

**PARTNERS IN SOLUTION
IMAGING/DIAGNOSTIC QA SOFTWARE**

Tuesday July 14, 3:30 pm - 5:30 pm

Yu Liu
Medical College of Wisconsin, Milwaukee, WI

Steve Dyer: "AutoQA Plus - Catphan QA"
QA Benchmark, LLC, Frederick, MD

Kenneth Ruchala: "RapidCHECK Software for Diagnostic"
Sun Nuclear Corporation, Madison, WI

Brian Cote: "Necessity of monitor quality control and total
management with QA software"
EIZO, Inc., Cypress, CA



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Thursday July 16, 1:00 pm-3:00 pm

Yu Liu
Medical College of Wisconsin, Milwaukee, WI

Erik Wikstrom "Ocean – RTI's QA Software – How can it improve Workflow?"
RTI Group North America

Felix Schofer "QA solutions for cone beam and computed tomography QA"
QUART GmbH

Matt Whitaker " Interfacility and machine image quality analysis using a cloud-
based system"
Image Owl, Inc.



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Learning Objectives


- Understand various accreditation organizations' imaging physics QA requirements
- Learn commercially available QA software analysis tools



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Introduction

- Importance of Quality Assurance (QA)
- QA requirements for Diagnostic Medical Physics
- QA Tasks: Diagnostic Medical Physics
- Solutions From Vendors (Tue & Thurs)
- Questions and Answers



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**Importance of Quality Assurance
for Diagnostic Medical Physics**


- Quality and safety improvement for patient care and safety
- Mammography Quality Standards Act (MQSA)(1992)
- Medicare Improvements for Patients and Providers Act (MIPPA)(2008)



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**QA requirements for Diagnostic
Medical Physics**


- The Joint Commission (TJC)
- American College of Radiology Accreditation (ACR)
- Intersocietal Accreditation Commission (IAC)
- ACR-AAPM-SIIM Technical Standard for Electronic Practice of Medical Imaging



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Diagnostic Imaging Modalities Requiring Physics QA- TJC


- X-ray radiography/Fluoroscopy
- Computed Tomography
- Magnetic Resonance Imaging
- Nuclear Medicine/Positron Emission Tomography (PET)



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Diagnostic Imaging Modalities Requiring Physics QA- ACR


- Computed Tomography
- Magnetic Resonance Imaging
- Nuclear Medicine/SPECT/Positron Emission Tomography (PET)
- Digital mammography
- Ultrasound



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Diagnostic Imaging Modalities Requiring Physics QA- IAC


- Computed Tomography
- Magnetic Resonance Imaging
- Nuclear Medicine/Positron Emission Tomography (PET)



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X-ray Radiography/Fluoroscopy QA


- kVp accuracy and consistency
- Exposure vs. kVp and mAs
- HVL
- Timer accuracy
- Light field vs. radiation field
- Dose rate
- Maximum dose rate



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Computed Tomography/CBCT QA



- ACR Computed Tomography Quality Control Manual 2017
- AAPM TG-233 Report: Performance Evaluation of Computed Tomography Systems (2019)
- AAPM TG-200 Report: The Design and Use of the ICRU/AAPM CT Radiation Dosimetry Phantom: An Implementation of AAPM Report 111 (2020)
- AAPM TG-111 Report: Comprehensive Methodology for the Evaluation of Radiation Dose in X-Ray Computed Tomography (2010)



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ACR Computed Tomography QA

- CTDIvol measurements
- CT number (HU) uniformity
- CT number (HU) accuracy
- Image slice thickness
- High contrast resolution
- Distance measurement accuracy
- Low contrast performance and Contrast-to-Noise Ratio (CNR)
- Laser alignment accuracy/scan localizer accuracy
- Artifact evaluation
- Acquisition display monitor

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Magnetic Resonance Imaging Physics QA

- ACR Magnetic Resonance Imaging Quality Control Manual (2015)
- AAPM Report No.100: Acceptance Testing and Quality Assurance Procedures for Magnetic Resonance Imaging Facilities (2010)

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ACR Magnetic Resonance Imaging QA

- Image uniformity
- Geometric accuracy
- High contrast spatial resolution
- Low contrast detectability
- Slice position accuracy
- Slice thickness accuracy
- Laser alignment accuracy/scan localizer accuracy
- Artifact evaluation
- Display monitor
- RF coil and other testing



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Nuclear Medicine/SPECT Physics QA

- AAPM TG-177 Report: Acceptance Testing and Annual Physics Survey Recommendations for Gamma Camera, SPECT, and SPECT/CT Systems (2019)

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ACR Nuclear Medicine/SPECT QA

- Energy resolution
- Count rate parameters
- Intrinsic/System image uniformity
- Intrinsic/System spatial resolution
- High contrast spatial resolution
- Low contrast detectability
- Image uniformity
- Artifact evaluation
- Display monitor
- Misc.



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Positron Emission Tomography Physics QA

- AAPM TG-126 Report: PET/CT Acceptance Testing and Quality Assurance (2019)

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ACR Positron Emission Tomography QA

- Spatial resolution
- Phantom image quality
- Image uniformity
- Accuracy of CT#
- Monitor evaluation
- Sensitivity
- Count rate performance
- Image co-registration
- Accuracy standard uptake value (SUV)



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Digital Mammography/Digital Breast Tomosynthesis (DBT)



- Mammography Quality Standard Act (MQSA)
- ACR Mammography Quality Control Manual (1999)
- 2018 ACR Digital Mammography Quality Control Manual, Rev. 2 (May 2020)



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ACR Digital Mammography/DBT QA



- Phantom image quality
- DBT Z resolution
- Spatial Resolution
- DBT volume coverage
- Automatic exposure control system performance
- Average Glandular Dose
- Acquisition workstation monitor
- Radiologist workstation monitor

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ACR Ultrasound Physics QA


- Image uniformity
- Geometric accuracy
- System sensitivity
- Contrast resolution
- Spatial resolution
- Artifact evaluation
- Display monitor
- Misc.

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Imaging Modalities Requiring Display Monitor QA


- Digital Mammography/DBT (MQSA)
- Computed Tomography
- Magnetic Resonance Imaging
- Nuclear Medicine/SPECT/PET
- Ultrasound



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Display Monitor QA


- AAPM TG-18 report: Assessment of Display Performance for Medical Imaging Systems (2005)
- ACR-AAPM-SIIM Technical Standard for Electronic Practice of Medical Imaging (2017)
- AAPM TG-270 report: Display Quality Assurance (2019)



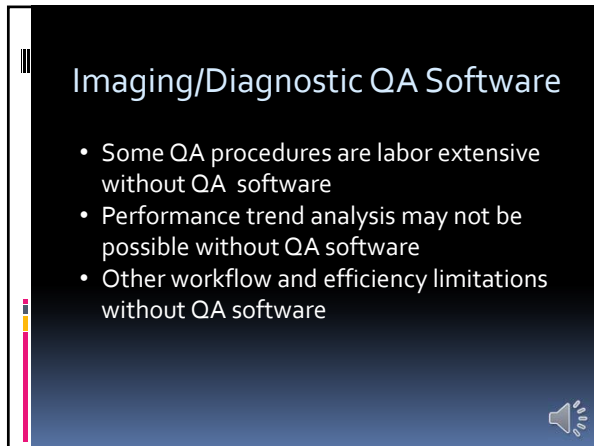
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Display Monitor QA

- Ambient lighting
- Display Luminance and Grayscale Display Function (GSDF)
- Display color
- Luminance uniformity
- Display noise
- Temporal performance
- Spatial resolution
- SMPTE , TG-18, TG-270 and test patterns



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Imaging/Diagnostic QA Software

- Some QA procedures are labor extensive without QA software
- Performance trend analysis may not be possible without QA software
- Other workflow and efficiency limitations without QA software

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