The Evolving Role of the Medical Physicist
Consulting, Coaching, and Creating a Culture of Quality

Angela Snyder, Ph.D.
October 12, 2018
Atirix sells the QC-Track® system for imaging QC

Enterprise device QC and credentials tracking

Attempted to make this applicable to everyone – but probably biased toward diagnostic
The Evolving Role of the Medical Physicist

DISCLOSURES

CONTRIBUTORS

- Patricia Collins, PhD, Diagnostic Medical Physicist, Department of Radiology & Medical Imaging, University of Virginia Health System
- Allen Goode, MS, Chief Diagnostic Medical Physicist, Department of Radiology & Medical Imaging, University of Virginia Health System
- Megan Baugher, R.T.(R)(US), Lead Ultrasound Technologist, Educational Resource Center, University of Virginia Health System
- Donna Stevens, MS, Imaging Physicist, Northwest Permanente
- Todd Anderson, MS, Senior Medical Physicist, Baptist Jacksonville, MD Anderson Cancer Center
- Steve Backes, President and CEO, Atirix Medical Systems
- Karen Backes, Senior Engineer, Quality Assurance, Atirix Medical Systems
- Rania Johnson, R.T.(R)(M)(QM), VP, Client Services, Atirix Medical Systems
The Evolving Role of the Medical Physicist

My contributors...

Patty Collins
Allen Goode
Megan Baugher
Donna Stevens
Todd Anderson
Steve
Karen
Rania
The Evolving Role of the Medical Physicist

Outline

- **Background**
  - Understanding your role as medical physicist

- **How to make a greater impact**
  - Analyze an opportunity for improvement
    - From compliance to Culture of Quality
  - Think like a consultant
    - Standardize
    - Optimize
    - Quantify
    - Engage
  - Coach your team toward a culture of quality
Understanding Your Role

Scope of Practice

The essential responsibility of the Qualified Medical Physicist’s clinical practice is to assure the safe and effective delivery of radiation to achieve a diagnostic or therapeutic result as prescribed in patient care. The medical physicist performs or supervises the technical aspects of procedures necessary to achieve this objective. The responsibilities of the medical physicist include: protection of the patient and others from potentially harmful or excessive radiation; establishment of adequate protocols to ensure accurate patient dosimetry; the measurement and characterization of radiation; the determination of delivered dose; advancement of procedures necessary to ensure image quality; development and direction of quality assurance programs; and assistance to other health care professionals in optimizing the balance between the beneficial and deleterious effects of radiation; and compliance with applicable federal and state regulations. Read more...

- Clinical safety and effectiveness
- Equipment performance and protocols
- Dose and shielding
- Quality and compliance
Understanding Your Role

Broad Areas of Opportunity

1. Practice precision in customization of care for individual patient.
2. Practice precision in reduced variability of care across patients.
3. Focus on both in-patient and out-patient care.
4. Optimize quality and patient safety.
5. Provide peer-review for plan of care.
6. Lead process improvement projects.
7. Incorporate in your practice the Value Equation.
8. Integrate your work in the ‘system context.’
10. Promote and use the data structures.
11. Use images quantitatively.

https://www.aapm.org/MedPhys30/articles/ClinicalGrowth.asp

Make a greater impact
Understanding Your Role

- Clinical, equipment, dose, and compliance evaluations
- Define on-going QC, accreditation assistance
- Champion change, process management and improvement
Outline

• Background
  – Understanding your role as medical physicist

• How to make a greater impact
  – Analyze an opportunity for improvement
    • From compliance to Culture of Quality
  – Think like a consultant
    • Standardize
    • Optimize
    • Quantify
    • Engage
  – Coach your team toward a culture of quality
Analyze an opportunity for improvement

**Ultrasound Equipment Quality Control**

- Annual physics evaluation
- Technologist QC oversight
- Per patient imaging workflow, esp. infection control for intra-cavity ultrasound probes
An evolving model for Quality Control:
Culture of Quality

Compliance Cycle

Culture of Quality
Analyze an opportunity for improvement: Ultrasound QC

Knowledge of the recommended or required test vs. Understanding why those tests are important
Analyze an opportunity:
US QC Knowledge of Requirements

“All the world now follows MQSA”

Dr. Stewart Bushong
Baylor Medical Center

“Medical Imaging: More Than Fifty Shades of Grey.”
AHRA Annual Conference
July 20, 2015

QC requirements continue to evolve both in scope and enforcement
All the world follows MQSA...

Device Quality Control

- Printers and Monitors
- Visual Checklist
- Mechanical
- Image Uniformity and Artifacts
- Geometric Accuracy
- Resolution
- Sensitivity/SNR
- Scaling
- Dose
The Evolving Role of the Medical Physicist

Analyze an opportunity: US QC Knowledge of Requirements

Ultrasound Specific Regulations

- **ACR Accreditation**
  - On-going QC? Optional/Recommended
  - Annual transducer QC? Yes...

- **AIUM**
  - Similar ACR with variations in frequency, responsibility, and enforcement

- **TJC**
  - Diagnostic Imaging Requirements?
    - No elements of performance **specific** to US but candidate for inspection per EC.02.04.03 “inspects, tests, maintains medical equipment”,...
  - Recent elevated interest in ultrasound driven by infection control
Dr. Browne on the impact of EC.02.03.04

- EC.02.04.03 “inspects, tests, maintains medical equipment” applies to **all** imaging equipment and could be an area for surveyor to review.
  - Not just CT, MR, PET, Nuc Med... **but also** US, FLUORO, DR, and diagnostic monitors

- It is up to the organization to determine the best way to accomplish this --- **“No TJC cookbook”**
  - “A criteria that is often used when evaluating is what expert guidance is being followed (CDC, **AAPM**, AMA etc.) or other justification for the program that is in place (risk analysis)”
“Improperly sterilized or HLD equipment – a growing problem”

Quick Safety, TJC Infection Control (IC) 02.02.01, May, 2017

• Per TJC Division of Health Care Improvement:
  – Standard **IC.02.02.01 Infection Control** requires organizations to reduce the risk of infections associated with medical equipment, devices and supplies.
  – From 2013 – 2016: Non-compliance rates are rising

• Per TJC Office of Quality and Patient Safety, findings at noncompliant organization include:
  – Lack of monitoring or documentation of sterilization or HLD of equipment
    • Makes it difficult to track the use of equipment on a specific patient
    • Complicates the patient notification process when an outbreak occurs
  – Equipment is spread throughout the facility and may be processed or stored in numerous locations,
    • Makes it difficult to track the equipment for documentation purposes.

Per TJC
... improperly sterilized or HLD equipment continues to be a frequently scored noncompliant standard — Infection Control (IC) 02.02.01.

The Joint Commission encourages leadership to carefully oversee these processes and ensure that staff is properly trained and has the resources needed to adequately perform these critical functions.
Analyze an opportunity:
US QC Understanding of Quality

- Having the knowledge and experience to:
  - Choose meaningful tests and schedules
  - Recognize and diagnose issues
- Identify and address systemic issues
  - e.g. transducer failure rates survey on the DXIMGMEDPHYS Diagnostic Imaging Physics List serve

An informal survey on the diagnostic physicist listserv in 2016 indicated a **10% failure rate** on transducer QC during yearly surveys
Analyze an opportunity for improvement: Ultrasound QC

Performance of the testing vs. Process of training and protocol checks to ensure accurate sustainable testing
Analyze an opportunity: US QC Performance

Ultrasound QC workflows

1. Base Unit Checklists
   - Weekly/monthly/quarterly checklists (technologist)

2. Transducer Phantom QC
   - Annual/semiannual/quarterly Phantom QC – may have additional base unit checks (physics/biomed)

3. Transducer HLD Traceability
   - HLD per exam tracking (technologist)

4. Accessory Monitoring
   - Checks performed on Clean Shield Cabinet etc. (technologist)
Analyze an opportunity: US QC Process

Process Questions

1. **Base Unit Checklists**
   - How do the technologists know what is an acceptable level of deterioration?
   - How is this passed on as new techs are added?

2. **Transducer Phantom QC**
   - When does a transducer fail (number of elements out, location of elements)?

3. **Transducer HLD Traceability**
   - How is the cleaning linked to the exam? Does this facilitate research should an adverse event occur?
   - Does this create a PHI risk?

4. **Accessory Monitoring**
   - Do all locations have the same accessories?
Analyze an opportunity for improvement: Ultrasound QC

Documentation of testing by recording status or data vs. Communication of trends, issues, and opportunities for coaching not just correction
The Evolving Role of the Medical Physicist

Analyze an opportunity: US QC Documentation

Documentation Options

- MQSA Device Quality Control
- Technologist and Interpreting Physician (IP) credentials
- Image Quality Reviews for IPs and RTs
- PM and Service documents
- Lead Interpreting Physician (LIP) Sign-off
- Physicist surveys

Angela Snyder, Ph.D., VP, Research

Copyright (c) 2018 Atirix Medical Systems, Inc.
Analyze an opportunity: US QC Communication

Active monitoring
• No missed failures
• Data trends
• Correct protocol and procedure
• Tests done on time

Opportunities for coaching
• Value and purpose of QC
• Predictive power
• Process improvement
• Reasoning behind frequency
The Evolving Role of the Medical Physicist

Outline

• **Background**
  – Understanding your role as medical physicist

• **How to make a greater impact**
  – Analyze an opportunity for improvement
    • From compliance to Culture of Quality
  – **Think like a consultant**
    • Standardize
    • Optimize
    • Quantify
    • Engage
  – Coach your team toward a culture of quality
Think like a consultant

Broad Areas of Opportunity

1. Practice precision in customization of care for individual patient.
2. Practice precision in reduced variability of care across patients.
3. Focus on both in-patient and out-patient care.
4. Optimize quality and patient safety.
5. Provide peer-review for plan of care.
6. Lead process improvement projects.
7. Incorporate in your practice the Value Equation.
8. Integrate your work in the ‘system context.’
10. Promote and use the data structures.
11. Use images quantitatively.

- Standardize
- Optimize
- Quantify
- Engage
Think like a consultant

- Standardize
- Optimize
- Quantify
- Engage

10 years of management consulting specializing in emerging technologies

Steve

14 years of management consulting specializing in banking merger integration and process improvement

Karen
Think like a consultant

- **Standardize**
  - Optimize
  - Quantify
  - Engage

- Managing multiple workflows is inefficient and can lead to discrepancies
  - Look for opportunities to change existing processes and standardize to a common workflow
    - Allows focus to be on quality of outcome rather than the approach
    - Ensures consistency
    - Reduces potential for error

1. Practice precision in customization of care for individual patient.
2. Practice precision in reduced variability of care across patients.
3. Focus on both in-patient and out-patient care

Karen
14 years of management consulting specializing in banking **merger** integration and process improvement
Think like a consultant

- Standardize
- Optimize
- Quantify
- Engage

- Understand the available technology
- Champion a solution that will increase efficiency
- Show the value that your solution will bring in terms of time/cost savings and/or risk reduction

Steve's 10 years of management consulting specializing in emerging technologies

“As a consultant, it was my job to apply new technologies for workflow improvements.”
Think like a consultant

- Standardize
- Optimize
- Quantify
- Engage

- It’s difficult to take data buried in paper and use it for management purposes
- When possible, use a model to estimate the real value of your solution

"If you can’t measure it, you can’t manage it."

Majored in Quantitative Methods and Information Systems

Steve

7. Incorporate in your practice the Value Equation.
10. Promote and use the data structures.
11. Use images quantitatively.
Think like a consultant

- Standardize
- Optimize
- Quantify
- Engage

medical physicist

“As a consultant, you have to convince a large group of people, none of whom report to you, to get on board with improved processes.”

Karen

- Help them understand the value to them, their organization and their patients
- Understand motivation
- Communicate your ideas clearly
- Engage the team

5. Provide peer-review for plan of care.
8. Integrate your work in the ‘system context.’
The Evolving Role of the Medical Physicist

Think like a consultant
- Standardize
- Optimize
- Quantify
- Engage

Ultrasound Equipment Quality Control
- Annual physics evaluation
- Technologist QC
- Per patient imaging workflow, esp. infection control
Think like a consultant: Standardization applied to US QC

Culture of Quality

- Communication
- Documentation
- Understanding
- Knowledge
- Performance
- Process

Knowledge of the recommended or required test vs. Understanding why those tests are important
Physicist Insight on Standardizing:

- **Donna Stevens**, DABR, Imaging Physicist, Northwest Permanente

**Context:**
- 33 base units and 225 probes
- AIUM, TJC
- Many locations (extra consistency challenge)
- Lead-tech-driven implementation of a structured QC system
- Opportunity to develop and implement **standardized** QC
Think like a consultant: Standardize

“I am primarily a consultant to the lead US techs who “own” the QC program.”

“It is important for the physicist to be able to “decipher” the US guidance document, understand the accrediting body requirements, and assist the techs in deciding which of the “Optional” measurements to include in their regular QC program.

- e.g. Determining accuracy of horizontal and vertical distances is an optional test; however, these measurements are very important in obstetrics, for example. Therefore, the techs should be interested in demonstrating that the US system is producing accurate measurements.”

“This document is written by physicists for physicists, so a “bridge” is needed.”

- Donna Stevens, DABR
Think like a consultant: Standardize

- Worked with lead tech to develop base unit worksheets and put them in place at all locations
- Customized appropriately for obstetrics with additional transducer testing done monthly by the techs
Think like a consultant: Standardization applied to CT QC

**Culture of Quality**

- **Communication**
- **Documentation**
- **Understanding**
- **Knowledge**
- **Performance**
- **Process**

**Performance of the testing vs. Process of training and protocol checks to ensure accurate sustainable testing**
CT QC: FROM PERFORMANCE TO PROCESS

Baptist Jacksonville/Baptist MD Anderson

The Evolving Role of the Medical Physicist

Angela Snyder, Ph.D., VP, Research

Copyright (c) 2018 Atirix Medical Systems, Inc. October 4, 2018
Case Study: CT Process

Situation

• CT
  – 6 locations and 15 units
  – All GE

• QC-Track
  – Implemented QC software for device QC in CT in 2015
  – Added Mammo in 2017

Todd Anderson, MS
Staff medical physicist
“Our goal in investing these resources is to make everyone like mammo.”

Todd Anderson, Medical Physicist
Effective process at work!

ATIRIX - QC TRACK FAILURES BY MONTH

January: 59
February: 40
March: 41
April: 63
May: 7
June: 5
July: 2
August: 1
September: 0

QC FAILURES
Performance

• QC performed at all locations
  – Recorded in a centralized database

• Monthly RSO meeting
  – QC software data provided quantitative performance data to review at the monthly meeting

• The quantitative data exposed a pattern of a high failure rate across locations
  – Each failure resulted in room shut down, service call

• Physics decided to dig in, figure out what was going on
Physics analysis

- Result: Determined the majority of failures on noise were actually a protocol issue combined with a training issue
  - with GE in particular, running a second scan allows the scanner to recalibrate, lowering the noise and removing the need to call service
- Note: running daily air calibrations per manufacturer was added to the ACR protocol as of Sept 2017

Not machine errors. Actually
- Familiarity with GE protocol
- Familiarity with failure process
The Evolving Role of the Medical Physicist

Angela Snyder, Ph.D., VP, Research

Process implemented:

• Training system implemented
  – Lead tech per location trained in QC process and QC software
  – Responsible for training others

• Now: all QC techs need to pass a competency tests before cleared to perform QC
  – Need to demonstrate competency in CT QC and using software
  – Created a certificate to give to users that pass the test
  – Considered incorporating the test into annual review process
On-going monitoring

- Monthly RSO meetings continue to review failures and timeliness
- All failures are now real machine errors
Conclusion: dramatic reduction in QC “failures”

• Buy-in from the techs
  – Appreciate the clarity on what they should be doing for QC
  – Handling failures with greater confidence when something is really wrong
  – Training system working well!
    • No increase in failures with new techs

• Instant Communication
  – Emails from electronic QC system alert lead tech and physicist if a test is ever failed or missed
Think like a consultant: Standardization applied to US QC

Culture of Quality

- Documentation of testing by recording status or data
- Communication of trends, issues, and opportunities for coaching not just correction
Value of Software-Structured QC:

“Primarily helpful for transducer inventory and tracking.”

“Definite advantage is having the documentation in a central location.”

“I periodically review the QC documentation and results. If I see something that raises a “flag” in my mind, I can discuss with the lead tech. I think this helps the techs with inspection readiness.”

- Donna Stevens, DABR
Think like a consultant

- Standardize
- Optimize
- Quantify
- Engage

Case study: University of Virginia

4. Optimize quality and patient safety.
6. Lead process improvement projects.
7. Incorporate in your practice the Value Equation.
Case Study: University of Virginia

- **Background:**
  - 27 base units and 77 probes, multi-location
  - QC divided between physicists and clinical engineering

- **Factors:**
  - 2016 ACR Inspection:
    - On-site physicist needs to own the QC process
    - Suggested the site perform the QC at the high end of the recommendations
  - Interruptions during transducer QC
  - The physicists were seeing a high failure rate on annual inspection of transducers, comparable to the 2016 physicist listserv survey

- **Response:**
  - Implemented a structured QC system, with physicist oversight and workflows to optimize layers of US QC
Ultrasound QC workflows

1. Base Unit Checklists
   - Weekly/monthly/quarterly checklists (technologist)

2. Transducer Phantom QC
   - Annual/semiannual/quarterly Phantom QC (physics/biomed)

3. Transducer HLD Traceability
   - HLD per exam tracking (technologist)

4. Accessory Monitoring
   - Checks performed on Clean Shield Cabinet etc. (technologist)
Optimization: Transducer Phantom QC with Barcodes

- Base Unit
- Transducer
- Barcode Scanner
- Phantoms
- Laptop for QC-Track
The Evolving Role of the Medical Physicist

UVA US QC STRUCTURE PHYSICIST

Angela Snyder, Ph.D., VP, Research
Ultrasound QC workflows

1. **Base Unit Checklists**
   - Weekly/monthly/quarterly checklists (technologist)

2. **Transducer Phantom QC**
   - Annual/semiannual/quarterly Phantom QC (physics/biomed)

3. **Transducer HLD Traceability**
   - HLD per exam tracking (technologist)

4. **Accessory Monitoring**
   - Checks performed on Clean Shield Cabinet etc. (technologist)
Ultrasound QC workflows

1. **Base Unit Checklists**
   - Weekly/monthly/quarterly checklists (technologist)

2. **Transducer Phantom QC**
   - Annual/semiannual/quarterly Phantom QC (physics/biomed)

3. **Transducer HLD Traceability**
   - HLD per exam tracking (technologist)

4. **Accessory Monitoring**
   - Checks performed on Clean Shield Cabinet etc. (technologist)
Optimization: HLD traceability workflow

**HLD Cleaning**

- Do HLD cleaning, HLD unit self-test, and infection testing.
- In QC-Track, scan barcode stickers on probe and HLD system, enter cycle data into QC-Track worksheet.
- Place probe into clean bag, put cleaning tag on bag, and make available for exam use.

**Perform Patient Exam and Tie Back to Cleaning Record**

- In exam room: Scan probe barcode.
- Pull up cleaning record in QC-Track, get QC-Track Worksheet ID, enter Worksheet ID into EHR/RIS exam discharge record.
- Return probe to HLD unit for next cleaning cycle.

**Infection Research**

- Open patient record in EHR.
- Get QC-Track Worksheet ID.
- Search to get:
  - Cleaning details on probe used for the exam
  - The probe’s cleaning history
  - HLD unit cleaning history
Lessons Learned

• Team approach critical for complex projects
  – US implementation benefits from coordination between physics and technologists
    • Lots of equipment locations, probes, and base units
    • Lots of technologists in different locations

• Transducer phantom QC workflow is much more efficient for the physicist
  • Barcodes, workflows, and reports help address key issue of interruptions during the QC process
  • Overall, easier to meet the ACR recommendation of more frequent phantom QC

• HLD probe workflow keeps traceability within the enterprise QC system
  • Requires coordination between imaging and infection control
  • Requires multiple steps: infection control sign off, additional fields added to EPIC, laptop assigned to cleaning labs,…
  • All parties can see the QC status and cleaning status in same system
Think like a consultant

- Standardize
- Optimize
- Quantify
- Engage

Case studies:
University of Virginia – Fluoroscopy, Nuc Med, and MRI
Quantify - AAPM TG 272

Task Group No. 272 - Comprehensive Acceptance Testing and Evaluation of Fluoroscopy Imaging Systems

AAPM Members, Affiliates and Non-Member Affiliates - Login for access to additional information

**Charge**

To define testing procedures for fluoroscopic imaging systems including conventional, mobile C-arm, and interventional/angiography systems, thereby establishing a comprehensive acceptance test procedure for practicing medical physicists, incorporating:

(a) Regulatory tests and measurements including procedures described in the NEMA standard XR 27-2013, “X-ray Equipment for Interventional Procedures User Quality Control Mode” and

(b) Image quality assessment accounting for new technological advancements in fluoroscopy equipment design.
Research Update – UVA Fluoro QC

• Objective in IR: image quality and equipment readiness
  – Big patient impact of room failures

• Challenge: Automate fluoro phantom QC to remove subjectivity
  – Custom phantom
  – Fluoro = loops!

• QC Goals
  – Meaningful
  – Fast
  – Quantitative
Instability in the SNR is observed (red shaded area) as the ADRIQ adjusts. The last 2 seconds of the fluoro loop (corresponding to 15 frames) is more stable (green shaded area) and thus used for SNR calculation.
Quantify – UVA Fluoro QC

Conclusions:
• Automated and observer-independent QC
• Minimal technologist effort and change in workflow
• Ensures system performance and readiness
• SNR thresholds for immediate feedback on whether the system is operating at an expected level

Only 5 recordings out of 568 (0.88%) fell outside of the control values for all 6 rooms.

LEGEND

- Fluoro Loop Mean SNR

• +3σ (UCL)
• -3σ (LCL)
Use of signal to noise ratio for daily quality control of fluoroscopes used for interventional radiology procedures

A. Goode\textsuperscript{1}, C. Snyder\textsuperscript{1}, A. Snyder\textsuperscript{2}, G. Manninen\textsuperscript{1}, M. De Lorenzo\textsuperscript{1}, P. Collins\textsuperscript{6}

\textsuperscript{1,5} University of Virginia Health System, Charlottesville, VA, \textsuperscript{2,6} Atirix Medical Systems, Minneapolis, MN

**INTRODUCTION**

Complex fluoroscopically guided interventions (FSGIs) are routine in many interventional radiology departments. Quality control (QC) is a necessary and appropriate activity to gauge the readiness of the fluoroscopes used for these procedures. We sought to identify a simple and reproducible metric to enable daily QC, helping to ensure that the fluoroscopes are ready to be used on FSGIs procedures.

**AIM**

To evaluate a daily imaging quality control regimen in a busy academic interventional radiology (IR) department using signal-to-noise (SNR) ratio from fluoroscope (fluoro) loops.

**METHODS**

Daily QC was performed over a 6-month period on 6 Siemens FluoroView S20, S21, and S22 units. An ROI in the fluoro was selected, and a number of images were chosen. The phantom was placed on the table in the same position each day. Each room was programmed to use the default "Normal" 7.5 pulses per second fluoro within a pre-configured setup for QA. After selecting images, several times to allow the other selection to be reproducible, a fluoro loop was acquired for roughly 5 seconds and stored using the "Save Fluoro" function. Fluoro loops were then sent to a QC track (Atirix Medical Systems) server for automated processing. A 12 mm region of interest (ROI) was placed in a uniform region of the center of the phantom. SNR was computed in the ROI for each frame of the last 2 seconds of the fluoro loop. The SNR for each of the last 10 frames were then averaged to yield a single mean value for the loop.

**RESULTS**

Kraus et al, showing the data distribution for a single month from an interventional radiology (IR) department using signal to noise ratio (SNR) ratio from fluoroscopy (fluoro) loops. The loop shows the trend of SNR over time.

**CONCLUSIONS**

Automated and observer-independent quality control of units used during fluoroscopically guided interventions was piloted for a busy IR department. Minimal technologist effort and change in workflow were needed to regularly track system performance and readiness of the system for the day. This data allows for room specific SNR thresholds to be established and used as a criterion for providing immediate feedback on whether the system is operating at an expected level.

**ACKNOWLEDGEMENTS**

The authors wish to thank Lee Sumpier, Steve Hay, and Bob Grizzan. GA thanks in Interventional Radiology for diligently taking the data. The authors also wish to thank Klaus Wundtberger, Field Service Engineer from Siemens Healthineers, for programming the equipment.
Think like a consultant - Quantify

- For MRI QC - SNR has greater sensitivity and subjectivity than spoke counting

Carl R. Keener, Ph.D. (Member of the ACR Committee on Quality Assurance in MRI)
MRI Annual Physics Tests – Beyond Just the Scans & Measurements
July 21, 2005
Think like a consultant - Quantify

This is particularly relevant as field strengths increase

SNR on a 3T system

3T is beyond the range of the design

low contrast detectability / SNR

LCD & SNR correlate closely
17 scanners (0.2 - 3.0T)
ACR T1 series on ACR phantom
1 operator (physicist)

SNR vs MRAP LCD

31-Dec 19-Feb 10-Apr 30-May 19-Jul 7-Sep

Date

SNR

310 320 330 340 350 360 370 380 390 400 410 420 430

3T is beyond the range of the design
The ACR physics subcommittee agrees

Is it acceptable to measure SNR for daily/weekly QC instead of recording an LCD score? Yes, SNR is an acceptable alternative to LCD scoring for daily/weekly phantom QC. However, LCD scores must be included in the Annual System Performance Evaluation.

https://www.acraccreditation.org/How-To/MRI-Accreditation-FAQ

Highlighted at AAPM 2018 Annual Meeting by Donna Reeve, Senior Medical Physicist MD Anderson
Think like a consultant - Quantify

An efficient and objective method for Nuc Med QC

Erik Tazegul
NCC AAPM Chapter Meeting
October 12, 2018
Think like a consultant

- Standardize
- Optimize
- Quantify
- Engage
Outline

• **Background**
  – Understanding your role as medical physicist

• **How to make a greater impact**
  – Analyze an opportunity for improvement
    • From compliance to Culture of Quality
  – Think like a consultant
    • Standardize
    • Optimize
    • Quantify
    • Engage
  – Coach your team toward a culture of quality
Coach your team toward a Culture of Quality:

Establishing the QC system should be a team approach between the physicist and the US technologist.

- Donna Stevens, DABR

- It is important that the US techs “own” the system and that it is set up in a way that is feasible for them to use.
- Also, while the physicist should know how to perform these measurements, it is more helpful to have the US tech demonstrate how the variety of probes are used clinically. Therefore, the technologist input in establishing the standard settings and baseline measurements for QC is critical.
Create a Culture of Quality

- **Understanding and Motivation:** Use understanding to motivate
- **Accountability:** Informed coaching and meaningful sign-off
- **Opportunities for Improvement:** Establish a process for failures and trends

Culture of Quality:
- Understanding
- Knowledge
- Performance
- Process
- Communication
- Documentation
- QC
Create a culture of quality: Understanding and Motivation

What is the motivation for quality control?

“It’s all about the inspection”

“Would you put a family member or loved one on that scanner with a QC failure or with QC not done?”
Create a Culture of Quality: Understanding and Motivation

QC becomes almost robotic if you are not thinking about the why or the correctness.

- Megan Baugher, RDMS, RVT, RT(R)

- Understanding the intent of the requirement promotes motivation to do it correctly.
  - The Joint Commission requirement is to clean an HLD US probe \textit{before} each exam, not \textit{after}. 
Create a Culture of Quality: Understanding and Motivation

Always try to explain the why, rather than saying “It’s required, so just do it.”
- Patty Collins, PhD, DABR

• Background
• Impact for patients
• Impact for everyday workflow
Create a Culture of Quality: Accountability

- **Engage the whole team**
  - Shared goals, clear expectations
- **Structure the process**
  - Make a plan, and make sure it’s followed
- **Make sign-off meaningful**
  - Physicist oversight of ongoing QC (ACR required)
  - Critically evaluate current practice and coach toward process improvement
  - Watch for data gaps or trends
Create a Culture of Quality: Communication

• Clearly communication chain, especially in the case of test failure
• Review QC data regularly
• Learn clinical workflows
• Teach (translate) regulations and recommendations
Conclusion: You can make a bigger impact!

- Physicists have unique, valuable expertise and insight to act as internal consultants.
- Find and analyze an opportunity for improvement, aiming not just for compliance, but a shift in culture.
- Apply some consulting principles.
  - Standardize
  - Optimize
  - Quantify
  - Engage
- Coach your team toward a Culture of Quality.
- Be part of increasing the visibility of the value, skill, and integral role of medical physicists.
Thank you!

Angela Snyder, Ph.D.
angela.snyder@atirix.com
www.atirix.com
Learn more: Atirix.com or 877/273-1764

- QC-Track brochures and infographics
  - Email QC-Answers@Atirix.com
- QC-Track Demos and Webinars
  - Email QC-Webinars@Atirix.com for our upcoming schedule or to request a demo
- Facebook – Atirix Medical Systems
  - Technical updated on all things imaging QC