Medical Societies Seek Medicare Reform Collaboration

In a February 25 letter, SNMMI and almost 100 other major U.S. medical professional societies asked leaders of key Congressional committees to "immediately initiate formal proceedings (hearing, roundtables, expert panels, etc.) to discuss potential reforms to the Medicare physician payment system to ensure continued beneficiary access to care." The professional societies represent more than 1 million physician and nonphysician health care clinicians.

Although the letter's signatories noted with appreciation Congress's efforts over several years to mitigate scheduled cuts to the Medicare Physician Fee Schedule (MPFS), they cited systemic issues, including the negative impact of the MPFS budget neutrality requirements and the lack of an annual inflationary update, as factors that will "continue to generate significant instability for health care clinicians moving forward, threatening beneficiary access to essential health care services." Ongoing COVID-19 issues were noted as compounding these difficulties.

The group cited challenges associated with the Medicare Access and CHIP Reauthorization Act's (MACRA) Quality Payment Program (QPP) as "preventing most clinicians from meaningfully participating in the program." As an example, nonphysician clinicians have not been fully integrated into the Merit-Based Incentive Payment System (MIPS), because most are ineligible to report the cost and interoperability promotion measures that account for 55% of MIPS scoring. In addition, incentive payments "have also been historically low, far below the 9% Congress intended, rendering them an ineffective mechanism to offset the reductions required by budget neutrality." One focus of proposed collaboration would be improving MIPS and Alternative Payment Models (APMs), including extending current incentives for participating in Advanced APMs. "Under the current payment system, many health care clinicians continue to face steep annual reductions in their Medicare payments," the letter continued. "The inherent instability of the MPFS, coupled with the shortcomings of MACRA's QPP, has created an environment where many practices have seen their payments decrease year-over-year, despite increasing costs and growing inflation."

AMA Focuses on Permanent Medicare Pay System Fixes

On the same day, the American Medical Association (AMA), one of the professional groups signing the letter to Congress, highlighted the key points of a recent AMA Advocacy Insights webinar identifying 3 main efforts for the coming year. These efforts, also featured at the AMA Medical Student Advocacy Conference (March 3 and 4), include: reforming Medicare physician payment, reducing prior authorization burdens, and making expanded access to telehealth permanent.

These advocacy issues are intended to build on partial successes in delaying scheduled Medicare payment cuts in 2021. "Stopping the proposed Medicare payment cuts was a major victory, but this yearly cliffhanger must end—the broken record must stop playing," said Bobby Mukkamala, MD, chair of the AMA Board of Trustees. "We are calling on Congress to bring about a permanent solution to end the annual battles that threaten the solvency of physician practices."

Reforming Medicare physician payment. The AMA urged Congress to establish a reliable Medicare physician payment update that "at a minimum, should keep up with inflation and practice costs while encouraging innovation." In addition, AMA identified the need for development of ways to reduce the administrative and financial burdens of MIPS participation, while ensuring the program's clinical relevance.

Reducing prior authorization burdens. The AMA stated that this health plan utilization management mechanism "has morphed into an inefficient process that requires many practices to hire extra staff and causes delays that often lead to patients abandoning treatment," as well as contributing to physician burnout. According to a 2021 AMA survey, 93% of physicians reported care delays associated with prior authorization, and 34% of survey participants reported that prior authorization led to a serious adverse event, such as hospitalization, disability/permanent bodily damage, or death, for a patient in their care. Physicians were urged to contact Congressional representatives in support of proposed legislation that reduces the burden of prior authorization within Medicare Advantage and to support other efforts to reform prior authorization requirements.

Make expanded access to telehealth permanent. When the current Public Health Emergency expires, most Medicare beneficiaries will lose access to telehealth services, which have proven robust and effective. Under section 1834(m) of the Social Security Act, waived during the recent serial PHEs, Medicare patients must live in an eligible rural location and travel to an eligible "originating site"—a qualified health care facility—to access telehealth services covered by the Medicare program. These requirements were created decades ago, before most patients had in-home access to the devices that facilitate telehealth communication. The AMA supports legislation that would permanently fix the originating site and geographic restriction on telehealth coverage, thereby ensuring that patients can continue to access Medicare telehealth services regardless of where they are located. "Many patients and physicians want telehealth services as an option," Mukkamala said. "These changes to telehealth policy must remain even after the pandemic is over."

The AMA has prepared fact sheets and online action kits on each of the 3 focus issues for 2022 (https://www.ama-assn.org/system/files/2022-nac-action-kit.pdf).

NRC Vetoes T&E Changes; Approves ^{82}Rb and Emerging Tech Modernization

In a public meeting held on January 28, Nuclear Regulatory Commission (NRC) commissioners voted to disapprove staff recommendations to change training and experience (T&E) requirements for Authorized Users (AUs) of radiopharmaceuticals. The proposed changes had been the source of comment and protest from major professional societies and their members. In 2020, NRC staff formally recommended that the commission pursue regulatory changes to the T&E requirements, moving to board certification as the sole factor for determining and obtaining AU status and modifying NRC criteria to allow for additional medical specialty board diplomates (beyond nuclear medicine and radiation oncology) to qualify as AUs. In voting down this proposal, one commissioner noted that the proposed changes had suggested "that the current training and experience framework could be viewed as encroaching on the practice of medicine. I disagree. Ensuring that AUs meet training and experience requirements necessary for radiological safety does not insert NRC into the actual practice of medicine. The broad support among medical organizations for NRC's licensing role makes it clear that the medical community does not view the current framework as encroaching on the practice of medicine."

SNMMI was among the groups that opposed T&E changes and submitted comments in multiple formats to the NRC. In 2020, Vasken Dilsizian, MD, then SNMMI President, testified before the Commission during a public hearing. He noted that expansion of medical specialty training requirements was not within the purview of the NRC. Moreover, Nuclear Medicine, Radiation Oncology, and Diagnostic Radiology with 16-mo Nuclear Medicine/Nuclear Radiology (NM/NR) pathways are the only Accreditation Council for Graduate Medical Education (ACGME)–approved training programs with specific goals and objectives pertaining to administration of radioactive material, and such training must be completed under supervision of board-certified physicians trained in this area.

Feedback from stakeholders was considered by the commissioners in making their decision. Another commissioner stated in his final review: "Many stakeholders offer persuasive arguments that the current T&E framework is working effectively to ensure radiological safety and is not resulting in a shortage of authorized users to administer radiopharmaceuticals." In a February 4 statement, SNMMI praised the NRC for this decision.

Current pathways for obtaining AU status remain:

- Certification by a medical specialty board (e.g., the American Board of Nuclear Medicine) recognized by the NRC or an Agreement State;
- Completion of 200 hours of classroom training and 500 hours of supervised work experience in an ACGME-accredited program (Nuclear Medicine, Diagnostic Radiology with a 16-month NM/NR pathway, or Radiation Oncology); and
- Previous identification as an AU on an NRC or Agreement State license or permit.

^{82}Rb Generators and Emerging Medical Technologies

Along with voting on AU T&E requirements, the NRC approved initiation of rulemaking to modernize 10 *Code of Federal Regulations* (*CFR*) Part 35 to accommodate the increasing medical applications of radioisotopes and new advances in medical technologies. NRC staff recommended updating Part 35 to establish generally applicable performance-based requirements for emerging medical technologies that would focus on the essential safety-related elements necessary to ensure radiation safety for workers, patients, and the general public. The revised regulation would also include performance-based requirements for ^{82}Rb generators, gamma stereotactic radiosurgery units, and ^{90}Y-microspheres. Many stakeholders had expressed an interest in having a regulatory framework well-suited to the advancement and integration of innovative radiopharmaceuticals.

Part 35 does not currently address ^{82}Rb generators, and NRC has relied on enforcement discretion in this area. But, as explained by NRC staff in their proposed rulemaking plan: "Longstanding reliance on temporary enforcement guidance to exercise enforcement discretion is inconsistent with NRC Enforcement Policy and is not a substitute for resolving the underlying technical issues associated with calibration and dosage measurement for ^{82}Rb generators."

NRC will open comment periods and hold stakeholder response sessions to address proposed changes.

Nuclear Regulatory Commission
SNMMI

SNMMI Calls for Expanded Coverage/Reimbursement of Amyloid PET

On February 17, SNMMI released a second letter to the U.S. Centers for Medicare & Medicaid Services (CMS) in response to the January 11 proposed National Coverage Determination (NCD) decision memorandum that would cover U.S. Food and Drug Administration (FDA)–approved monoclonal antibodies that target β-amyloid for treatment of Alzheimer disease (AD) through coverage with evidence development (CED) (see *J Nucl Med.* 2022;63[3]:12N). In addition to indicating that FDA-approved drugs in this class would be covered only for people with Medicare who are enrolled in qualifying clinical trials, the NCD would have a number of potential negative effects for patients with or in the process of diagnosis for AD, according to the SNMMI letter.

After receiving initial comments from SNMMI experts, the society requested specific actions relative to coverage, including accompanying rationales:

(1) *CMS should cover an amyloid PET scan before a patient is considered eligible for a CMS-approved study.* Amyloid PET can identify ahead of time those patients who will not benefit from monoclonal antibodies and thereby simplify the enrollment process for patients and trial sponsors. It will also improve care for patients without β-amyloid, allowing treating professionals and caregivers to focus on treatment modalities that are appropriate for those patients. CMS should not limit coverage to trial participants but should provide coverage of amyloid PET to determine whether a patient should be enrolled in a trial.

(2) *CMS should not finalize a limit of 1 β-amyloid PET scan per lifetime.* No evidence currently suggests that a single amyloid PET scan per patient is appropriate or that an outdated scan can provide the diagnostic information needed to determine whether a patient is currently a candidate for therapy. Not only can β-amyloid status change over time, ongoing clinical trials for monoclonal antibody therapies for AD have used the results of posttreatment β-amyloid PET to inform decisions to discontinue monoclonal antibody therapy.

(3) *CMS should require posttreatment β-amyloid PET to be performed as needed to document the removal of β-amyloid from the brain.* CMS should allow as many PET scans as are needed to ensure that the trial design is optimal and reliable and provides physicians with the information needed to make informed decisions about initiating and continuing therapy. Notably, 1 or more scans must be covered during therapy to verify removal of amyloid.

(4) *CMS should retire the current PET CED in conjunction with finalizing the monoclonal antibody NCD.* Continuation of limitations on amyloid PET while other uses of PET for AD, such as tau PET, are covered at the discretion of the Medicare Administrative Contractors creates an illogical and confusing situation for physicians, patients, and clinical trial designers.

(5) *CMS should not limit sites of service for approved clinical trials to hospitals.* Limiting trials only to hospitals would greatly impede patient access because of geographic and payment considerations and would contribute to health care disparities.

In addition, SNMMI reiterated that appropriate reimbursement of amyloid PET agents is needed. Since 2008, CMS has packaged diagnostic radiopharmaceuticals (including the 3 amyloid agents) with the related PET scan in hospital outpatient settings. The packaging begins after the expiration of a passthrough period (about 3 years) during which drugs are paid separately. The result is a reimbursement rate of about 9% of the passthrough rate. Although CMS has the authority to fix this problem, it has resisted. SNMMI, the Medical Imaging & Technology Alliance, the Council on Radionuclides and Radiopharmaceuticals, and more than 70 supporting organizations are therefore pursuing legislative action through the Facilitating Nuclear Diagnostics (FIND) Act, a bipartisan and bicameral bill intended to unpackage these life-saving diagnostics.

In its summary, the latest SNMMI request recommended that CMS remove the coverage limitations on amyloid PET by retiring the NCD, by establishing that amyloid PET will be covered (before clinical trials) to identify patients who are candidates to receive monoclonal antibody therapy and as necessary after therapy initiation to inform treatment decisions, and by clarifying that there is no lifetime limit on the number of medically necessary amyloid PET scans that a patient can receive.

The January 11 CMS announcement of the proposed NCD and limited coverage of the drug included a 30-day period for public comment. After reviewing all comments received on the proposed determination, CMS is scheduled to announce its final decision by April 11.

SNMMI

ABNM: Nuclear Medicine In-Training Examination Goes Virtual

Leonie Gordon, MD, Associate Executive Director, American Board of Nuclear Medicine

In 2022, in keeping with the commitment to serve well our trainees and their valued residency programs, the American Board of Nuclear Medicine (ABNM) offered residents remote virtual in-training testing. In order to achieve this and update our virtual presence in testing, ABNM chose a vendor that offers a complete online solution for the management, delivery, and reporting of assessment programs. The vendor has led the industry with innovations in secure internet testing. ABNM migrated all its secure testing databases to the new vendor over several months, and this created a state-of-the-art online item-banking system. It runs on major browsers both for Windows and Mac and offers extensive configuration options.

The ABNM successfully delivered its in-training examination (ITE) as a remote computer-based exam during January 2022. Resident participation in the ITE fulfills Accreditation Council for Graduate Medical Education nuclear medicine training program requirements for summative assessment. The ITE also benchmarks individual resident scores for all residency levels. It offers residents an opportunity to evaluate their knowledge and to improve identified weaknesses prior to taking the ABNM certifying examination.

ABNM recognized that the logistics for programs and residents would be different for a virtual examination. New graphics were created (https://www.abnm.org/2022-ite-announcement). The board expected the examination to be proctored at local sites and held a proctor/virtual examination training webinar prior to administration of the examination. For those unable to attend the session or who wanted a refresh, the webinar was recorded and is available on YouTube (https://www.youtube.com/watch?v=kd3aa8JDnNg). As expected with any remotely delivered exam, a few candidates experienced connectivity and software issues. ABNM staff members were available to troubleshoot and help trainees with these issues. Test results are being validated through third-party psychometric analysis, and the data will be used for optimally accurate benchmarking.

Leonie Gordon, MD

Candidates expressed appreciation for the ability to take the exam at their local sites, which eliminated the need for exposure to groups of people during the COVID-19 pandemic. The length of time the examination was available online to programs and residents was also increased to overcome pandemic-related challenges. Although the ABNM prepared candidates well for the computer-based examination, concern was expressed about access to the exam and unfamiliarity with the exam screens. A help button was available during the exam on all computer screens to answer many questions, but some candidates did not avail themselves of this feature and did not realize that methods were available to zoom, adjust contrast, and scroll through images.

The ABNM hopes to have the ITE results available within 2 months and will include teaching key points for questions residents did not answer correctly. These will be included in the results correspondence, and the hope is that it will offer an opportunity to evaluate their knowledge and identify areas of deficiency relative to peers at the same level of training. In addition, ABNM has developed Certlink-in-Training, which provides residents the opportunity to participate in continuous online learning, as well as an opportunity for maximizing test preparation. Certlink questions have key points, critiques, and annotated references. ABNM hopes the ITE and participation in Certlink-in-Training will maximize opportunities for future testing preparation, including secure examinations. Certlink-related tutorials are available at: https://www.abnm.org/certlink-training-tutorial-video-series/.

ABNM will continue to offer the ITE virtually, with enrollment in September through October 2022 with the same device preparation. The ITE for U.S. and Canadian programs will be given in January 2023.

SNMMI Meetings Back in Full Swing

Virginia Pappas, CAE, SNMMI CEO

With 2 years of the COVID-19 pandemic behind us, SNMMI and its meeting attendees have mastered the art of the virtual meeting, as was clear at the 2022 Mid-Winter Meeting and American College of Nuclear Medicine (ACNM) Annual Meeting held February 25–27. Although virtual meetings will remain a part of SNMMI's education offerings in coming years, we are more than excited to be meeting again in person at the 2022 Therapeutics Conference and the 2022 Annual Meeting!

SNMMI Mid-Winter and ACNM Annual Meeting

When the Omicron variant derailed SNMMI's plans for an in-person meeting, the society seamlessly transitioned to a virtual meeting, which was attended by more than 600 nuclear medicine and molecular imaging professionals. Thirty-three sessions were organized into 3 simultaneous tracks: ACNM Annual Meeting, cardiovascular, and general nuclear medicine. The Science Pavilion hosted on a new easy-to-use platform, including 64 posters, many of which included recorded presentations of the abstracts. The exhibit hall featured 26 companies, including title sponsor Advanced Accelerator Applications. Several networking events were held during the meeting, including a virtual chocolate tasting hosted by the SNMMI Women in Nuclear Medicine, which led one participant to claim they "will never taste chocolate the same way again!"

SNMMI Therapeutics Conference

The SNMMI Therapeutics Conference was held March 10–12 in New Orleans. The meeting featured some of the leading nuclear medicine experts in areas such as MIBG therapy, therapeutic dosimetry, prostate cancer, and neuroendocrine cancer, to name just a few. The speakers also included a patient and a medical oncologist presenting their perspectives on radiopharmaceutical therapy. In addition, we were joined by 33 companies in the exhibit hall for the meeting. We would like to thank all of our exhibitors and sponsors, particularly our title sponsor, ITM.

SNMMI 2022 Annual Meeting—In Person at Last

SNMMI now switches its focus to the 2022 Annual Meeting, to be held June 11–14 in Vancouver, BC, Canada. In addition to the in-person event, a full virtual program will offer live-streaming of many sessions, on-demand access to all sessions, virtual poster and exhibit halls, and virtual networking events. In-person attendees will also have access to the live-streamed content, providing the ultimate flexibility.

The meeting kicks off on Saturday, June 11, with a lineup of 8 categorical seminars covering a variety of exciting topics in nuclear medicine and molecular imaging, including imaging biomarkers in neurodegenerative and neuropsychiatric disorders, radiopharmaceutical therapies, "what's now and what's next" in prostate cancer diagnosis and treatment, and more.

The official opening ceremony on Saturday afternoon will feature an overview of the meeting as well as an address from the French Society of Nuclear Medicine, representing this year's Highlight Country. An exhibitor reception will be held on Saturday night—a great chance to reconnect with colleagues in person. Sunday's program begins with the Henry N. Wagner Jr., MD, Lecture, delivered by oncologist and researcher E.G. Elisabeth de Vries, MD, PhD, professor of medical oncology at University Medical Centre Groningen (The Netherlands). She will discuss her groundbreaking research on increasing the sensitivity of tumor therapies using advanced imaging techniques.

Additional plenary sessions will include the SNMMI Business Meeting/Anger Lectureship, the SNMMI-TS Award Recognition and Plenary Session, and the always-popular Henry N. Wagner, Jr., MD, Highlights Symposium, which will summarize scientific highlights from the Annual Meeting in the fields of neuroscience, oncology, cardiology, and general nuclear medicine.

Ninety educational sessions will provide attendees with an in-depth view of the latest research and development and insights into practical clinical application, with 60 continuing education sessions available for physicians, pharmacists, and physicists and 30 technologist-organized continuing education sessions.

More than 1,450 abstracts were submitted from around the globe for this year's Annual Meeting, and the Scientific Poster Hall will showcase more than 1,000 posters. Forty-five scientific sessions will be offered. New this year are 12 "integrated" sessions combining lectures and related scientific oral presentations. Also new: SNMMI will host a large Meet the Author Session and Reception on Monday, June 13. On Tuesday afternoon, SNMMI will offer a series of poster oral presentations from award-nominated authors in the Scientific Poster Hall.

One of the best parts of in-person attendance is the opportunity to visit the Exhibit Hall. More than 140 companies will be on site in Vancouver, showcasing the latest advances in technology. Multiple industry satellite symposia will be offered on the Exhibit Hall floor throughout the meeting.

Special programming to be held during the Annual Meeting includes the Nuclear Medicine Review Course, Technologist Educators Forum, Physician Educators Symposium, and a new Grant Review Program. In addition, the meeting will feature a number of networking events, including the opening exhibitor reception, poster hall mixer, meet the author reception, and more.

SNMMI is committed to ensuring that appropriate and necessary health and safety protocols are in place for this event. We will follow all Centers for Disease Control and Prevention safety protocols and recommendations and will comply with all federal, state, and local regulations.

We look forward to seeing you in person at the 2022 Annual Meeting in Vancouver! To register, visit www.snmmi.org/am.

Radioisotope Supply Update

NRG, which operates the High Flux Reactor (Petten, The Netherlands), indicated in February plans to restart the reactor for a new cycle of radioisotope production on March 17 after a 2-mo outage. The Nuclear Medicine Europe Emergency Response Team (NMEu ERT; Brussels, Belgium) held an update call on February 14 on the unplanned outage that resulted in cancellation of the reactor's first operating cycle of 2022. The cause of the defect (a cooling system leak in a basement ceiling), detected during an inspection on 21 January before the scheduled cycle start, had been identified, and analysis of the underlying cause would be submitted to the Authority for Nuclear Safety and Radiation Protection (ANVS), along with a solution to restore functionality. After approval by ANVS, the solution would be implemented and the reactor cooling system restored. After a planned 1-mo maintenance period, NRG intended to restart the reactor for a full cycle. Additional updates were planned during the review and start-up period.

On the February 14 call, the ERT also provided updates from other reactors in Europe that continued to work to address radioisotope shortages caused by the Petten outage. The Maria research reactor (Świerk-Otwock, Poland) added additional operating days to increase supplies of ^{99}Mo. The BR2 reactor (Mol, Belgium) resumed operations on February 12 (3 days earlier than planned) and announced that it would extend its radioisotope production cycle. Curium Pharma (London, UK) harvested ^{99}Mo targets from short irradiations at BR2 and processed ^{99}Mo for customers. Belgium's National Institute of Radioelements (IRE) reactor in Fleurus also announced it would resume production on its high-enriched uranium line in February. The NMEu indicated that as a result of these measures, supplies of ^{99}Mo/^{99m}Tc and ^{177}Lu were expected to return to normal in February, and ^{131}I supplies should be back to normal in the first half of March.

In the United States, University of Missouri Research Reactor (MURR) staff announced on February 9 increased production of critical medial radioisotopes in an effort to help in alleviating disruptions in the global supply chain. J. David Robertson, executive director of MURR, anticipated that the reactor will maintain its increased production levels throughout the duration of the reactor shutdown in Europe. "MURR is fortunate to be in a position where we can increase our production when the global supply chain is impacted, because we operate 6 and a half days a week, 52 weeks per year," he said. "Our dedicated staff are committed to getting life-saving treatments delivered to the patients who need them."

Nuclear Medicine Europe
University of Missouri Research Reactor

SNMMI Launches New Quality Systems Personnel Training Program

SNMMI announced on January 31 the launch of a new program designed to educate, train, and develop individuals with pharmacy or chemistry backgrounds in the production and release of clinical radiopharmaceuticals. The Quality Systems Personnel Training Program (QSPTP), conceived and led by Sally Schwarz, MS, RPh, BCNP, FAPhA, will provide participants with the theoretical knowledge and practical experience needed to assume responsibility for production, quality control, and release of radiopharmaceuticals. Topics in the program include production and quality assurance, synthesis and clinical formulation of radiopharmaceuticals, regulatory requirements, and research applications. Experiential training at Current Good Manufacturing Practice–certified sites will also be incorporated into the program.

Specific needs to be addressed by the program include cross-training in the principles and practice of radiopharmaceutical science; manufacturing and quality assurance of radiopharmaceuticals—both in the academic and commercial settings; synthesis and pharmaceutical formulation of radiopharmaceuticals, especially from cyclotron-produced radionuclides; application of radiopharmaceuticals in biomedical research and clinical nuclear medicine; and compliance including all regulatory requirements associated with radiopharmaceutical manufacture and release.

"The manufacture and ongoing production of radiopharmaceuticals for clinical evaluation and use is dependent on skilled personnel who are cross-trained in several disciplines," said Alan Packard, PhD, SNMMI past president. "Currently, very few individuals have this type of training. To meet the growing need for qualified persons of this nature, SNMMI has developed a training program to cover the core competencies needed in this area of our field."

Individuals successfully completing the QSPTP will receive a certificate of training. In the future, SNMMI plans to collaborate with academic institutions to expand the program to include hands-on training in a production environment. "Having more professionals trained in the release of clinically important radiopharmaceuticals will benefit both academic and commercial entities," said Packard. "We hope that the QSPTP will provide a solid educational framework so that more individuals will become 'qualified persons' and will help to advance the field of radiopharmaceutical science." Detailed information on the program and its components is available at: www.snmmi.org/qsptp.

SNMMI

AI and Malpractice Liability

In an article published on February 1 ahead of print in the *Journal of the American College of Radiology*, Banja, from Emory University (Atlanta, Ga), and coauthors from Michigan State University (Grand Rapids) and the Penn State Milton S. Hershey Medical Center (Hershey) reported on ethical and legal implications associated with advances of artificial intelligence (AI) models and technologies in clinical practice, with a specific focus on exposure to liability for malpractice. The authors focused on 4 main considerations: (1) the importance of being able to explain AI models in patient care; (2) the

identification of strategies for diminishing clinician liability in poor patient outcomes that could be attributed to over- or under-reliance on AI; (3) the possibility of relieving liability burdens through legislation or regulation; and (4) conceptualizing AI models as "persons" with potential liability in legal proceedings.

Journal of the American College of Radiology

Thomas O'Dorisio, MD 1943–2022

Thomas M. O'Dorisio, MD, a pioneer in neuroendocrine cancer research and practice, died on February 2 in Ostrander, OH. He was a professor emeritus at the University of Iowa (Iowa City), having served as director of the Neuroendocrine Tumor Program and coleader of the Gastrointestinal Neuroendocrine group. In 1971, Dr. O'Dorisio graduated from the Creighton University School of Medicine (Omaha, NE) and went on to compete a residency in internal medicine and a fellowship in endocrinology at The Ohio State University (OSU; Columbus). He remained at OSU, serving as director of the Division of Endocrinology, held numerous leadership roles guiding components of the research mission, and received multiple teaching and education awards. In 1999, along with his wife, M. Sue O'Dorisio, MD, PhD, he was recruited to join the University of Iowa. His interest in nuclear medicine techniques in neuroendocrine cancer led to numerous collaborations with nuclear medicine and molecular imaging and therapy colleagues. He published more than 330 peer-reviewed articles, as well as texts and other scholarly works. Shortly before his final illness, he had begun work toward a master's degree in religious studies from Regis University (Denver, CO).

University of Iowa

^{153}Sm-DOTMP Agent Receives Rare Pediatric Disease Designation

QSAM Biosciences, Inc. (Austin, TX) announced on February 2 that the U.S. Food and Drug Administration (FDA) had granted its Rare Pediatric Disease (RPD) designation to CycloSam (^{153}Sm-DOTMP), a clinical-stage drug candidate for treatment of osteosarcoma. The agent has demonstrated preliminary safety and efficacy in animal studies. In 2020 it was successfully used under a single-patient Investigational New Drug approval to perform bone marrow ablation prior to allogenic marrow transplantation. In August 2021 the company received FDA Orphan Drug designation for use in osteosarcoma.

Douglas Baum, CEO of QSAM, said: "Combined with the orphan designation for osteosarcoma that we received last year from the FDA, the RPD Designation may allow QSAM to potentially bring CycloSam to market more rapidly through additional incentives and eligibilities that ultimately help these young patients for whom there is currently little hope. Patients with this disease are eligible to participate in our current Phase 1 clinical trial; however, we anticipate that we will initiate a separate clinical trial in the coming year specifically focused on primary bone cancers such as osteosarcoma and Ewing sarcoma. We are dedicated as a company to making a difference in the lives of children and their families battling these forms of bone cancer."

The RPD designation, covering diseases defined by the FDA as primarily affecting <200,000 Americans under the age of 18 each year, can provide substantial financial incentives by making companies eligible for a Priority Review Voucher (PRV) upon drug approval by the FDA. A PRV grants accelerated FDA review of a drug candidate for any indication, reducing the review period to 6 mo and potentially gaining early market access. PRVs may be used by the recipient company for any drug development program or can be sold or transferred to larger pharmaceutical companies.

QSAM Biosciences, Inc.
U.S. Food and Drug Administration

Each month the editor of Newsline selects articles on diagnostic, therapeutic, research, and practice issues from a range of international publications. Most selections come from outside the standard canon of nuclear medicine and radiology journals. These briefs are offered as a window on the broad arena of medical and scientific endeavor in which nuclear medicine now plays an essential role. The lines between diagnosis and therapy are sometimes blurred, as radiolabels are increasingly used as adjuncts to therapy and/or as active agents in therapeutic regimens, and these shifting lines are reflected in the briefs presented here. We have also added a small section on noteworthy reviews of the literature.

^{177}Lu-PSMA I&T Toxicities

Hartrampf et al. from University Hospital Würzburg (Germany), Johns Hopkins University School of Medicine (Baltimore, MD), and Okayama University (Japan) reported on January 27 in *Cancers (Basel)* (2022;14[3]:647) on a study evaluating the toxicity profiles of ^{177}Lu–prostate-specific membrane antigen (PSMA)–I&T in patients with metastatic, castrate-resistant prostate cancer. The study included 49 such patients treated with at least 3 cycles of ^{177}Lu-PSMA-I&T. Serum lab values were compared before and after radioligand therapy, and adverse events were documented. Under treatment, 11 (22%) patients were found to have nephrotoxicity of Common Terminology Criteria for Adverse Events (CTCAE) grades I or II by creatinine metrics and 33 (67%) as assessed by estimated glomerular filtration rate (eGFR). Only 13% showed reduced ^{99m}Tc-MAG3–derived tubular extraction rates. Over all renal functional metrics, absolute changes of only 2% were recorded. Recategorization based on renal parameters was infrequent. After 3 cycles of therapy, follow-up eGFR correlated negatively with age and eGFR change correlated with Gleason score at baseline. Leukocytopenia of CTCAE I and II was seen in 41% and 2% of patients, respectively. Thrombocytopenia of CTCAE I was seen in 14%, with absolute decreases of 15.2% and 16.6% for leukocyte and platelet counts, respectively. Thirty-six (73%) and 10 (20%) patients experienced CTCAE I and II anemia, respectively. The authors concluded that "after PSMA-targeted therapy using ^{177}Lu-PSMA I&T, no severe (CTCAE III/IV) toxicities occurred, thereby demonstrating that serious adverse renal or hematological events are unlikely to be a frequent phenomenon with this agent."

Cancers (Basel)

PET/MR and Lymphoma Imaging Biomarkers

In an article published on February 16 ahead of print in *Annals of Hematology*, Husby et al. from the Norwegian University of Science and Technology (Trondheim, Norway), St. Olavs Hospital/Trondheim University Hospital (Norway), University Hospital of North Norway (Tromsø), Aarhus University Hospital (Denmark), University Medical Center Groningen (The Netherlands), and the University Medical Centers Amsterdam (The Netherlands) reported on the diagnostic performance of ^{18}F-FDG PET/MR compared to that of ^{18}F-FDG PET/CT in a group of patients with Hodgkin lymphoma, diffuse large B-cell lymphoma, or high-grade B-cell lymphoma. A total of 61 patients were imaged with both modalities at baseline and again for response assessment after treatment. Images were interpreted by experienced physicians, and prognostic biomarkers (Deauville score, SUV_{max}, SUV_{peak}, and metabolic tumor volume [MTV]) were compared. Baseline PET/MR showed a sensitivity of 92.5% and specificity of 97.9% when compared with PET/CT as a reference standard for nodal sites. Corresponding PET/MR figures for extranodal sites were 80.4% and 99.5%. Concordance in expert reading was found in 57 patients, with disagreement attributed to misclassification of region rather than inaccuracy in lesion detection. For posttreatment response assessment, PET/MR showed a sensitivity of 100% and specificity of 99.9% for all sites combined compared to the PET/CT standard. Deauville scores 4 and 5 and criteria of response were found to be the same for the 2 modalities, with SUV_{max}, SUV_{peak}, and MTV values highly correlated. The authors concluded that "FDG PET/MR is a reliable alternative to PET/CT in this patient population, both in terms of lesion detection at baseline staging and response assessment, and for quantitative prognostic imaging biomarkers."

Annals of Hematology

Presurgical PET in Epilepsy

Steinbrenner et al. from the Charité-Universitätsmedizin Berlin (Germany), National Hospital for Neurology and Neurosurgery (London, UK), University College London Hospitals (UK), Smt. B. K. Shah (SBKS) Medical College (Vandodara, India), Evangelische Krankenhaus Königin Elisabeth Herzberge (Berlin, Germany), the Johns Hopkins School of Medicine (Baltimore, MD), and the Sree Chitra Tirunal Institute for Medical Sciences and Technology (Trivandrum, India) reported on February 15 ahead of print in *Epilepsia* on a multicenter retrospective study assessing the utility of ^{18}F-FDG PET as part of the management decision-making process in patients with drug-resistant focal epilepsy. The study included the records of 951 patients with epilepsy (temporal lobe [TLE], 479; extratemporal [ETLE], 219; and uncertain lobar origin, 253) who had undergone PET imaging as part of presurgical workups. PET indicated distinct hypometabolism in 62% and was concordant with ictal EEG in 74% of patients with TLE and 56% with ETLE. PET was determined to be useful in presurgical decision making in 396 (47%) patients, contributing to recommended resection in 78 (20%) and intracranial EEG in 187 cases (47%).

In a third of patients, PET led to the conclusion that surgery was not feasible. For patients with TLE, rates of freedom from seizures at 1 y after surgery did not differ between patients with negative MR and EEG–PET concordance (n = 30) and those with positive MR and concordant EEG (n = 46). Half of patients with ETLE with negative MR and EEG–PET concordance and three-fourths of those with positive MR and concordant EEG were seizure free at 1 y. The authors noted that this is by far the largest reported study of presurgical PET in patients with drug-resistant focal epilepsy and that their findings "confirm the significance of FDG PET in presurgical epilepsy diagnostics."

Epilepsia

^{177}Lu-PSMA-617 RLT After Failed ^{223}Ra-Dichloride

In an article in the January 22 issue of *Cancers (Basel)* (2022;14[3]:557), Baumgarten et al. from University Hospital Frankfurt (Germany) reported on the safety and efficacy of ^{177}Lu-prostate-specific membrane antigen (PSMA)–617 in patients with metastatic castrate-resistant prostate cancer and progressive bone involvement under treatment with ^{223}Ra-dichloride. The study included 28 such men (median age, 73 y; range, 63–89 y) with progressive disease who started ^{177}Lu-PSMA-617 within 8 wk after the last ^{223}Ra administration. Patients had received a median of 4 and a group total of 120 cycles of ^{223}Ra and then received a median of 4 cycles of ^{177}Lu-PSMA-617 with a mean treatment activity of 6.5 ± 1.2 GBq per cycle (mean cumulative activity of 30.7 ± 23.4 GBq). Serum responses (≥50% decline in prostate-specific antigen 12 wk after the first ^{177}Lu-PSMA-617) were observed in 18 (64.3%) patients. Imaging-based partial remission was seen in 11 (39.3%) patients. The median imaging-based progression-free survival was 10 mo and median overall survival (OS) was 18 mo. Patients with fewer bone lesions (2–20) had significantly longer OS (28 mo) than those with higher tumor burdens (14 mo). Six patients experienced grade ≥3 hematologic toxicities after their last treatment cycle, including anemia, leukopenia, and thrombocytopenia. The authors concluded that "in progressive bone-metastatic castrate-resistant prostate cancer patients, prompt initiation of ^{177}Lu-PSMA-617 after failing ^{223}Ra is effective with an acceptable toxicity profile."

Cancers (Basel)

Automated Image-Based Diagnosis in Parkinsonism

Papathoma et al. from the Karolinska Institutet (Stockholm, Sweden), Danderyd's Hospital (Stockholm, Sweden), the Academic Specialist Center (Stockholm, Sweden), and the Feinstein Institute for Medical Research (Manhasset, NY) reported in the February 17 issue of *Scientific Reports* (2002;12[1]: 2763) on a systematic assessment of the accuracy of a previously developed ^{18}F-FDG PET–based automated algorithm in the diagnosis of parkinsonian syndromes, including unpublished data from a prospective cohort. The study included first a series of 35 patients in which the automated image-based classification method showed excellent sensitivity and specificity for discriminating Parkinson disease from atypical parkinsonian syndromes. A systematic literature review and metaanalysis showed similar results (pooled sensitivity and specificity of 84% and 96%, respectively). The authors concluded that this ^{18}F-FDG PET automated analysis has excellent diagnostic potential early in the disease course and "may be a valuable tool in clinical routine as well as in research applications."

Scientific Reports

PET/CT and MALT Lymphoma Staging

In an article in the January 31 issue of *Cancers (Basel)* (2022;14[3]:750), Cohen et al. from the Tel Aviv Sourasky Medical Center and Tel Aviv University (Israel) reported on the role of ^{18}F-FDG PET/CT in staging and prediction of progression-free survival (PFS) in patients with newly diagnosed mucosa-associated lymphoid tissue (MALT) lymphoma. The retrospective study included 66 such patients. PET detected extranodal lesions in 38 (57.6%) patients and accompanying nodal disease in 13 (19.7%). The detection rate for extranodal lesions was higher in those located in tissues with low/homogeneous tracer uptake than in those with high/heterogeneous uptake (100% and 40.4%, respectively). Nodal lesions were found to have significantly lower SUV_{max}, metabolic tumor volume, and total lesion glycolysis than extranodal lesions in the same patients. The rates of detection and tracer avidity of extranodal lesions were higher in patients with advanced bulky disease and associated marrow/nodal involvement. Higher SUV_{max} in extranodal lesions predicted shorter PFS. Higher SUV_{max} and total lesion glycolysis trended toward shorter PFS in patients with localized disease. The authors concluded that "SUV_{max} of extranodal lesions may predict PFS" in patients with newly diagnosed MALT.

Cancers (Basel)

PSMA PET/CT and Prostate Cancer Outcomes

Bodar et al. from Amsterdam University Medical Center/VU University (The Netherlands) and the Prostate Cancer Network/The Netherlands Cancer Institute (Amsterdam) reported on February 15 ahead of print in *BJU International* on a study investigating associations between intraprostatic, intratumoral SUV_{max} on prostate-specific membrane antigen (PSMA) PET/CT in patients with prostate cancer before robot-assisted radical prostatectomy and pathology outcomes, including International Society of Urological Pathology score (pISUP) and lymph node status. The study drew data from 318 patients from 2 previous studies with biopsy-proven prostate cancer who were scheduled for robot-assisted radical prostatectomy. Patients underwent either ^{68}Ga-PSMA-11 (59%) or ^{18}F-DCFPyL (41%) PET/CT before surgery. Associations between the primary tumor SUV_{max} and pre- and postoperative variables were assessed.

Patients with pISUP ≤2 showed significantly lower SUV_{max} than patients with pISUP >2 for both tracers. Patients with tumor grades pN1 had significantly higher median SUV_{max} than those with pN0/pNx grades with both tracers. Additional analyses showed intraprostatic SUV_{max} to be an independent predictor of pN1 for both ^{68}Ga-PSMA-11 and ^{18}F-DCFPyL. The authors concluded that "intraprostatic, intratumoral PSMA intensity on PET/CT, as semiquantitatively expressed by SUV_{max}, may be a valuable innovative biomarker in patients with localized prostate cancer, as it is highly associated with known conventional prognostic factors, such as pISUP and lymph node status."

BJU International

First-Line ^{90}Y-Ibritumomab Tiuxetan in Follicular Lymphoma

In article published online on February 12 ahead of print in the *Annals of Hematology*, Rieger et al. from the Charité–Universitätsmedizin Berlin (Germany), the Universita degli Studi di Napoli Federico II (Italy), the National Cancer Institute (Bethesda, MD), Fondazione G. Pascale IRCCS (Naples, Italy), Lund University Hospital (Sweden), University Ulm (Germany), Johannes-Gutenberg University (Mainz, Germany), the Medical University Graz (Austria), the Technische Universität München (Germany), Max-Delbrück-Center for Molecular Medicine in the Helmholtz Association (Berlin, Germany), and the Vivantes Klinikum Am Urban (Berlin, Germany) reported on long-term follow-up of patients treated with ^{90}Y-ibritumomab tiuxetan as first-line therapy for follicular lymphoma. Previous studies have shown complete remission rates of 56% and a median progression-free survival (PFS) rate of 26 mo over a follow-up period of 30.6 mo with this radioimmunotherapeutic approach. The current study included 59 patients originally treated for grade 1–3A disease in stages II–IV. Patients with complete response and no evidence of minimal residual disease, partial response, or stable disease at 6 mo after treatment had been observed with no additional treatment. Patients with complete response but persistent minimal residual disease had received consolidation therapy with rituximab. After a median follow-up of 9.6 y, median overall PFS was 3.6 y, and 8-y PFS was 38.3%. The median overall survival (OS) was not reached during this follow-up, and 8-y OS was 69.2%. Shorter OS was associated with age (≥65 y) and disease progression within 24 mo of treatment. No increases in secondary malignancies or transformation into aggressive lymphoma were observed when compared to trials with similar follow-up periods. The authors concluded that ^{90}Y-ibritumomab tiuxetan as first-line treatment "demonstrates a favorable safety profile and long-term clinical activity in a substantial fraction of follicular lymphoma patients in need of therapy."

Annals of Hematology

Tracer-Specific Reference Tissue Selection and PET in AD

Li et al. from United Imaging Healthcare Group Co., Ltd. (Shanghai, China), University of Sydney (Australia), the Harvard Medical School (Boston, MA), University College Cork (Ireland), Zhengzhou University of Light Industry (China), and Xuanwu Hospital/Capital Medical University (Beijing, China) reported on February 15 ahead of print in *Human Brain Mapping* on a reference tissue–based quantification approach for improving change detection in brain glucose metabolism, amyloid, and tau deposition in PET imaging of Alzheimer disease (AD). Study data included large groups of PET images acquired with ^{18}F-FDG (794 scans), ^{18}F-florbetapir (906 scans), and ^{18}F-flortaucipir (903 scans) as well as T1-weighted MR images from the Alzheimer's Disease Neuroimaging Initiative database. The researchers calculated the statistical power of reference tissues in detecting longitudinal SUV ratio (SUVR) changes in cerebellum gray matter, centrum semiovale, and pons at both region-of-interest (ROI) and voxel levels, with results compared between cognitively normal and impaired individuals. The average ROI values for the pons were higher than those of the centrum semiovale and cerebellum gray matter in detecting glucose metabolism decreases, whereas the centrum semiovale reference tissue–based SUVRs provided higher values for detection of amyloid and tau deposition increases. The 3 reference tissue areas generated comparable images for the 3 tracers, although the pons-based map showed superior performance for ^{18}F-FDG. The authors concluded that "tracer-specific reference tissue improved the detection of ^{18}F-FDG, ^{18}F-florbetapir, and ^{18}F-flortaucipir PET SUVR changes, which helps the early diagnosis, monitoring of disease progression, and therapeutic response in AD."

Human Brain Mapping

^{18}F-Fluciclovine PET Amino Acid Imaging in Glioblastoma

In an article in the January 31 issue of *Frontiers in Oncology* (2022;12: 829050), Scarpelli et al. from Purdue University (West Lafayette, IN) and the Barrow Neurological Institute (Phoenix, AZ) reported on a study designed to characterize the biologic bases of enhanced fluciclovine uptake on PET in brain tumors by correlating multiple biologic factors with fluciclovine uptake across a range of human glioblastoma xenograft models. The investigation was performed in rats that underwent orthotopic implantation with 1 of 5 different human glioblastoma cell lines, followed by ^{18}F-fluciclovine PET (for tumor-to-normal uptake ratios) and MR imaging (for tumor volume and gadolinium enhancement assessment) of established tumors. Excised tumors underwent histologic analysis. Fluciclovine uptake ratios on PET were found to be most strongly correlated with tumor amino acid transporter ASCT2 levels and also significantly associated with tumor volume and tumor enhancement status on MR imaging. Both enhancing and nonenhancing tumors were visualized on PET, with a median tumor-to-normal uptake ratio across the 5 tumor lines of 2.4 (range, 1.1–8.9). The authors concluded that these data

suggest that "fluciclovine PET may be useful for assessing brain tumor amino acid metabolism" but noted that variables such as size of tumors and enhancement status could be confounding if not accounted for in fluciclovine-based metabolic measurements.

Frontiers in Oncology

Metabolism-Associated Gene Signatures for ^{18}F-FDG Avidity

Lee et al. from Samsung Medical Center/Sungkyunkwan University School of Medicine (Seoul, South Korea) and CHA University (Seongnam, South Korea) reported on January 31 in *Frontiers in Oncology* (2022;12:845900) on a study designed to elucidate metabolic genes and functions associated with ^{18}F-FDG uptake and to assess associated prognostic value in a sample group of patients with hepatocellular carcinoma. The study included 60 patients with Edmondson–Steiner grade II disease, who underwent ^{18}F-FDG PET/CT before initiation of treatment. RNA sequencing data were obtained from tumor and normal liver tissues, and associations between specific metabolism-associated genes and tumor tracer uptake were analyzed. The researchers applied a novel metabolic gene expression balance scoring system correlating glucose and lipid metabolism-associated gene expression. Nine genes related to glycolysis and the *HIF-1* signaling pathway were positively correlated with tumor tracer uptake, and 21 genes related to fatty acid metabolism and the *PPAR* signaling pathway were negatively associated with tumor tracer uptake. Seven potential biomarker genes were identified. Balance scoring according to dominance between glucose and lipid metabolism demonstrated good prognostic value in this patient group. The authors concluded that these data strongly support "the prognostic power of FDG PET/CT and indicate the potential usefulness of FDG PET/CT imaging biomarkers to select appropriate patients for metabolism-targeted therapy in hepatocellular carcinoma."

Frontiers in Oncology

PET/MR and SSTR2 Expression in Meningioma

In an article in the January 28 issue of *Frontiers in Oncology* (2022;11:820287), Roytman et al. from Weill Cornell Medicine/New York Presbyterian Hospital and Columbia University Medical Center (both in New York, NY) reported on a study using ^{68}Ga-DOTATATE PET/MR imaging to determine whether a relationship exists between tumor vascularity and somatostatin receptor-2 (SSTR2) expression in meningiomas. The prospective study included 36 patients with 60 meningiomas (World Health Organization [WHO]-1, 20; WHO-2, 27; and WHO-3, 13) who underwent ^{68}Ga-DOTATATE PET/MR with dynamic contrast-enhanced (DCE) perfusion. Tumor volumes were segmented and superimposed onto parametric DCE maps including multiple parameters, and PET tumor SUVs and SUV ratios to superior sagittal sinus were recorded. Results showed a strong and significant correlation between tumor vascularity and SSTR2 expression in WHO-2 and WHO-3 but not in WHO-1 meningiomas, which the authors concluded suggested "biological differences in the relationship between tumor vascularity and SSTR2 expression in higher-grade meningiomas." They called for additional work to expand on this finding.

Frontiers in Oncology

PET/CT + mpMR in Radiorecurrent Prostate Cancer

Rasing et al. from University Medical Center Utrecht and Amsterdam University Medical Center (both in The Netherlands) reported on February 3 in *Cancers (Basel)* (2022;14[3]:781) on the positive predictive value of combined multiparametric MR and prostate-specific membrane antigen (PSMA) PET/CT imaging in patients with locally recurrent prostate cancer after primary radiation therapy and on the added value of pathology verification with MR-targeted biopsies. The study included 41 patients with locally recurrent prostate cancer referred for 19-Gy single-dose MR-guided focal salvage high-dose-rate brachytherapy. All patients had undergone multiparametric MR and PSMA PET/CT before biopsy. Imaging results were used to identify lesions suspected for isolated tumor recurrence, and these were biopsied. Forty (97.6%) patients had positive biopsies for recurrent cancer. Five of these initially had negative biopsies of lesions identified on MR/PSMA PET, and recurrence was confirmed in 4 of the 5 after rebiopsy (1 patient refused a second biopsy). The positive predictive value for combined multiparametric MR and PSMA PET imaging was 97.6%. The authors concluded that biopsies can be withheld "when the results of the combined multiparametric MRI and PSMA PET/CT are conclusive, avoiding an unnecessary invasive and burdensome procedure."

Cancers (Basel)

MR and PET in Renal Cell Carcinoma Detection

In an article in the February 11 issue of *BMC Cancer* (2022;22[1]:163), Yin et al. from Wuxi No. 2 People's Hospital/Nanjing Medical University (China), the Affiliated Hospital of Jiangnan University (Wuxi, China), and Shanghai University of Medicine and Health Sciences (China) provided a systematic review and metaanalysis of the diagnostic performance of MR and PET imaging in detection of renal cell carcinoma. After a keyword search of the major scientific databases, a total of 44 articles were included for analysis. The resulting pooled sensitivities of MR, ^{18}F-FDG PET, and ^{18}F-FDG PET/CT were 80%, 83%, and 89%, respectively. The corresponding overall specificities were 90%, 86%, and 88%. The pooled sensitivity and specificity of 1.5-T MRI studies were 86% and 94%, respectively. For prospective PET studies, the pooled sensitivity, specificity and AUC were 90%, 93%, and 97%, respectively. For detection of primary renal cell carcinoma, PET as reported in the articles reviewed had a pooled sensitivity, specificity, and AUC of 77%, 80%, and 84%, respectively. For PET/CT, the corresponding percentages were 80%, 85%, and 89%.

The authors concluded that these results suggest that "MRI and PET/CT present better diagnostic value for the detection of renal cell carcinoma in comparison with PET" and that "MRI is superior in the diagnosis of primary renal cell carcinoma."

BMC Cancer

PET/CT and GEP NET Management

Magi et al. from Sant'Andrea University Hospital/ENETS Center of Excellence (Rome), Sapienza University of Rome, the University of Bologna, and the IRCCS Azienda Ospedaliero-Universitaria di Bologna (all in Italy) reported on February 11 ahead of print in *Endocrine* on a retrospective study evaluating the role of ^{18}F-FDG PET/CT in grade 1 gastroenteropancreatic neuroendocrine tumors (GEP NETs). The study included data from 55 patients (24 with pancreatic NETs, 31 with gastrointestinal NETS). At diagnosis, 28 (51%) had metastatic disease, and 50 (91%) patients had positive findings on ^{68}Ga-labeled somatostatin receptor PET/CT. All patients underwent ^{18}F-FDG PET/CT, and 27 (49%) had positive findings. ^{18}F-FDG PET/CT findings led to changes in therapeutic management in 29 (52.7%) patients. Progression-free survival (PFS) was longer in patients with negative ^{18}F-FDG PET/CT (median PFS not reached in the study period) than in those with positive findings (24 mo), particularly in the group with pancreatic NETs. The authors concluded that these data support "a more 'open' attitude toward the potential use of ^{18}F-FDG PET/CT in the diagnostic work-up of grade 1 GEP NETs, which may be used in selected cases to detect those at higher risk for an unfavorable disease course."

Endocrine

Reviews

Review articles provide an important way to stay up to date on the latest topics and approaches through valuable summaries of pertinent literature. The Newsline editor recommends several general reviews accessioned into the PubMed database in January and February. Parel et al. from the National Heart, Lung, and Blood Institute (Bethesda, MD) provided "Updates in the impact of chronic systemic inflammation on vascular inflammation by positron emission tomography (PET)" on February 16 in *Current Cardiology Reports*. In the same journal on February 16, Juarez et al. from University Medical Center Utrecht (The Netherlands), University of Turku/Turku University Hospital (Finland), University Medical Center Groningen (The Netherlands), King's College London/St. Thomas' Hospital (UK), and UMA-Health (Buenos Aires, Argentina) looked at the potential of "Artificial intelligence to improve risk prediction with nuclear cardiac studies." In an article on January 26 in *Nanomaterials* (Basel) (2022;12[3]:399), Murar et al. from the Barcelona Institute of Science and Technology (Spain) and the Eindhoven University of Technology (The Netherlands) reviewed "Advanced optical imaging-guided nanotheranostics towards personalized cancer drug delivery." Anan et al. from the Universiti Sains Malaysia (Pulau Pinang) and the Imam Abdulrahman Bin Faisal University (Dammam, Saudi Arabia) published "A review on advances in ^{18}F-FDG PET/CT radiomics standardisation and application in lung disease management" on February 5 ahead of print in *Insights into Imaging* (2002;13[2]:22). In an article published on January 21 online ahead of print in the *International Journal of Molecular Sciences* (2002;23[3]: 1158), Debnath et al. from the University of Texas Southwestern Medical Center (Dallas) summarized "PSMA-targeting imaging and theranostic agents—Current status and future perspective."