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The American Society of Neuroradiology (ASNR) is pleased to introduce its latest initiative: the PET-Guided Diagnosis and Management in Neuro-Oncology Study Group. This group will focus on leveraging molecular imaging and theranostics to enhance the care of adult and pediatric patients with primary and metastatic brain tumors, driving progress through collaborative research, consensus recommendations, and advocacy efforts.

The rapid clinical translation of PET and theranostics in recent years has expanded our understanding of brain tumor metabolism and is opening new pathways for personalized medicine. However, the rapid pace of these advancements has also introduced challenges, including standardization of clinical practices, health care economics, and the need for a coordinated approach that aligns with the interests of all stakeholders. The new Study Group embodies a multidisciplinary effort to empower clinical neuroradiologists and other health care professionals and to bridge the gap between cutting-edge technology and everyday clinical practice by uniting experts from neuroradiology, nuclear medicine, clinical neuro-oncology, and translational sciences.

The objectives are multifaceted. The primary goal is to disseminate the latest evidence regarding the clinical utility of validated radiotracers in adult and pediatric CNS tumors. This knowledge empowers clinicians to make informed decisions regarding the delineation of brain tumor extent, treatment planning, and response assessment. In the near-term, the focus will be on amino acid PET in gliomas[1-4] and brain metastases[5] as well as somatostatin receptor (SSTR) targeted PET in meningiomas and other SSTR-positive brain tumors.[6,7] For example, gallium 68 DOTA-D-Phe1-Tyr3-octreotate (^{68}Ga DOTATATE PET) has shown utility and is increasingly used in the clinical setting in meningioma and paraganglioma diagnosis and radiation therapy planning. Numerous prospective studies have shown added clinical value of fluorine 18 [^{18}F] labeled amino acids in combination with MR imaging for brain tumor management, including *O*-(2-[^{18}F] fluoroethyl)-L-tyrosine[1] (^{18}F-FET), anti-1-amino-3-[^{18}F]fluorocyclobutane-1-carboxylic acid[2] (^{18}F Fluciclovine), and 3,4-dihydroxy-6-[^{18}F]-fluorolphenylalanine[8] (^{18}F-FDOPA), with ongoing effort toward US FDA approval for amino acid PET currently underway. In addition, unique applications of PET/MR imaging and theranostics to pediatric CNS tumors will be highlighted.

The Study Group also acknowledges the current limitations of companion diagnostics in neuro-oncology due to lack of validated imaging probes, as well as the heterogeneity of patient management contributing to therapeutic clinical trials with negative outcomes.[9] To address these limitations, the Study Group advocates biomarker-driven patient selection, akin to the successful application of prostate-specific membrane antigen (PSMA) PET in prostate cancer, and [^{18}F] fluoroestradiol PET in breast cancer.[10] Tailoring treatments based on specific biomarkers can optimize therapeutic efficacy and improve patient outcomes.[11] In addition to amino acid metabolism and SSTR overexpression, which were discussed above, emerging targets for primary and metastatic brain tumors can include imaging probes for cell proliferation and cell membrane biosynthesis, epidermal growth factor receptor expression, chemokine receptor expression, the 18 kDa translocator protein (TSPO), PSMA, integrins, hypoxia, and finally the immune system.[12,13] Additionally, targeted PET agents for primary neoplasms outside the CNS can be applied to improve the detection and biologic characterization of brain metastases.[11]

Short-term goals are focused on the ASNR 2024 Annual Meeting, where 2 sessions will be offered to introduce the critical topics in molecular neuro-oncology and discuss the clinical use of state-of-the-art PET and theranostics. After the ASNR meeting, the Study Group plans to publish a state-of-practice article, summarizing the evidence presented in the 2 sessions.

In the longer term, we aim to accelerate translational research by leveraging the collective expertise of physicians and scientists working in the field of neuro-oncology. Collaboration will be the key to advancing the development of novel radiotracers, which is essential for enhancing diagnostic accuracy and therapeutic efficacy in neuro-oncology. In collaboration with the Society of Nuclear Medicine and Molecular Imaging and the Society for Neuro-Oncology, the ASNR Study Group will work to establish research priorities and consensus recommendations and develop evidence to support reimbursement for neuro-oncologic PET through cost-effectiveness studies as well as educational sessions during national meetings and webinars. These efforts will provide clarity and direction regarding the optimal applications of PET in neuro-oncology, ensuring consistency and quality of care across institutions.

We invite our colleagues from seasoned experts to early-career professionals to engage with the Study Group, whether through active participation in meetings, contribution to collaborative research, or dissemination of knowledge within their networks. Together, we can overcome the challenges that lie ahead, ensuring that neuroradiologists have a seat at the table in this multidisciplinary effort to improve patient outcomes.

In conclusion, we hope that the establishment of the PET-Guided Diagnosis and Management in Neuro-Oncology Study Group will facilitate continued progress in neuro-oncologic imaging. Through collaborative research, consensus recommendations, and advocacy efforts, the Study Group aims to address challenges and drive progress in the field. When neuroradiologists join forces with nuclear medicine physicians, neuro-oncologists, neurologic surgeons, radiation oncologists, and other physicians and members of the multidisciplinary care team, along with physicists and

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other imaging scientists and advocates, we can work toward a brighter future for patients battling CNS tumors.

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