

SNMMI COVID-19 Task Force Surveys

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The spread of the novel coronavirus COVID-19 is global, with millions infected and hundreds of thousands succumbing to the disease's complications. Outbreaks continue to occur, with significant differences in severity, mortality, and rates of infection and recovery. COVID-19 has had substantial impact on health care systems as elective procedures and diagnostic studies are delayed to minimize risk of exposure and reallocate resources to patients with the disease. This has created a rapidly evolving management issue for nuclear medicine and molecular imaging (NMMI).

As part of a concentrated effort to evaluate the early impact of COVID-19 on NMMI, the SNMMI COVID-19 Task Force developed a plan to identify the logistic and resource problems caused by COVID-19 and the ways in which this global pandemic has affected our clinical practice, research, and members' workforce environments. In addition, the task force elicited feedback on how the society is meeting its obligation to serve members' needs during the pandemic.

Survey Results: Impact of COVID-19 on Clinical Practice

This electronic survey was launched on May 27 in conjunction with a medical research survey and was open for a 16-day window. Targets included all active SNMMI members, excluding those in the in-training and resident membership categories. Recipients were instructed to complete the survey that best reflected the work of their department, clinic, or lab. For the Clinical Practice survey, we received 263 responses, representing 17 countries (90.39% from the United States) and 45 different states or U.S. territories. Respondents included technologists (73.25%), physicians (21.05%), physician/scientists (1.75%), and others (2.63%). Reported workplaces included medical centers (31.17%), non-university-affiliated hospitals (20.35%), academic institutions (14.72%), free-standing imaging facilities (12.55%), and university-affiliated medical centers (10.39%). Key findings from the Clinical Practice survey are summarized here.

- 92.78% of respondents saw a decrease in diagnostic nuclear medicine imaging study volumes as a result of COVID-19. For conventional nuclear medicine procedures (other than PET), 79.92% experienced decreases of >50% in study volumes (37.24% saw a 50% reduction; 42.68% a 75% reduction). For PET, a 25% decrease in study volume was experienced by 22.31% of respondents, and 17.77% saw a 50% decrease. However, these participants expected their nuclear medicine imaging procedure volume to return to pre-COVID levels within the next 6 months (42.58% in the next 3 months; 23.44% within 3–6 months).
- 39.53% of respondents saw a decrease in radionuclide therapy volumes as a result of COVID-19, with 14.51% halting all procedures. Almost 50% (47.15%) did not know the answer or reported that the question was not applicable to their work; however, 17.62% had a 75% reduction in therapy volume. Of those with a decrease, 22.89% expected their therapy volume to return to pre-COVID levels within the next 3 months. (Note: 44.49% of respondents reported <10 radionuclide therapies performed per month at their institution prior to the pandemic.)
- The majority of those surveyed (65.32%) experienced no adverse issues with radiopharmaceutical supply, and 83.95% reported having the necessary supply of personal protective equipment (PPE). Those who reported PPE issues noted challenges in supply shortage and limits in amounts that could be ordered or allocated (e.g., 1 mask per day as supplies were redirected to COVID-19 units and frontline workers).
- New or additional protocols specific to COVID-19 for cleaning equipment and/or cameras were reported by 79.44%. More than 50% of respondents have implemented additional PPE requirements for staff (84.62%), new cleaning protocols for equipment (81.38%), and checking patient temperature prior to a study or therapy (62.25%). In addition, 36.44% stated they were restricting time with patients, and 17% had mandatory COVID-19 testing of patients.
- Almost half (49.17%) have not converted or are not planning to convert to telemedicine options. Overall, 71.08% of respondents saw some level of in-person visits, ranging from 1%–25% of all in-person visits canceled. In an open-ended question, we asked about the top 3 clinical indications for those seen virtually. Trending among the answers submitted were: follow-up, chest pain, shortness of breath, and thyroid cancer.
- Almost half (49.79%) were planning to furlough, lay off, reduce hours for, or transition staff to part time employment.
- More than half (53.53%) have a plan in place to restart operations where these have come to a stop or been significantly reduced. Of these, 90.30% plan to limit the number of patients in the waiting room, 81.34% will require social distancing, 77.61% will implement new staff safety protocols, and 60.45% will require a higher level of PPE upon reopening. More than half of respondents say they see the major barriers to restarting practice or operations as a lack of patient confidence (54.47%) and the ongoing nature of the pandemic

(52.34%). In addition, 36.60% believe that implementing social distancing guidelines will be an issue.

- When asked about the creation of new patient information/education resources specific to COVID-19, respondents indicated that their institutions have created guidelines (63.40%) and informational flyers (44.26%). An additional 29.36% had created videos for patients, with 16.17% stating they have not created any new patient resources. This information is mainly being disseminated through institutional websites (61.28%) or phone calls (48.51%), with 39.57% using social media and 30.21% using email to share these resources with patients.
- For SNMMI members in the United States, 63.76% were aware of the Coronavirus Aid, Relief, and Economic Security (CARES) Act (1 and 2). More than half stated they did not take advantage of any available benefits (54.15%), but 22.27% have done so; 23.58% of domestic members reported they were unaware of the CARES Act 1 or 2.

Survey Results: Impact of COVID-19 on NMMI Research

In addition to its effect on the medical community in the clinical setting, the COVID-19 pandemic is causing significant disruption to NMMI research efforts, with many projects being discontinued or severely delayed. A sustained downturn in molecular imaging research will slow scientific discovery and resulting enhancements for medical care for patients, including those with cancer, heart disease, and neurologic disorders, and ultimately prevent or delay the availability of new diagnostics and therapeutics. The SNMMI Research and Discovery Domain conducted a survey of institutions to determine the scope of this disruption. The survey was launched on May 5, in conjunction with the SNMMI COVID-19 Task Force Survey on Clinical Practice, which closed on June 12. Targets included all SNMMI members and sites listed in the Clinical Trials Network database. A total of 55 responses were received representing 10 countries (including the U.S., with 24 states). Respondents reported their departments/divisions as radiology (21), nuclear medicine (19), imaging, molecular imaging (5), science centers (4), and clinical (cardiology, diagnostic PET; 3). Respondents' reported lab types were radiochemistry (17), clinical (15), imaging (13), small animal imaging (11), PET/CT (9), research (7), MRI (4), lab (not specified; 4), hospital (4), nuclear medicine (4), and cyclotron (3). Key findings from the NMMI Research survey are summarized here.

- 79% of sites stopped or limited molecular imaging/nuclear medicine research because of COVID-19; 9% did not stop or limit research, and 12% answered "Other," with comments referencing very limited capacity for 7 weeks, all nonessential studies including clinical research stopped, delayed phase 3 study initiation, and all activities stopped that could not be done remotely. Changes imple-

mented included 61% stopping diagnostic imaging, 29% stopping radiotherapy, 69% stopping preclinical research, and 67% stopping basic research.

- 47% of sites stopped all diagnostic clinical research, 23% stopped new patient enrollment, 6% reported no changes to diagnostic imaging research, and 25% of sites answered "Other," with comments referencing imaging during shutdown only when critical to patient treatment, stopping all human research that did not directly benefit patients, and continuing only research with a substantial standard-of-care component.
- 33% of sites stopped all radiotherapy clinical research, 16% stopped new patient enrollment, 19% reported no changes to radiotherapy research, and 32% answered "Other," with 1 site decreasing radiotherapy patients by 50%. Thirteen sites reported that they do not perform radiotherapy research.
- 48% of sites stopped all basic research, 28% reported decreased hours or staffing, and 24% answered "Other," with comments including stopping non-COVID research except for projects in which discontinuation would result in significant loss of data, stopping all non-COVID research, and stopping lab work while data analyses and reporting continued. Nine sites reported that they do not perform basic research.
- 87.5% of respondents observed no shortages in supplies such as radionuclides or radiopharmaceuticals; 12.5% reported shortages of generators, supply kits, ^{89}Zr , or ^{177}Lu -edotreotide; and 2 respondents reported that research PET tracer production was stopped at their sites.
- When asked if sites anticipated terminating research positions because of funding concerns, 43% of respondents were not sure, 41% anticipated no terminations, and 9% expected terminations. Of the 7% who answered "Other," 2 reported no research positions in the department, 1 reported furloughs, and 1 reported that the Payroll Protection Program had helped.
- 64% of sites reported that they will delay a planned capital purchase (scanner, new lab instrumentation, etc.), 13% will cancel a planned purchase, 7.7% reported no planned changes, and 5% reported no current plans for purchase. One comment noted overall budget cuts.
- 47% of sites do not anticipate having to permanently stop projects because of funding concerns, 42% are not sure, and 11% anticipate permanent project stoppage.
- Of the 24 sites that will resume diagnostic clinical research, 7 restarted in May, 3 were planned for June, 6 for July, 4 in 3 months, 2 in 6 months, and 2 have not decided. Of the 12 sites restarting radiotherapy research, 3 started in May, 2 were planned for June, 2 for July, 3 in 3 months, 1 in 6–12 months, and 1 was unknown. Of 26 sites restarting preclinical research, 4 started in May, 10 were planned for June, 3 for July, 5 for 3 months,

1 in 6–12 months, and 3 were unknown. 85% stated that the hospital or university will make the decision, for 5.7% the facility manager will decide, for 3.8% the department, and for 1.9% the lab director. One site reported that the government will make the decision to resume research, and in another the decision will be joint.

- 59% of researchers reported that the slow down/stoppage will affect their ability to submit abstracts to SNMMI or other professional meetings in 2021, 31% predicted no effect, and 6% were unsure.
- When asked what SNMMI can do to support research, 65% answered appeal to the National Institutes of Health (NIH) for additional funding, 63% recommended lobbying Congress for additional funding, and 39.5% replied “Other,” with 4 citing the need for guidelines for resuming studies, 4 international sites indicating their belief that little could be done, 2 sites suggesting lobbying NIH for fund carryover allowances, 2 recommending lobbying pharma/biotech companies, 1 asking for elimination of meeting abstract submission fees, and 1 asking for support for N95 masks.

Additional relevant comments in this research survey included: an appeal for additional funding in scholarships to help in the current pandemic; the observation that many research patients are at high risk for COVID-19 and thus are not coming to the hospital; and challenges in sufficient PPE to resume operations, in supplies of cell lines and animal models, and in availability of isotopes as a result of a surge in demand.

SNMMI Member Survey on COVID-19

Resources

In addition to evaluating the impact of COVID-19 on clinical practice and medical research, the SNMMI COVID-19 Task Force also sought feedback on how the society is meeting its obligation to serve members’ needs during the COVID-19 pandemic. This survey was designed to evaluate how the pandemic has affected the professional lives of individual members, the use of COVID-19 resources, and ways in which SNMMI can better support its overall membership. The electronic survey was launched on June 4 and was open for a standard 2-week window. Targets included all active SNMMI members with a valid email on file (~12,000). We received 411 responses (roughly a 3.4% response rate), representing 32 different countries and including 43 states or U.S. territories. Respondents identified themselves as technologists (58.01%), physicians (21.78%), scientists (6.30%), physician/scientists (4.20%), and industry representatives (3.15%). Workplaces included medical centers (23.88%), academic institutions (22.83%), non-university-affiliated hospitals (12.86%), free-standing imaging facilities (8.92%), and university-affiliated medical centers (8.92%). Key findings from the SNMMI Member Survey on COVID-19 Resources are summarized here.

- When asked to rank how well the society is meeting its obligation to serve members’ needs during the pandemic (scale: 1 = poor to 10 = excellent), the average score was 8. This included more than 50% selecting a ranking of 9 (20.7%) or 10 (30.9%). Of those surveyed, only 41 selected a ranking of ≤ 5 . These results suggest above average satisfaction with SNMMI service during the COVID-19 pandemic.
- Of surveyed members, 88.08% are still employed in their current capacity, but 27.07% have been furloughed, laid off, had their hours reduced, or transitioned to part-time work as a result of the pandemic.
- Of those surveyed, 38.90% had planned to attend the in-person SNMMI 2020 Annual Meeting and 67.75% planned at the time of the survey to attend the SNMMI 2020 Annual Meeting Virtual Edition. Most surveyed members (79.70%) believed the Virtual Edition would meet their educational requirements, with <10% (8.52%) anticipating that it would not. Respondents reported plans to attend major virtual meetings or webinars from the American Association for Cancer Research, American Healthcare Radiology Administrators, American Society of Nuclear Cardiology, the European Association of Nuclear Medicine, the European Congress of Radiology, the Radiological Society of North America, and the World Molecular Imaging Congress, among others.
- More than half (51.77%) were unsure when they would be permitted to attend an in-person conference or had no specific timeframe for doing so. Less than 10% (9.09%) believed it would be within the next 3–6 months and only 15.40% within the next 6–9 months. 23.74% believed they will be permitted to travel to in-person events within 9–12 months. The 2 main factors prohibiting future travel included institutional travel restrictions (32.07%) and federal/state/local travel restrictions (32.07%). 42.93% are also unclear whether their departments or institutions will have funding for education or meetings next year, with 30.81% predicting they will not.
- 40.76% of respondents had visited the online SNMMI COVID-19 Resource Center; 48.61% had not. 10.63% indicated that they were unaware of this resource.
- 69.54% of respondents have implemented new clinical guidelines or best practices as a result of COVID-19, with the 2 main resources being government agencies (59.93%) and SNMMI (48.43%). Few respondents (6.12%) had additional questions related to specific nuclear medicine procedures and COVID-19 that had not been covered by new protocols or guidelines. Open-ended responses mainly included issues with ventilation and treadmills.
- No trending responses were noted to open-ended questions about what else the society can do to support members during this time.

(Continued on page 21N)

and make them interesting and understandable was widely acknowledged, including in a memorable TEDx lecture at Stanford.

Most scientists and physicians knew Dr. Gambhir through his scientific publications. We were fortunate to know him through direct interactions. He was always a gentleman, modest, thoughtful, sensitive, gracious, and generous. Sam Gambhir will be greatly missed, and we mourn with Aruna. We lost a beloved colleague, a mentor and friend, a wonderful human being, and an incredible scientist. Humanity lost a giant who had so much more to contribute toward a better world. For so many of us, Sam was the reason we

chose this field and the motivation to be at Stanford. He will be remembered dearly by all who met him, through the immense body of his published work, the worldwide network of research and clinical scientists he trained and nurtured, and the just established Sanjiv “Sam” Gambhir Professorship of Translational Medicine at Stanford University.

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Professor

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(Continued from page 19N)

Discussion

The goal in surveying the NMMI community was to identify variables impacting clinical practice, medical research, and members’ workforce environments and to disseminate this knowledge and experience. The pandemic will have evolved at the time these results are published, but the survey findings emphasize the profound manner in which COVID-19 has affected the NMMI community. Respondents highlighted the workflow and operational changes that will remain necessary to protect the safety of staff and patients and to ensure quality care. Whether locations experience minor rates of disease or severe outbreaks, all will look to understand the variables

that can be more efficiently managed to improve readiness for potential future outbreaks. A dynamic practice management plan specific to a region’s current status and experience must address the morbidity and mortality associated with COVID-19, the disruption of lives, the financial instability of the health care system, as well as the effects of disease progression associated with delayed medical care. Such a management plan strengthens a practice’s ability to operate with an expedient strategy to handle the unpredictable severity, mortality, and rates of infection and recovery with COVID-19 or other pandemics and to be better prepared to preserve and restore the financial aspect of the practice.