

Growth in Comparative Imaging Reflects Search for Optimal Modalities

NUCLEAR MEDICINE COMMUNITY PLAYS EXPANDING ROLE IN RSNA ANNUAL MEETING

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Nuclear medicine once again made its voice heard at the Scientific Assembly and Annual Meeting of the Radiological Society of North America (RSNA), and that voice has grown progressively louder in recent years.

Held last November in Chicago, IL, the 71st RSNA annual meeting included papers on radionuclide planar imaging, single-photon emission computed tomography (SPECT), positron emission computed tomography (PET), dual-photon absorptiometry, and radiolabeled antibodies.



Heidi S. Wiessmann, MD, associate professor of nuclear medicine at the Albert Einstein College of Medicine in the Bronx, NY, is also chairman of the SNM Correlative Imaging Council.

According to Heidi S. Wiessmann, MD, chairman of the RSNA Nuclear Medicine Program Committee, however, more scientific paper submissions are needed from the nuclear medicine community. There were 29,600 people attending the 1985 RSNA meeting, noted Dr. Wiessmann, many of whom do not attend The Society of Nuclear Medicine's (SNM) annual meeting although their daily work may include nuclear medicine procedures.

“Some of these individuals may believe that there is no future in nuclear medicine if we don't show them the benefits of radionuclide studies, and the recent clinical advances, including the more sophisticated modalities such as SPECT and PET, with scientific presentations of the highest quality,” said Dr. Wiessmann, who is also associate professor of nuclear medicine at the Albert Einstein College of Medicine and Montefiore Medical Center in the Bronx, NY.

If nuclear medicine investigators present their research only at the SNM meeting, “if we only talk to each other,” many radiologists will not understand how nuclear medicine relates to radiography, X-ray computed tomography (CT), nuclear magnetic resonance (NMR), and

ultrasound, she added.

Philip O. Alderson, MD, director of the Department of Nuclear Medicine at Columbia-Presbyterian Medical Center in New York, noted that the RSNA has the largest attendance of imagers in the world at its annual meeting. “This forum offers a valuable opportunity to present nuclear medicine in a favorable light, and it's to our advantage to put our best foot forward at the RSNA meeting with high quality nuclear medicine submissions,” said Dr. Alderson, who is

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Dr. Weissmann pointed out that the RSNA, in seeking to encourage nuclear medicine participation at the annual meeting, has enabled the number of scientific sessions to increase commensurate with the rise in the number of abstract submissions. As a result, the committee has been able to accept most, if not all, abstracts of scientific merit, “and all indications are that this will continue,” she added. She also urged nuclear medicine scientists, physicians, and technologists not to view the RSNA and SNM meetings as competitive since they reach different audiences.

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The RSNA is including nuclear procedures in its view of the future practice of radiology, as indicated by its first RSNA Fellowship Grant Awards. (The RSNA announced a

new \$1 million RSNA Research and Education Fund last October, which will award fellowships for the purpose of enhancing the scientific and educational base for radiology practice.)

Scott F. Rosebrough, PhD, a 28-year-old graduate research assistant in the Department of Pharmacology at Upstate Medical Center in Syracuse, NY, was awarded a research fellowship for his project on radioimmunoimaging of venous thrombi. Dr. Rosebrough was nominated by John G. McAfee, MD, director of the Division of Radiological Sciences at Upstate, and will conduct his investigation in the Division of Nuclear Medicine at the State University Hospital of Syracuse.

The goal of Dr. Rosebrough's project is to develop a radiopharmaceutical agent for localizing thrombi and thromboemboli by scintillation imaging, based on his work with a fibrin-avid monoclonal antibody labeled with iodine-131. In an effort to reduce the high level of blood pool background radioactivity inherent in the use of that agent, Dr. Rosebrough plans to generate monoclonal antibody fragments that have a shorter survival in the circulation, which will increase the target-to-background ratio and should result in clearer images, explained Robert E. Campbell, MD, a trustee of the RSNA Research and Education Fund. Other radionuclides, such as technetium-99m and indium-111, will be tested as possible labels, and “ultimately, Dr. Rosebrough anticipates that this technique will represent an adjunct to venography as the imaging ‘gold standard’ for thrombus detection,” said Dr. Campbell.

The second grant was awarded to Evan K. Fram, MD, a resident in the Department of Radiology at Duke University Medical Center in Durham, NC, for a project to integrate NMR imaging and spectroscopy in the study of cerebral disease. Dr.

Fram also plans to characterize the spectroscopic changes associated with a number of cerebral pathologies, including ischemia, tumors, and degenerative diseases, and to collect data to evaluate the clinical use of the integrated spectroscopic and imaging exam.

The 1985 RSNA meeting also paid tribute to William R. Eyler, MD, editor of *Radiology* from 1966–1985. Dr. Eyler, who was chairman of the Department of Diagnostic Radiology at the Henry Ford Hospital in Detroit from 1955–1966, is also board-certified in nuclear medicine. He has published over 100 scientific papers, including several on nuclear medicine investigations. In the 1960s, Dr. Eyler published work on mercury-203 brain scanning, radionuclide evaluation of jaundiced patients, and technetium-99m pertechnetate scanning of salivary glands. Dr. Eyler is now editor emeritus of *Radiology*.

Increase in Nuclear Papers

Since 1980, the number of nuclear medicine papers presented at the RSNA meeting has increased from about 30 to 65. The number of scientific exhibits covering nuclear medicine has declined, however, from 24 out of a total of 324 exhibits in 1980 and 23 of 506 in 1981 to 14 of 614 in 1984 and 13 of 644 in 1985.

At the 1985 RSNA meeting, seven of the approximately 120 cardiovascular papers, and six of approximately 100 central nervous system papers, involved radionuclide studies. Of approximately 100 bone studies, 10 involved nuclear procedures, including two on dual-photon absorptiometry.

Ten of approximately 200 oncology papers entailed nuclear medicine studies, and one of about 70 therapeutic papers was on radionuclide therapy. About 15 of 160 in the gastrointestinal, liver, spleen, biliary, and genitourinary category dealt with nuclear medicine procedures, as did

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seven of the approximately 50 pulmonary papers.

NMR Overtakes CT

The 1985 RSNA program offered a total of 813 scientific papers, including about 200 on NMR (imaging and spectroscopy), 120 on CT, and 60 on ultrasound. (The remaining abstracts covered plain film radiography, radiation therapy, angiography, digital-subtraction angiography (DSA), angioplasty, biopsy, fluoroscopy, xeroradiography, and thermography.)

The numbers of abstracts on the various modalities have shifted significantly over the past six years, reflecting the growth of NMR, ultrasound, and CT. In 1980, the RSNA meeting presented about 80 papers on CT, about 40 on ultrasound, one on NMR, two scientific exhibits on SPECT, and no abstracts on PET. From 1981 to 1984, the numbers of papers on these technologies ranged

from 90-130 for CT, 45-65 for ultrasound, 12-150 on NMR, 2-12 on SPECT, and 0-2 on PET.

Studies that compared two or more diagnostic modalities for one clinical application increased dramatically in the same period, from 15 (with six involving radionuclide procedures) in 1980 to 125 (with 18 involving radionuclide procedures) in 1985. A handful of 1985 abstracts were also correlative imaging studies.

According to Helen C. Redman, MD, chairman of the RSNA Program Committee, "Studies based solely on a single technology are generally less interesting than comparison studies of several modalities." (1)

Nuclear Medicine Sessions

Papers on neurologic nuclear medicine imaging covered SPECT imaging of regional cerebral blood flow in patients with Alzheimer's disease and dementia, using iodine-123 *N*-isopropyl *p*-iodoamphetamine (IMP),

xenon-133, and iodine-123 *N,N,N'*-trimethyl-*N'*-(2-hydroxy-3-methyl-5-iodobenzyl 1, 3-propanediamine (HIPDm) enhanced with acetazolamide, as well as PET imaging of mu opiate receptors with carbon-11 carfentanil. There was also a comparison of NMR, SPECT, and CT in the detection and quantification of cerebrovascular disease.

A physics session on SPECT included papers on cone-beam collimation to improve data acquisition geometry, and three-dimensional reconstruction with cone-beam geometry. In addition, investigators presented an evaluation of backprojection algorithms used in SPECT, and of the effects of aliasing on the image noise-power spectrum.

Seven papers were presented in a session on gastrointestinal imaging, including the significance of delayed gallbladder visualization in technetium-99m iminodiacetic acid (IDA)

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Number of Scientific Papers Presented at RSNA Annual Meetings

	1980	1981	1982	1983	1984	1985
Total	392	432	520	640	813	813
Nuclear medicine*	30	40	30	35	85	65
Nuclear magnetic resonance (NMR)* (includes imaging and spectroscopy)	1	10	30	90	150	200
X-ray computed tomography (CT)*	80	90	100	115	130	125
Ultrasound*	40	45	50	55	60	60
Comparative studies, one or more modalities (radionuclide studies compared to other modalities)	15 6	15 3	20 3	50 19	90 23	125 18
Heart, cardiovascular (radionuclide studies)	80 11	75 7	90 8	80 8	100 10	120 7
Brain, central nervous system (radionuclide studies)	45 1	50 3	40 3	70 0	90 3	100 6
Gastrointestinal, liver, spleen, renal, hepatobiliary, genitourinary (radionuclide studies)	70 9	85 11	85 8	180 7	170 10	160 13
Lung, pulmonary (radionuclide studies)	20 2	30 7	30 2	35 4	60 9	50 7
Bone, orthopedic (radionuclide studies)	30 4	30 2	45 5	55 8	70 6	100 10
Oncologic (radionuclide studies, diagnostic (radionuclide therapy)	50 3 1	75 6 1	55 2 0	110 7 1	155 9 2	185 10 1

*does not include comparative studies between this modality and other technologies

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cholescintigraphy, and the use of technetium-99m *N*-pyridoxyl 5-methyltryptophan (PMT), with computer analysis, in diffuse liver disease. There were also papers on the extrahepatic uptake of technetium-99m phytate as a prognostic index in patients with cirrhosis, and an evaluation of technetium-99m diethylenetriaminepentaacetic acid (DTPA) to locate acute gastrointestinal tract bleeding.

In a session on radiolabeled antibodies, with five presentations, investigators presented initial clinical experience with indium-111 antimelanoma IgG2a murine monoclonal antibody (MoAb), and the use of an iodine-131 IgG1 MoAb in human lung adenocarcinoma. There was also an assessment of the feasibility of dual-radiopharmaceutical MoAb imaging to control for nonspecific localization, using indium-111 reactive and gallium-67 nonreactive IgG1 murine MoAb administered simultaneously to mice bearing human melanoma implants.

A nuclear cardiology session with seven papers covered initial clinical experience with technetium-99m *t*-butylisonitrile (TBI) to image myocardial blood flow. The session also

included comparative studies of indium-111 platelet scintigraphy and two-dimensional echocardiography in the detection of left ventricular thrombi, and of stress thallium-201 imaging and stress radionuclide angiography in the diagnosis of coronary artery disease.

In addition to the scientific papers, 11 nuclear medicine works in progress were presented, including a comparison of NMR imaging, ultrasound, and blood pool scanning using technetium-99m-labeled red blood cells (RBC). One group described a technique to locate gastrointestinal bleeding, using radiolabeled RBCs and a small scintillation probe during exploratory surgery, in patients with inconclusive results from noninvasive localization tests. There was also a presentation on PET imaging in radioiodine dosimetry of the thyroid.

Aside from the scientific portion at the RSNA meeting, over 400 commercial exhibitors were represented, including many manufacturers of nuclear medicine products.

For the first time since the late 1970s, the RSNA program in 1985 offered a categorical course in nuclear medicine, which covered 19 topics. A 232-page syllabus, edited by Steven

M. Pinsky, MD, with associate editors Philip O. Alderson, MD, and Robert J. Wilson, PhD, was published for the program. (Each year the RSNA chooses subjects for a categorical course, which is a systematic and thorough presentation of one modality, as opposed to refresher courses that cover random topics.)

Unifying Principles

Since 1982, Christopher C. Kuni, MD, a radiologist at the St. Paul-Ramsey Medical Center in Minnesota, and William R. Hendee, PhD, vice president of Science and Technology for the American Medical Association (AMA) and a past president of the SNM, have taught a refresher course, “Unifying Principles of Medical Imaging,” annually at the RSNA meetings.

“The addition of new imaging modalities to diagnostic radiology is accompanied by the expectation that radiologists and physicists will assimilate the physical principles and operational characteristics of these modalities without difficulty,” said Drs. Hendee and Kuni.

“This expectation has become a bit impractical, at least if the physical principles of radiologic imaging procedures continue to be presented in the traditional manner. A new teaching approach is needed that reveals unifying concepts among different methods of radiologic imaging and illustrates these concepts by clinical examples,” they added.

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