ACR Accreditation Update: Ultrasound

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Topics

- New QC sections in the ACR Ultrasound and Breast Ultrasound accreditation programs
  - What is new?
  - What is required?
  - What is not included?
- Example annual survey test methods and results
- Conclusions

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New QC sections in the ACR Ultrasound and Breast Ultrasound Accreditation Programs

- Under development and review for ≥2 years
  - Last revised April 9-10, 2014
  - Effective June 1, 2014
- Identical QC sections for both Ultrasound and Breast Ultrasound Accreditation Programs
Includes sections on
• Acceptance testing
• Annual survey
• Quality control testing (routine)
• Preventive maintenance

Most recent signed Annual Survey report must be included with applications for ACR (re)accreditation

Physicist involvement in the program is strongly recommended, but not required

Acceptance testing

• This is designated as an optional component of the program, although the value of acceptance testing is recognized in the document
• Testing should include all tests to be performed in subsequent annual surveys, but may be more comprehensive

Annual survey

• This is a required component of the program
• Specific tests are designated, some required and some optional
Annual survey tests

1. Physical and mechanical inspection
2. Image uniformity and artifact survey
3. Geometric accuracy **REQUIRED**
4. System sensitivity
5. US scanner electronic image display performance
6. Primary interpretation display performance
7. Contrast resolution
8. Spatial resolution
9. Evaluation of QC program **OPTIONAL**

- All scanners and probes in routine clinical use must be tested
- A signed report describing results must be provided to the practice
- Phantoms must be used for uniformity, sensitivity, and geometric accuracy tests
  - No specific phantoms are described
  - Commercial and custom phantoms are acceptable
- No specific test methods are required
- Subjective & objective methods are acceptable
  - No specific performance benchmarks or pass-fail criteria are provided

Example test methods and results
Physical and mechanical inspection

- Scanner
  - Wheel locks
  - Monitor bezel
  - Keyboard
  - Power cable
  - Probe ports
  - Ancillary equipment

- Probes
  - Face
  - Handle / housing
  - Cable connection to handle, strain relief
  - Cable
  - Connector

Image uniformity & artifact survey

- Most effective test for identifying problems
- Scan a uniform test object/phantom showing moving speckle
  - Inspect image while scanning
  - Process a clip to produce a median or mean image (AAPM)

- Assess artifact severity and needed action (clinical images)
Geometric accuracy:

- Measure known axial, lateral, and (reconstructed) elevational distances with scanner calipers or an automated program.

System sensitivity

- Common approaches
  - Visual DOP estimation
  - Calculation of DOP from SNR vs depth curve
    - IEC 61391-2

SNR vs DOP graph
Ultrasound scanner electronic image display performance

- Critical component of performance assessment: *Ultrasound scanner monitor is effectively a primary diagnostic display device*
- No requirements of specific tests

Primary interpretation display performance

- This most likely means PACS workstations
- Testing only required for diagnostic workstations used for US exam primary interpretation, and located at same facility as the US scanner
- No requirements of specific tests
- Inclusion of display testing results obtained by PACS team or biomed service group would be acceptable

According to the new ACR ultrasound QC requirements, which of the following tests is *not* required during the annual survey?

1. Sensitivity
2. Geometric accuracy
3. Spatial resolution
4. Physical and mechanical integrity
5. Image uniformity and artifact survey

- Sensitivity: 22%
- Geometric accuracy: 22%
- Spatial resolution: 6%
- Physical and mechanical integrity: 22%
- Image uniformity and artifact survey: 28%
According to the new ACR ultrasound QC requirements, which of the following tests is not required during the annual survey?

1. Sensitivity
2. Geometric accuracy
3. Spatial resolution
4. Physical and mechanical integrity
5. Image uniformity and artifact survey

The new ACR ultrasound QC requirements specify pass/fail criteria for which of the following evaluations?

1. Sensitivity
2. Geometric accuracy
3. Image uniformity and artifact survey
4. All of these
5. None of these

Reference: ACR ultrasound and breast ultrasound accreditation program requirements:
Routine quality control

- Routine QC is an optional (but recommended) component of the program
- Likely performed by a sonographer or service engineer

A subset of 5 of the annual tests are designated for routine QC
- Geometric accuracy is only needed for 3D or 4D probes, and is only checked in the elevational direction
- Test methods may be different than for annual survey, especially if a sonographer is performing them

What is the minimum number of annual routine ultrasound QC testing sessions?

15%  1. 4
11%  2. 3
11%  3. 2
15%  4. 1, plus the annual survey
4%   5. Routine QC is recommended but is not absolutely required
What is the minimum number of annual routine ultrasound QC testing sessions?

1. 4
2. 3
3. 2
4. 1, plus the annual survey
5. Routine QC is recommended but is not absolutely required

Preventive maintenance

- This is a **required** component of the program
- Must be performed by a qualified service engineer
- PMs must be documented
  - Corrective action addressing issues found during annual surveys must also be documented, and included with applications for ACR (re)accreditation

Conclusions

- New QC section for the ACR Ultrasound and Breast Ultrasound Accreditation Programs
  - Effective June 1, 2014
- This new QC program can be easily implemented with only minimal costs to the US practice
  - **Flexibility in the program makes physicist involvement critical to assure quality**
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