

---

# Fusion Imaging: A New Type of Technologist For a New Type of Technology

*The following statement was issued by the PET-CT Consensus Conference held July 31 in New Orleans, LA, and jointly sponsored by the SNMTS and the American Society of Radiologic Technologists (ASRT).*

**F**rom advances in x-ray film and cassettes to the introduction of computers and digital images, diagnostic imaging has never stopped reinventing its technology to improve patient care. Today, diagnostic imaging is on the cusp of explosive growth in an arena known as fusion imaging. This technology melds two independent imaging modalities—typically a procedure that demonstrates an organ's function with one that depicts the organ's anatomy—to produce a diagnostically and clinically superior study.

Nuclear medicine procedures such as positron emission tomography (PET) and single photon emission computerized tomography (SPECT) are unparalleled in their ability to assess information about metabolic function, while Computerized Tomography (CT) and Magnetic Resonance (MR) are superior at depicting anatomy. Until recently, clinicians had to obtain physiological and anatomical information on separate machines and use special registration software to digitally superimpose the two images. Today, new hybrid equipment is capable of performing both types of examinations simultaneously, automatically merging the data to form a composite image. By uniting metabolic function with anatomic form, fusion imaging depicts the human body with a level of precision never before achievable.

The first commercial system to combine functional and anatomic imaging capabilities was a SPECT-CT unit introduced commercially in 1998. In 1999, manufacturers began working on a hybrid PET-CT system, and the first commercial PET-CT unit was introduced in 2000. Today, four companies manufacture hybrid PET-CT systems—CPS Innovations, GE Medical Systems, Philips Medical Systems and Siemens Medical Solutions. Combined, these four companies had sold approximately 150 PET-CT units worldwide by mid-2002.

Although the number of PET-CT machines is small today, it is expected to increase in the next few years. In part, the demand will be driven by the technology's potential to revolutionize treatment planning for radiation therapy. New technology known as intensity modulated radiation therapy (IMRT) allows radiation therapists to deliver very high doses of cancer-killing radiation directly to cancerous tumors. A PET-CT scan gives radiation therapists a more

accurate anatomical reference point for IMRT procedures, telling them the functional size and shape of a tumor and showing them precisely where to target the beam of radiation. This ensures that the tumor receives the maximum amount of radiation possible while the healthy tissue surrounding the tumor is spared.

As the popularity of fusion imaging grows, questions have arisen concerning the education, qualifications and regulation of the personnel who operate hybrid equipment such as SPECT-CT and PET-CT machines. On July 31, 2002, the Society of Nuclear Medicine Technologist Section (SNMTS) and the American Society of Radiologic Technologists (ASRT) convened a consensus conference to discuss the personnel issues involved in performing fusion imaging. Conference participants included technologists, physicians, and educators, as well as representatives from state regulatory agencies, companies that manufacture hybrid-imaging equipment, and radiopharmaceutical suppliers, educational accreditation agencies, certification bodies, and professional associations.

The goal of the conference was to develop specific recommendations for the education and regulation of personnel who operate hybrid imaging equipment. By offering these recommendations in the form of consensus statements, conference participants hope to ensure safe, high quality care for all patients who undergo fusion-imaging examinations. Each consensus statement is presented below, accompanied by relevant discussion that took place at the July 31 meeting.

Because PET-CT currently is the most widely used type of hybrid imaging equipment, the consensus statements focus on personnel who operate PET-CT units. However, group members believe their recommendations might also be applied to personnel who operate other types of multi-modality imaging equipment.

## **Consensus Statement Number 1**

### **Personnel Qualified to Operate PET-CT Equipment**

*Any registered radiographer with the credential RT(R), registered radiation therapist with the credential RT(T), or registered nuclear medicine technologist with the credentials RT(N) or CNMT may operate PET-CT equipment after*

*obtaining appropriate additional education or training and demonstrating competency. It is acknowledged that some individuals will require more extensive additional education and training than others. A task force appointed by the American Society of Radiologic Technologists and the Society of Nuclear Medicine Technologist Section will determine appropriate levels of education or training. The task force will use the results of a task analysis to identify core competencies for operators of PET-CT equipment, review and evaluate existing operator training materials, outline a formal course of study for PET-CT technologists, and recommend appropriate methods for delivering the educational content.*

#### **Discussion Concerning Consensus Statement Number 1**

Ideally, technologists operating a hybrid PET-CT unit would be a hybrid themselves, credentialed in both CT and nuclear medicine. However, fewer than 5,000 people nationwide are registered in radiography by the American Registry of Radiologic Technologists (ARRT) and registered in nuclear medicine technology by the ARRT or by the Nuclear Medicine Technology Certification Board (NMTCB). An even smaller number, less than 200, are ARRT- or NMTCB-registered nuclear medicine technologists who are also credentialed in CT through a specialty examination offered by the ARRT. As a result, a variety of personnel are operating PET-CT units. Although anecdotal reports suggest that the majority of equipment users are registered nuclear medicine technologists, the machines also are being operated by registered radiographers with or without credentials in CT, by registered radiation therapists, and by other personnel, both registered and unregistered.

Because so few technologists are credentialed in both radiography and nuclear medicine, and even fewer are credentialed in CT and nuclear medicine, conference participants did not believe it would be reasonable to demand dual certification for operators of PET-CT equipment at this point. To do so would limit patient access to this valuable technology. Instead, they recommended that multiple pathways be created to educate or train registered nuclear medicine technologists, radiographers, and radiation therapists to operate PET-CT equipment.

Conference participants acknowledged that each individual will require varying amounts of additional education, depending upon his or her background, skills, and experience. For this reason, participants asked the ASRT and SNMTS to form a task force to identify core competencies that any operator of PET-CT equipment must possess. The task force then will recommend a professional course of study for PET-CT that focuses on providing quality examinations while reducing radiation dose to patients.

Currently, the manufacturers of PET-CT equipment provide the majority of education and training for operators of the equipment. As the modality matures, however, it is expected that natural market forces will lead to the development of more formalized training programs and educa-

tional models. Participants at the consensus conference noted that future instruction in PET-CT will need to follow a professional course of study that focuses not only on the technology and the examination, but also on patient care and patient management.

#### **Consensus Statement Number 2**

##### **Regulation of Personnel Who Operate PET-CT Equipment**

*States that license radiographers, nuclear medicine technologists, or radiation therapists are encouraged to amend their regulations to permit any of these individuals to perform PET-CT examinations after they have received appropriate additional education or training and demonstrated competency. States that do not currently license radiographers, nuclear medicine technologists, or radiation therapists are encouraged to adopt laws that regulate the education and credentialing of these individuals. The Consumer Assurance of Radiologic Excellence bill, a federal legislative proposal, may be used as a model for state statutes governing the regulation of personnel who plan and deliver radiation therapy and perform any diagnostic imaging examinations except medical ultrasound.*

#### **Discussion Concerning Consensus Statement Number Two**

Licensure laws for imaging technologists and radiation therapists vary from state to state. Currently, 38 states fully or partially license radiographers, 28 states fully or partially license radiation therapists, and 21 states fully or partially license nuclear medicine technologists.

Licensure is designed to protect the public by ensuring that only qualified individuals engage in a given occupation or profession. State licensure of radiologic technologists, radiation therapists, and nuclear medicine technologists ensures that these individuals possess a basic level of education, knowledge, and skill. However, many of the state licensure laws are not prepared to deal with personnel who use multimodality equipment such as PET-CT. For example, some states require that people operating PET-CT equipment possess dual certification in nuclear medicine and radiography—a very rare type of individual in some areas of the country. If a dually certified individual is not available, then these states require that two technologists be present to operate the PET-CT equipment—one who is licensed in nuclear medicine to oversee the PET portion of the examination and one who is licensed in radiography to oversee the CT portion of the examinations. With today's personnel shortages, it is inefficient to require two people to perform a job that could be accomplished by one. Requiring that technologists possess dual certification or that two technologists be present for PET-CT examinations could limit patient access to PET-CT if use of the technology increases dramatically.

Consensus conference participants recommended that licensure of PET-CT personnel be uniform across the states. They noted that enactment of the proposed Consumer As-

insurance of Radiologic Excellence bill, introduced in Congress last year, would provide a minimum regulatory standard for all personnel who plan and deliver radiation therapy and perform any type of diagnostic imaging examination except medical ultrasound. Until the CARE bill is enacted, however, the group urged the states to act individually to adopt the recommendations offered in this consensus paper concerning personnel qualifications and regulation.

In addition, professional societies such as the ASRT and the SNMTS also should review their own position statements, standards, and other documents to bring them into line with the recommendations of the consensus conference.

## CONCLUSION

The primary responsibility of an individual operating any type of medical imaging equipment is to obtain the best image quality while delivering the smallest radiation dose possible. For hybrid imaging examinations such as PET-CT, the technologist must be competent in every aspect of the examination, not just one component of it, in order to maximize quality and minimize dose. Quality patient care hinges upon the qualifications of the person performing the procedure.

Hybrid technology has the potential to revolutionize medicine. However, in our rush to embrace fusion imaging, we must not lose sight of the ultimate users of this technology: our patients. They expect and deserve safe, accurate examinations provided by skilled, competent caregivers. The consensus statements developed at the PET-CT Consensus Conference and presented in this paper are a first step toward guaranteeing patients that the personnel involved in the exciting new world of fusion imaging are properly educated and qualified.

## Conference Participants

Facilitator; Mickey Clarke, CNMT, FSNMTS  
Immediate Past President, Society of Nuclear Medicine Technologist Section

Anne C. Chapman, RT(R)(N), CNMT  
Director of Radiology/Diagnostic Cardiology, Immanuel St. Joseph's, Mayo Health System, Mankato, MN  
Trustee, American Registry of Radiologic Technologists

John S. Cowan, MS, CPA  
Fiscal Officer, Joint Review Committee on Educational Programs in Nuclear Medicine Technology, Polson, MT

Elaine J. Cuklanz, MS, MT(ASCP)NM  
Executive Director, Joint Review Committee on Educational Programs in Nuclear Medicine Technology, Polson, MT

Doug Darrow  
Product Sales Manager-PET, Siemens Medical Solutions Inc., Iselin, NJ

Lynne Fairbent  
Director of Federal Programs, American College of Radiology, Reston, VA

James Futch  
Administrator, Radiologic Technologist Certification Program, Florida Department of Health, Tallahassee, FL

John Gray, RT(R)  
Executive Director, Arizona Board of Medical Radiologic Technology, Phoenix, AZ

Joanne Greathouse, EdS, RT(R), FASRT, FAERS  
Chief Executive Officer, Joint Review Committee on Education in Radiologic Technology, Chicago, IL

Paul Hanson  
CTI Molecular Imaging Inc., Knoxville, TN

Scott Holbrook, BS, CNMT  
PET.NET Pharmaceuticals, Knoxville, TN  
Chairman, Society of Nuclear Medicine Technologist Section PET Education Task Force

Frances Keech, MBA, RT(N)  
Director, Nuclear Medicine Program, Massachusetts College of Pharmacy and Health Sciences, Boston, MA  
President, Society of Nuclear Medicine Technologist Section

Tony Knight, CNMT  
Program Director, Nuclear Medicine Technology, University of Iowa, Iowa City, IA  
Chairman, Nuclear Medicine Technology Certification Board

Carolyn Richards MacFarlane, BS, CNMT, RT(N)  
Nuclear Medicine Accreditation, American College of Radiology, Reston, VA

Alan Maurer, MD  
Immediate Past President, Society of Nuclear Medicine

Lynn May  
Chief Executive Officer, American Society of Radiologic Technologists, Albuquerque, NM

Ken Maynard  
Manager of International Programs, Society of Nuclear Medicine, Reston, VA

Lyn M. Mehlberg, BS, CNMT, FSNMTS  
Regional Quality Improvement Coordinator, Department of Imaging Services, St Luke's Medical Center, Milwaukee, WI  
President-elect, Society of Nuclear Medicine Technologist Section

Greg Morrison, MA, RT(R), CNMT  
Executive Vice President and Chief Knowledge Officer, American Society of Radiologic Technologists, Albuquerque, NM

Donna Newman, BA, RT(R), CNMT  
Nuclear Medicine Technologist, MeritCare Medical, Fargo, ND  
President, American Society of Radiologic Technologists

Virginia Pappas  
Executive Director, Society of Nuclear Medicine, Reston, VA

Kevin Powers, EdS, RT(R)(M)  
Director of Education, American Society of Radiologic Technologists, Albuquerque, NM

Jerry Reid, PhD  
Executive Director, American Registry of Radiologic Technologists, St Paul, MN

Nilda Rivera  
Marketing Manager, Radiopharmacy-Masters Education, GE Medical Systems, Waukesha, WI

Ellen Thomas, BS, CNMT, RT(N)  
Manager, New Orleans Regional PET Center, New Orleans, LA

Immediate Past Chairman, Nuclear Medicine Technology Certification Board

Kristen Waterstram-Rich, MS, CNMT, NCT  
Associate Professor and Director, Nuclear Medicine Technology Program, Rochester Institute of Technology, Rochester, NY

Past President, Society of Nuclear Medicine Technologist Section

Chairman-elect, Nuclear Medicine Technology Certification Board

Jennifer White  
Operational Training Leader, CPS Innovations, Knoxville, TN



The Technologist  
Section of the  
Society of  
Nuclear  
Medicine