

QA Past, Present, and Future

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RETHINKING MEDICAL PHYSICS

AAPM | Nashville, TN | July 2018

Disclosures







- Founding partner
 - TreatSafely
 - Image Owl

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Evolution of Radiation Therapy

1960s	1970s	1980s	1990s	2000s	2010s
					
First Clinac and Basic Collimator	Cerrobend Blocking Electron and Photons	CT Scanning and Computerized 3D Treatment Planning	Dynamic MLC and IMRT	Electronic Imaging and motion compensation	MR Linac and adaptive therapy

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QA Past

- Setup and assessment of equipment performance
 - Commissioning
 - On-going QA and monitoring
- Patient-specific checks
 - Monitor units
 - Appropriate dose calculation
 - Verification of treatment record

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QA Past



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Evolution of QA in Radiation Therapy



Equipment QA

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Evolution of QA in Radiation Therapy



Patient-Specific QA

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Improving the technology of QA



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QA Present

- More checks but mostly the same
 - Per-patient measurement for some cases
- Collect lots of data; then do our best to analyze it
 - Each data point within limits?
- Some patient interactions
- Limited learning and adapting

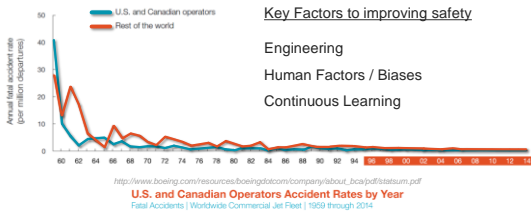


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Where do we need to improve?

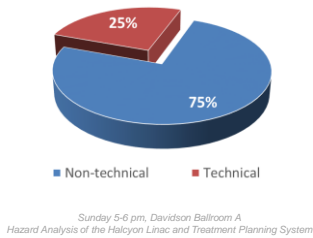


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Safety-Related Hazards in RT



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Where do we go from here?

- Quality assurance should be...
 - Efficient and easy to interpret
 - Capable of preventing catastrophic errors
 - Independent of patient-specific requirements
 - Predictive of process or equipment changes

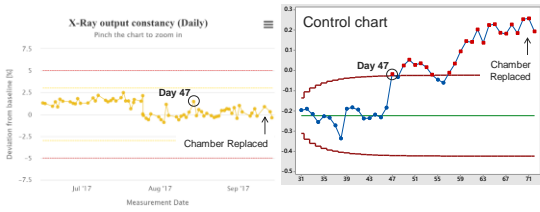


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Linac Ion Chamber Replacement

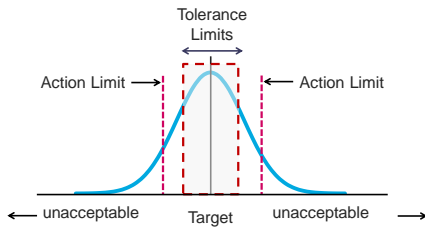


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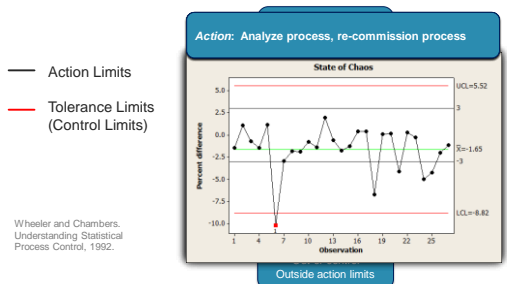
Tolerance Limits vs. Action Limits



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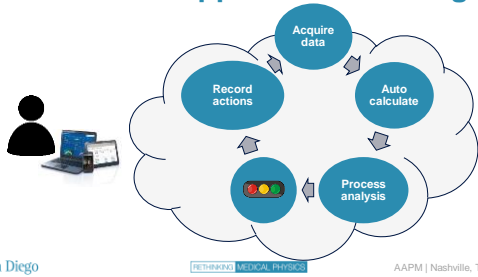
Wheeler and Chambers.
Understanding Statistical
Process Control, 1992.

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Decision Support and Learning

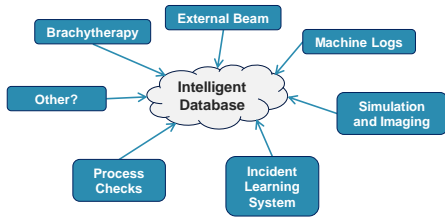


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Multiple QA Types and Data Sources



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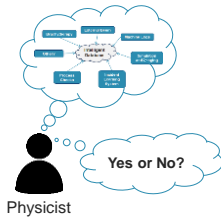
Patient-Centered QA



Will this patient receive safe and high-quality treatment?

Is this patient receiving safe and high-quality treatment?

Did this patient receive safe and high-quality treatment?



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A New Direction in QA



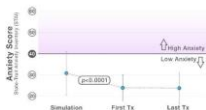
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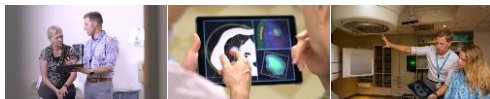
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A New Direction in QA

- Direct patient care
 - Routine scheduled consultations with a medical physicist



Atwood et al. IJROBP, 2018



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QA Future

- Continuous data collection for equipment QA
 - No more monthly, annual, or per-patient equipment checks
- Collect, collate, and synthesize multiple data streams and information sources
 - Handle exceptions rather than worry about everything
- Focus on patients and processes
 - While retaining our role as technology experts

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