A Brief Report on the Results of the 2024 National Survey of Nuclear Medicine Conducted by the Chinese Society of Nuclear Medicine

Jing Wang[1], Xiaoli Lan[2], Hongcheng Shi[3], and Sijin Li[4]

[1]Department of Nuclear Medicine, Xijing Hospital, Fourth Military Medical University, Xi'an, China; [2]Department of Nuclear Medicine, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China; [3]Department of Nuclear Medicine, Zhongshan Hospital, Fudan University, Shanghai, China; and [4]Department of Nuclear Medicine, First Hospital of Shanxi Medical University, Collaborative Innovation Center for Molecular Imaging of Precision Medicine, Taiyuan, China

The Chinese Society of Nuclear Medicine conducted a national nuclear medicine survey in January 2024. The purpose of the survey was to update the data from 2019 and provide a scientific basis for further development (*1*). The survey data covered 31 provinces, municipalities, and autonomous regions in mainland China. All data in the survey were reported through the National Nuclear Medicine Survey Information Reporting System on the official website of the Chinese Society of Nuclear Medicine. This brief report is intended to add to the supplement issue of *The Journal of Nuclear Medicine* on China (*2*), to help readers further understand the current status of nuclear medicine in China.

SURVEY CONTENTS

The following information was collected and reported: basic information on the discipline, available equipment, clinical application of imaging equipment, use of radiopharmaceuticals, radiopharmaceutical therapy, in vitro analysis, nuclear medicine personnel, and nuclear medicine education. We also report several opinions and next steps.

SURVEY DATA

The data time range was January 1, 2023, to December 31, 2023.

Basic Information on the Discipline

Department Overview. There are 1,237 departments (offices) engaged in nuclear medicine–related work nationwide, including 1,028 public medical institutions and 209 nonpublic medical institutions; 1,069 tertiary hospitals (including 862 top-tier tertiary hospitals, which refer to the highest level of hospital classification in China); 96 secondary hospitals; and 72 others.

Services Provided. Of the 1,237 total departments, 787 (63.6%) offer single-photon imaging (including SPECT/CT, SPECT, and γ-camera imaging); 763 (61.7%) provide radiopharmaceutical therapy, of which 709 have specialized outpatient services and 389 have radiopharmaceutical therapy wards; 663 (53.6%) offer PET imaging (including PET, PET/CT, and PET/MRI); 581 (47.0%) conduct organ function measurements; 339 (27.4%) perform in vitro analysis; 49 (4.0%) conduct coincidence imaging; and 55 (4.4%) operate nuclide molecular probe laboratories.

Administrative Affiliation. Of the 1,237 total departments, 73.6% are independent nuclear medicine departments, 13.3% are affiliated with medical imaging departments, 4.1% are affiliated with PET/CT centers, 2.9% are affiliated with radiology departments, and 6.1% are categorized as others.

Available Equipment

Positron Imaging Equipment. Of medical institutions nationwide, 53.3% are equipped with positron imaging equipment and 85.9% are in tertiary medical institutions. There are 772 units nationwide, an increase of 80.8% (up from 427 units in 2019), including 721 PET or PET/CT and 51 PET/MRI.

Single-Photon Imaging Equipment. There are 1,044 single-photon imaging equipment units nationwide, an increase of 15.6% (up from 903 units in 2019), including 686 SPECT/CT, 277 SPECT, 51 coincidence SPECT/CT, 14 cardiac SPECT, 11 γ-camera imaging, 4 cadmium zinc telluride SPECT, and 1 cadmium zinc telluride SPECT/CT.

Organ Function Measurement Equipment. There are 786 organ function measurement equipment units nationwide, including 562 thyroid function analyzers, 171 bone densitometers, 21 $^{13}C/^{14}C$ breath test analyzers, 11 nephrograms, 10 nuclear multifunctional analyzers, and 11 units categorized as others.

Medical Cyclotrons. There are 148 medical cyclotron units nationwide, an increase of 23.3% (up from 120 units in 2019), distributed in 140 medical institutions across the country (accounting for 11.3%).

Small-Animal Imaging Equipment. There are 63 small-animal imaging equipment units nationwide, including 35 PET/CT, 6 SPECT/PET/CT, 5 SPECT/CT, 4 optical imaging, 3 PET/MRI, and 10 units categorized as others.

In terms of equipment affiliation, 71.0% reside in a nuclear medicine department, 15.5% in a medical imaging department, 7.3% in independent PET or PET/CT centers, and 3.2% in a radiology department; 3.0% are classified as others.

Clinical Application of Imaging Equipment

The total number of PET or PET/CT examinations in 2023 was 1,381,758, an increase of 62.6% (up from 849,942 in 2019), of which tumor imaging accounted for 93.78%, nervous system imaging accounted for 2.36%, ^{68}Ga imaging accounted for 1.44%, guided biopsy puncture accounted for 0.83%, cardiovascular

Received Oct. 24, 2024; revision accepted Jan. 29, 2025.
For correspondence or reprints, contact Jing Wang (13909245902@163.com) or Sijin Li (lisjnm123@163.com).
Published online Feb. 27, 2025.

DOI: 10.2967/jnumed.124.269044

system imaging accounted for 0.59%, ^{11}C imaging accounted for 0.23%, bone imaging accounted for 0.22%, and other system imaging accounted for 0.55%.

The total number of PET/MRI examinations in 2023 was 27,825, an increase of 97.4% (up from 14,095 in 2019), of which tumor imaging accounted for 63.1%, nervous system imaging accounted for 27.9%, ^{68}Ga imaging accounted for 5.8%, ^{11}C imaging accounted for 1.6%, and cardiovascular system imaging accounted for 1.6%.

The total number of single-photon imaging (including cadmium zinc telluride SPECT, cadmium zinc telluride SPECT/CT, SPECT, SPECT/CT, γ-camera imaging, cardiac SPECT, and coincidence SPECT/CT) examinations was 2,716,806 cases in 2023, an increase of 8.1% (up from 2,514,142 in 2019). The top 5 items were skeletal system, accounting for 65.6%; endocrine system, accounting for 14.1%; urinary system, accounting for 10.3%; cardiovascular system, accounting for 4.6%; and digestive system, accounting for 1.7%.

The total number of coincidence imaging examinations was 9,583 cases in 2023, a decrease of 54.43% (down from 21,031 in 2019). Among them, tumor imaging accounted for 93.7%, bone imaging accounted for 3.4%, cardiovascular system imaging accounted for 2.3%, and other imaging accounted for 0.6%.

Regarding small-animal imaging, PET/CT involved 67,276 cases, SPECT/PET/CT 7,924 cases, optical system 1,776 cases, PET/MRI 1,510 cases, SPECT/CT 1,397 cases, PET 474 cases, CT 17 cases, and others 8,037 cases.

Use of Radiopharmaceuticals

Radiopharmaceutical Licenses. The number of units with class II licenses is 588; 326 units have obtained class III licenses (including class IIIA and class IIIB licenses), and 69 units have obtained class IV licenses.

Use of Radiopharmaceuticals. Single-photon drugs are used by 825 medical institutions. There are 697 medical institutions using positron drugs; all 697 of these institutions use ^{18}F-labeled drugs, 44 use ^{68}Ga-labeled drugs, 42 use ^{11}C-labeled drugs, and 28 use [^{13}N]N-ammonia.

Radiopharmaceutical Therapy

Of the 1,237 medical institutions nationwide, 801 (64.8%) perform radiopharmaceutical therapy, an increase of 4.0% (up from 770 in 2019), with a total of 2,993 dedicated beds for radiopharmaceutical therapy. Of these 801 institutions, 718 (89.6%) perform ^{131}I treatment, 410 (51.2%) perform bone tumor treatment, 216 (27.0%) perform plaster treatment (for instance, ^{32}P/^{90}Sr treatment for keloid or infant skin strawberry hemangioma), and 89 (11.1%) perform Yunke treatment ([^{99}Tc]Tc-methylene diphosphonate treatment for rheumatoid arthritis or osteoporosis).

The total number of treatments was 570,840, an increase of 8.0% (up from 525,480 in 2019). The top 7 treatments include ^{90}Sr/^{90}Y applicator treatment (37.4%) for keloid or infant skin strawberry hemangioma, ^{131}I treatment of Graves hyperthyroidism (18.2%), ^{131}I treatment for thyroid disease (16.5%), ^{32}P patch treatment for keloid or infant skin strawberry hemangioma (12.0%), [^{99}Tc]Tc-methylene diphosphonate treatment for rheumatoid arthritis (7.4%), radioactive particle implantation treatment for tumor (5.3%), and ^{89}Sr treatment for bone tumors (1.5%).

In Vitro Analysis

In China, the in vitro analysis at nuclear medicine department includes mainly radioimmunoassay, chemiluminescence, and electrochemiluminescence. Of the 1,237 medical institutions nationwide, 339 (27.4%) perform in vitro analysis business, with a total of 42,556,296 samples tested and 183,323,652 tests; 96.2% of them perform internal quality control, 75.2% participate in the interlaboratory quality evaluation of the National Health Commission's clinical inspection center, and 44.5% participate in the interlaboratory quality evaluation of the provincial, municipal, and autonomous region clinical inspection centers; 37.8% have internal auditors trained by the China National Accreditation Service for conformity assessment–entrusted institutions.

Nuclear Medicine Personnel

There are 15,677 medical personnel engaged in nuclear medicine–related work nationwide, an increase of 24.6% (up from 12,578 in 2019). The breakdown of these 15,677 personnel is as follows: 43.0% physicians, 28.5% technicians, 22.6% nurses, 1.9% chemists, 1.1% physicists, 0.8% researchers, 0.4% engineers, and 1.7% others. With respect to the level of nuclear medicine personnel, 23.0% have senior titles, 40.1% have intermediate titles, 35.0% have junior titles, and 1.9% have other titles.

Nuclear Medicine Education

In terms of education, 31.9% of nuclear medicine personnel have postgraduate degrees, 57.6% have undergraduate degrees, and 10.5% have junior college degrees.

There are 193 doctoral supervisors and 505 master's supervisors in imaging medicine and nuclear medicine nationwide. There are 480 doctoral students and 1,569 master's students.

Conclusion

Among the various factors affecting the development of nuclear medicine, 66% of the departments participating in this survey reported a lack of nuclear medicine specialists, and 59% indicated that regional economic factors play a role in the development of nuclear medicine. Additionally, some departments suggested that the popularization of clinical scientific research should be strengthened.

NEXT STEPS

In accordance with the requirements of the "Medium and Long-Term Development Plan for Medical Isotopes (2021–2035)" (*3*) launched by the Chinese government, the Chinese Society of Nuclear Medicine will address the issues identified in this survey by adhering to an innovation-driven approach, enhancing the development and cultivation of talent, and strengthening international communication and collaboration. The Chinese Society of Nuclear Medicine is committed to continually improving the precise diagnosis and treatment of major diseases through nuclear medicine.

DISCLOSURE

No potential conflict of interest relevant to this article was reported.

ACKNOWLEDGMENT

We thank Dr. Guiyu Li from the Department of Nuclear Medicine, Xijing Hospital, Fourth Military Medical University, for performing data analysis.

REFERENCES

1. Yang W, Kang F, Chen Y, et al. Landscape of nuclear medicine in China and its progress on theranostics. *J Nucl Med.* 2024;65(suppl 1):29S–37S.
2. Table of contents. JNM website. https://jnm.snmjournals.org/content/65/Supplement_1. Published May 6, 2024. Accessed February 6, 2025.
3. Notice on Issuing the Medium- and Long-Term Development Plan for Medical Isotopes (2021–2035). National Nuclear Safety Administration website. https://nnsa.mee.gov.cn/ztzl/haqshmhsh/haqrdmyyt/202501/202501/t20250125_1101449.html. Published January 25, 2025. Accessed February 18, 2025.