NUCLEAR MEDICINE PRACTICE ACCREDITATION

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TOPICS

ACR Nuclear Medicine Practice Accreditation Program
Society of Nuclear Medicine Practice Accreditation Program
Intersocietal Commission for the Accreditation of Nuclear Medicine Laboratories (ICANL) Practice Accreditation Program
INTRODUCTION

There is considerable variation in the maintenance of nuclear medicine imaging instrumentation.

Some facilities use a preventive maintenance program provided by vendors.

Other facilities use a periodic testing program set up by medical physicists or “super” technologists.
MISC QC FILMS
INTRODUCTION

There is considerable variation in the maintenance of nuclear medicine imaging instrumentation.

Some facilities use a preventive maintenance program provided by vendors.

Other facilities use a periodic testing program set up by medical physicists or “super” technologists.
The key element in quality assurance testing is determining the action that is needed.

“A routine QC program must include a sufficiently comprehensive suite of individual measurements to ensure adequate sensitivity to detection of detrimental changes in performance. At the same time, the criteria used to judge the outcome of routine QC must not be so strict as to misleadingly identify insignificant changes as important.”

“... a routine ... (SPECT) QC program should give technologists and clinicians the data with which to decide whether:

- to image patients normally, or
- to image patients while putting in a call to have the system serviced, or
- to put off imaging patients until the system has been serviced and fixed.”


**Suggested edition:** Personnel should correct this problem the next time service is requested for any other reason
Third-Party Payers

Beginning to recognize importance of image quality

United Healthcare of Wisconsin will require outpatient facilities that provide Nuclear Cardiology Services be accredited by ICANL effective July 1, 2003

United stated that accreditation is “an important mechanism for setting objective standards of quality.”
Facilities involved in legal action and which are not accredited, or that do not have programs for managing medical equipment, will be at a disadvantage.
ACR NUCLEAR MEDICINE PRACTICE ACCREDITATION PROGRAM

ACR Committee formed in 1996 under direction of Ronald Van Heertum, M.D. at Columbia University Medical Center

Initial committee included two medical physicists but was later expanded to four members

The physics subcommittee developed parts of application dealing with regulations and quality control, and produced a program for evaluating the performance of imaging equipment
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ELEMENTS - Personnel Qualifications

Physicians - Trained, Board certified

Medical Physicists - Board certified (Medical Nuclear Physics or Radiological Physics), Continuing Education in accordance with ACR Standard

Properly trained individuals can assist in acquiring test data if approved by the medical physicist

Medical physicist must be present during initial and annual surveys, approve all data and provide signed report
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ELEMENTS - Clinical Data and Images

Facilities must submit complete patient studies and written reports and protocols

Clinical Test Image Data Sheets must be completed

Two different examination types must be submitted for each “Module”

Module 1 - Planar
Module 2 - SPECT
Module 3 - Nuclear cardiology
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ELEMENTS - Facility Performance Tests

Quality Control Tests

Must be performed by technologists at the frequency specified in the application

- Intrinsic or system uniformity - each day of use
- Intrinsic or system resolution - weekly
- COR or detector registration - as recommended by a Qualified Medical Physicist

Usual tests for dose calibrators and counting instruments
Facility Performance Tests - cont.

Protocols for QC tests should include action levels

As part of annual survey the qualified medical physicist should meet with the supervising physician and the QC technologist(s)

Qualified Medical Physicist **must** perform acceptance tests

Tests **may** be performed by qualified nuclear medicine technologist or medical physicist-in-training under direct supervision by the medical physicist
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Facility Performance Tests - cont.

Qualified Medical Physicist must perform comprehensive QA tests at least annually.

Intrinsic and system uniformity, intrinsic or system spatial resolution, intrinsic or system sensitivity, energy resolution, count rate performance, multiple window spatial registration, formatter/video display, overall system performance for SPECT systems, and checks of system interlocks and safety devices.
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Phantom Images Required By ACR

Planar only systems

Intrinsic or system uniformity - Tc-99m or Co-57 and TI-201 or Ga-67

Intrinsic or system spatial resolution Tc-99m or Co-57 and TI-201 or Ga-67

SPECT systems

Intrinsic or system uniformity as for planar systems

Planar spatial resolution by imaging ACR-approved SPECT phantom placed directly on collimator (Tc-99m and TI-201 or Ga-67)
INTRINSIC SETUP FOR DUAL HEAD SYSTEMS

5 times maximum crystal dimension

ADAC, Marconi Axis

Siemens e.cam, SMV
INTRINSIC SETUP FOR TRIPLE HEAD SYSTEMS

Source at 5 times maximum detector dimension

Picker 3000, Marconi Irix

Marconi Irix (Head one only)
INTRINSIC UNIFORMITY

Tc-99m

TI-201
Tc-99m INTRINSIC SPATIAL RESOL’N
(PLANAR SYSTEMS ONLY)
INTRINSIC UNIFORMITY

Tc-99m  TI-201
Tc-99m INTRINSIC SPATIAL RESOLUTION
INTRINSIC UNIFORMITY

Tc-99m

TI-201
CORRECTED & UNCORRECTED INTRINSIC UNIFORMITY

Corrected Tc-99m

Uncorrected Ti-201

Uncorrected Ga-67
Co-57 & FILLABLE FLOOD
UNMIXED TC-99M
FILLABLE FLOOD
Phantom Images Required By ACR

Planar only systems
- Intrinsic or system uniformity - Tc-99m and TI-201 or Ga-67
- Intrinsic or system spatial resolution Tc-99m and TI-201 or Ga-67

SPECT systems
- Intrinsic or system uniformity as for planar systems
- Planar spatial resolution by imaging ACR-approved SPECT phantom placed directly on collimator (Tc-99m and TI-201 or Ga-67)
SPECT SYSTEM -
Tc-99m SYSTEM PLANAR UNIFORMITY

Head One

Head Two

Tc-99m
SPECT SYSTEM - SYSTEM PLANAR UNIFORMITY
Phantom Images Required By ACR

Planar only systems
- Intrinsic or system uniformity - Tc-99m and TI-201 or Ga-67
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SPECT systems
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ACR PHANTOM - PLANAR RESOL’N
SPECT SYSTEM -
SYSTEM PLANAR RESOLUTION

Head One

Head Two

Tc-99m
Phantom Images Required By ACR - cont.

SPECT systems - cont.

Overall SPECT Performance (acquisition, processing and hard copy are specified)

Set of all reconstructed images

Tomographic uniformity (2 cm thick uniform section)

Tomographic spatial resolution (5 cm thick section of cold rods)

Tomographic contrast (2 slice thick section centered on cold spheres)
OVERALL PERFORMANCE
SPECT PHANTOM
ACR PHANTOM SETUP
ACR PHANTOM (Tc-99m): SLICES 34 - 49
Phantom Images Required By ACR - cont.

SPECT systems - cont.

Overall SPECT Performance (acquisition, processing and hard copy are specified)

Set of all reconstructed images

Tomographic uniformity (2 cm thick uniform section)

Tomographic spatial resolution (5 cm thick section of cold rods)

Tomographic contrast (2 slice thick section centered on cold spheres)
ACR PHANTOM (TI-201): SLICES 1 - 16
ACR PHANTOM (TI-201): SLICES 17 - 32
SPECT SYSTEM - SYSTEM PLANAR UNIFORMITY

Head One
Tc-99m

Head Two
SPECT SYSTEM - SYSTEM PLANAR UNIFORMITY

Head One

Head Two

TI-201
SPECT SYSTEM - PLANAR SPATIAL RESOLUTION

Head Two
Tc-99m

Head Two
TI-201
ACR PHANTOM (Tc-99m): SLICES 33 - 48
SPECT SYSTEM - SPATIAL RESOLUTION

Head Two - Planar Tc-99m

Both Heads - SPECT Tc-99m
ACR PHANTOM (TI-201)

UNIFORMITY
104-17

CONTRAST
104-18

RESOLUTION
104-16
SPECT SYSTEM - SYSTEM SPATIAL RESOLUTION

Head Two - Planar TI-201

Both Heads - SPECT TI-201
ACR PHANTOM PROJECTION DATA
ACR PHANTOM PROJECTION DATA
ACR PHANTOM (Tc-99m): SLICES 5 - 16
ACR PHANTOM (Tc-99m): SLICES 5 - 16
ACR PHANTOM (Tc-99m): SLICES 37 - 44
ACR PHANTOM (Tc-99m)

- SPECT UNIFORMITY
- SPECT CONTRAST
- SPECT RESOLUTION
- PLANAR RESOLUTION
ACR PHANTOM (Tc-99m)

SPECT UNIFORMITY

SPECT CONTRAST

SPECT RESOLUTION

PLANAR RESOLUTION
ACR INTRINSIC UNIFORMITY

Tc-99m

117-1

TI-201
SPECT SYSTEM - PLANAR SPATIAL RESOLUTION

Tc-99m

TI-201
ACR PHANTOM (Tc-99m)

SPECT UNIFORMITY

SPECT CONTRAST

SPECT RESOLUTION

PLANAR RESOLUTION
INCORRECT AUTOMATIC ATTENUATION CORRECTION BOUNDARY
EFFECT OF INCORRECT BOUNDARY
SPECT SYSTEM

TI-201 INTRINSIC UNIFORMITY

ACR PHANTOM TI-201 SPATIAL RESOLUTION
ACR PHANTOM (TI-201): SLICES 52 - 63
ACR PHANTOM (TI-201)

120-18 SPECT UNIFORMITY

120-19 SPECT CONTRAST

120-17 SPECT RESOLUTION

120-6 ACR PLANAR RESOLUTION
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Evaluation of the Applications - General Description

Clinical and phantom images for each camera are submitted to a review panel of physicians and medical physicists, respectively.

The final report includes specific assessments and recommendations.

3-year accreditation is given to successful applicants.

A certificate and machine label are provided for each approved camera specific to the types of exams that can be performed.
Evaluation of the Applications - General Description - cont.

Facilities that fail

Specific recommendations for improvement are made

Individual cameras that fail cannot be used at an accredited site.
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Evaluation of Phantom Images

ACR Phantom is based on a phantom that is commonly used but the choice should not be considered as an endorsement.

All images are scored using one of five terms - excellent, good, satisfactory, marginal, and fail (descriptors are used for each term).

Intrinsic and system uniformity variations in image intensity due to incorrect balance of the PM tubes, as well as CRT or video or/and formatter artifacts are considered.

The type of resolution pattern is considered in the evaluation.
Fee for Accreditation

Facility fee $650.00
Each Additional Facility $550.00
Per camera:
   One module $300.00
   Two modules $600.00
   Three modules $900.00

Re-Application After Deficiency

Only the procedure that was deficient must be re-submitted
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On-Site Reviews of Accredited Facilities

Random on-site surveys may be performed during accreditation period to validate consistent quality

Sites will be notified in advance

Survey team will include physician and physics reviewers and an ACR staff person
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Future Additions

- Development of a fourth Module on PET imaging is in progress
- Phantom is a modification of the phantom for Module 2 that includes “hot” cylinders
ACR SPECT/PET PHANTOM
AMERICAN COLLEGE OF NUCLEAR PHYSICIANS

Proficiency Testing Program (PTP)

ACNP produced a phantom that simulated various clinical conditions on semi-annual basis for many years

Program collected subscriber data on QC programs

Participants identified location(s) of defect(s) and provided clinical interpretation that would be consistent with the defect(s)

Also provided symptoms that might be observed
Proficiency Testing Program (PTP) - cont.

- Subscribers received individual report
- Also received summary critique that enabled them to compare their results to all other participants
- Critique included recommendations for future practice
Practice Accreditation Program and PTP

Applicants are reviewed on site by physicians and scientists trained and certified as inspectors.

Components: Staff qualifications, patient records and reports, procedure manual, facilities and equipment, QC, imaging processes, radiopharmaceutical handling, QMP, and bone densitometry.

Accreditation period: 3 years

PAP Fee: $3000
INTERSOCIETAL COMMISSION FOR THE ACCREDITATION OF NUCLEAR MEDICINE LABORATORIES (ICANL) PRACTICE ACCREDITATION PROGRAM (2000)

Societies

American Society of Nuclear Cardiology, Society of Nuclear Medicine, Society of Nuclear Medicine Technologists, American College of Cardiologists, ACNP, Institute of Clinical PET
Comparison of ICANL and ACR Programs

Wackers states that major difference is "... emphasis on the presence of laboratory- and camera-specific procedure protocols for each of the nuclear medicine examinations and on the submission and review of complete patient studies and reports."

ACR also requires complete patient studies

ICANL requires at least three PET studies

ACR PET program is now in "pilot" phase
Comparison of ICANL and ACR Programs - cont.

- ICANL grants accreditation by body system
- ACR focuses on the quality of submitted cases per camera
- Both ICANL and ACR accredit nuclear cardiology facilities
ICANL PRACTICE ACCREDITATION

Comparison of ICANL and ACR Programs - cont.

ICANL does not require acceptance tests or that annual quality assurance tests be performed or supervised by a medical physicist

ACR does have these requirements

ICANL does not require submission of SPECT phantom images but does accept them if done

ACR requires SPECT phantom images
Comparison of ICANL and ACR Programs - cont.

ICANL retains right to perform random on-site reviews and charges an administrative fee and travel expenses.

ACR retains right to perform random on-site reviews without charge.
CONCLUSION

- NM accreditation demonstrates to payers and regulatory agencies, and referring physicians, that the facility provides high-quality health care.

- Immediate and long-term benefit is patient confidence and peer recognition.

- Medical physicists play an important role in this process.