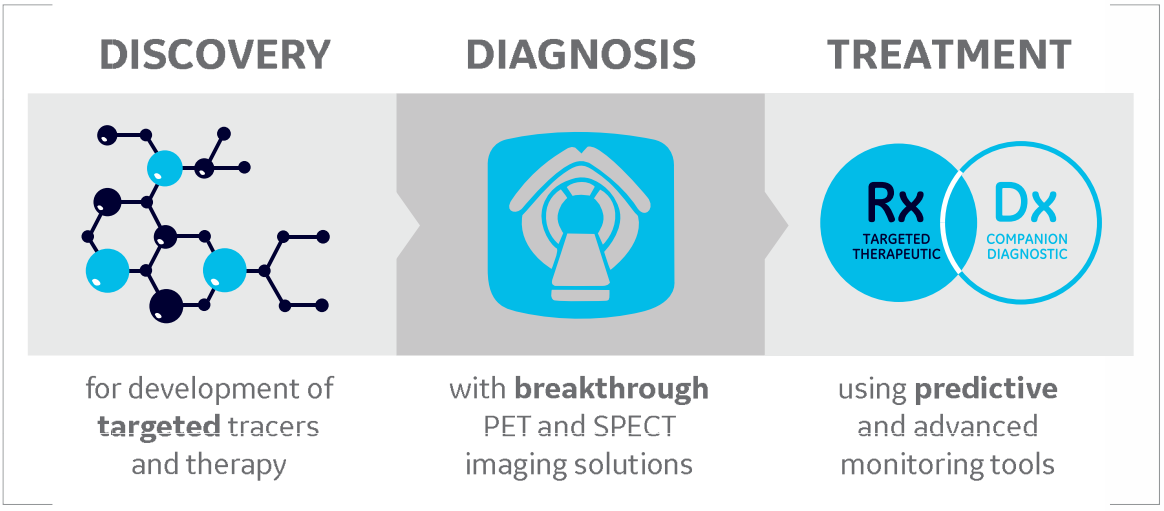
• GE Healthcare has a rich pipeline in molecular imaging. However, there is a risk that access will be delayed if the reimbursement models do not account for the investments in innovations.

• DaTscanTM ([123I]ioflupane) is one of our most recent examples. A radiopharmaceutical product which demonstrates its value in helping neurologists better differentiate between Parkinsonian Syndrome and essential tremor across a subset of patients with complex or unclear clinical presentations. There are inequalities to accessing this exam across the provinces and territories in Canada, with some regions making the exam available and then those that limit or do not offer the exam at all, despite clinical demand from the referring community.

• My wish for the nuclear medicine community is to have unhindered access to approved radiopharmaceuticals, as it not only offers a clear pathway to early diagnosis and patient management, but also the significant potential to further elevate the value of nuclear medicine across the medical field.

• And finally, circling back to my first point about human healthcare resources, we need the best and brightest minds going into Nuclear Medicine. Anything we can do to raise awareness and encourage new students to enter this field will have a direct impact on the lives of patients in Canada.

Connecting Every Step in Molecular Medicine



We are focused on core challenges

At GE Healthcare we believe we can uniquely help connect the teams, data, and decisions in every step from discovery to diagnosis to treatment with intelligently efficient innovations that will ultimately help you deliver precise, personalized care. This is our vision.

There is so much data available across molecular imaging today. There are so many connection opportunities and loops to close. That's where we see significant opportunity. And we believe we're in a unique position to fulfill this vision because we are the only vendor with pharmaceutical diagnostics, cyclotrons, chemistry synthesis, PET/CT, SPECT/CT, advanced digital solutions and pharma partnerships to cover the breadth of steps from discovery to treatment.

Please contact your local GE Healthcare representative to learn more or visit gehealthcare.ca

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INTERVIEW WITH LYNDAL WALKER

Lyndal Walker
President & General Manager – AAA Canada

Could you give us a glimpse into your background before becoming the President and General Manager of AAA Canada?

Certainly, but first thank you for this opportunity to present information about the work of Advanced Accelerator Applications, AAA Canada, to the readers of e-Patient. This publication does important work to help educate patients and stakeholders about the value and potential of nuclear medicine both for the diagnosis and treatment of serious conditions, including cancer.

When I first became involved in the pharmaceutical and medical devices industry, I started as a clinical research associate and moved through various sales, marketing, and executive positions with companies large and small, in Canada and internationally. It's now been more than 25 years and the experiences as well as the people I have worked with throughout my career have helped shape my outlook, business approach and leadership style.

I believe in personal development no matter what stage you are at in your career. To stay current and gain new perspective I recently pursued a master's certificate in global business management from INSEAD in France.

It's been almost three years since I joined AAA Canada. It was a very busy and exciting time for the company as we were preparing to launch our first product in Canada.

What have been the three most important changes you have seen in the field of nuclear medicine over the last five years?

Since I started working in this field, there have been tremendous advances in nuclear medicine technology that bring value and hope for patients in Canada and around the world.

The first of the three changes I would like to highlight is the introduction of new nuclear cancer therapies. New therapies, with the advanced technology they represent, show how a new generation of nuclear therapies will be able to have an important positive impact on patients. It's vital that we continue to travel this road of making innovation broadly available to Canadians in a timely fashion.

The second is the development of new diagnostic tools with innovative technology supporting a more accurate diagnosis and staging of cancers and a more tailored treatment plan.

Overall, these innovations are part of the growing new technology of theranostics, combining diagnostic technologies with therapeutic applications. I'm sure we'll see this area grow in importance and continue to advance as our technological understanding keeps moving forward.

The third most important change is one I would like to see happen, - improvement in access for Canadian patients to the latest innovations in nuclear medicine. At present there are striking inequities in access to nuclear medicine services to patients in different provinces and also between

Canada and other advanced nations internationally to support the expansion of nuclear medicine advances.

A recent report by the Canadian Agency for Drugs and Technology in Health (CADTH) showed that Canada is lagging badly in medical imaging, ranking in the bottom third of all countries in the Organisation for Economic Cooperation and Development (OECD) in the number of magnetic resonance imaging (MRI) machines and positron emission tomography-computed tomography (PET-CT) scanners and in the bottom quarter of countries for CT scanners. For the number MRI, PET-CT and CT scans given per population, Canada ranks only around or below the midpoint.[1]

Canada can do much better. There is significant room for improvement to ensure all Canadians can access leading innovation in nuclear medicine. I hope the next few years we will see that happen.

How and in what extent was AAA involved in this evolution of nuclear medicine?

AAA was founded 20 years ago to focus exclusively on developing innovations in nuclear medicine and has pioneered important advances in the field. We are living up to our core mission to reimagine nuclear medicine to transform patients' lives.

In Canada, AAA has been working in partnership with key nuclear medicine associations and treatment centres to bring attention to their vital work and the need to ensure all Canadians have equal access to the benefits of theranostics treatment.

This is particularly important for patients for which treatment options in the past have been limited if initial therapy fails. We want to ensure all Canadians can benefit from the hope that having access to innovative alternative therapies can bring.

It has been a great privilege for all of us at AAA in Canada to work closely with, and learn from, the people who are the true heroes of nuclear medicine – the expert doctors, the skilled technicians and invaluable nurses who make the patient's journey possible and fill it with hope.

How do you see the field of nuclear medicine evolving in the next five years and what role could AAA play?

The next five years hold huge promise for the further growth of nuclear medicine into the mainstream of diagnostics and therapeutics in the oncology space. Our plan is to continue to lead innovation in this area.

It is vital to expand knowledge of the capabilities and benefits of nuclear medicine both within the health system and among government leaders and patients to reimagine the role of nuclear medicine across Canada. We will continue to invest in R&D and our ambition is to further unlock the potential of nuclear medicine through clinical trials of new imaging agents and therapeutics. The scientific data that are generated will drive future treatment options and decisions for patients.

We recognize that clinical experts across the country need help to access the resources needed in their institutions so that nuclear medicine can play a larger role in cancer diagnosis and therapy. We are committed to supporting nuclear medicine specialists across Canada to deliver practice-changing technology and continuing to generate scientific evidence to advance nuclear medicine solutions for Canadians.

We look forward to seeing understanding of and access to nuclear medicine and theranostics grow across Canada in the years ahead.

In your role as President and General Manager at AAA Canada, what is your greatest wish for the speciality of nuclear medicine?

My greatest wish is for nuclear medicine to become an even more of a vital element in the options being considered for patient care in oncology, and for theranostic options to be expanded to other cancers and available to patients who need them. In an ideal world, we would upscale equipment and have more trained technicians which would reduce wait times for patients who need urgent access to PET scanners.

I am exceptionally proud to work alongside a team of hands-on individuals truly committed to the company's work and to making a difference for patients across Canada and around the world. Amazing things have happened in just a short time, so the future is promising, as is our technology. AAA is committed to the journey.

[1]Canadian Agency for Drugs and Technology in Health, The Canadian Medical Imaging Inventory 2019-20, January 2021, Executive Summary, p 17-19

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