Quality in Medical Physics and Beyond.

Peter Dunscombe
University of Calgary
Disclosure

Peter Dunscombe

Director, TreatSafely, LLC
Director, Center for the Assessment of Radiological Sciences.
Occasional Consultant to IAEA and Varian.
Objectives

To explore the concept of quality in radiotherapy.
To describe Donabedian’s dimensions of quality.
To examine selected quality indicators in the US, Europe and developing countries.
To take a peek the AAPM’s Safety Profile Assessment results.
Quality in Medical Physics and Beyond

Quality
  Donabedian
    Medical Physics Quality
      Radiotherapy Program Quality
        Bottom Lines
Quality in Medical Physics and Beyond

Donabedian

What is Quality?

Medical Physics Quality

Evidence for Quality?

Radiotherapy Program Quality

Information about Quality?

Bottom Lines

What constitutes Quality?

Spring Clinical Meeting, March 2015
Quality in Medical Physics and Beyond

Quality

Donabedian

Medical Physics Quality

- Structure
- Process
- Outcome

Radiotherapy Program Quality

Bottom Lines

Spring Clinical Meeting, March 2015
Quality in Medical Physics and Beyond

Quality

Donabedian

Medical Physics Quality

Radiotherapy Program Quality

Bottom Lines

Accreditation

QUATRO

APEX

SPA
Quality in Medical Physics and Beyond

Quality
- Donabedian
  - What is Quality?
    - Evidence for Quality?
      - Information about Quality?
        - What constitutes Quality?

- Medical Physics Quality
- Radiotherapy Program Quality

Bottom Lines

Spring Clinical Meeting, March 2015
What is Quality?

Quality of care is defined as the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.

Quality in Radiotherapy

The degree to which radiotherapy is consistent with current professional knowledge

- The prescription is appropriate, i.e. evidence based.
- The prescription is delivered within consensus determined tolerances.
Quality in Medical Physics and Beyond

Quality
  └── Donabedian
      ├── What is Quality?
      │    └── Medical Physics Quality
      │           └── Radiotherapy Program Quality
      │                    └── Bottom Lines
      └── Evidence for Quality?
          └── Information about Quality?
              └── What constitutes Quality?

Spring Clinical Meeting, March 2015
Evidence for Quality

QA makes a clinical trial stronger: evidence-based medicine in radiation therapy
Weber D, Tomsej M, Melidis C, Hurkmans C. Radiotherapy and Oncology 105 (2012) 4-8

- Analyzed 9 prospective clinical trial reports of violations and outcomes.
- Major deviation rates from 11.8% to 48%
- Major deviations (n=22) included:
  - Excessive or incomplete tumor coverage.
  - 90% isodose surface not encompassing the planning target volume.
  - Total delivered dose of ±10% of prescribed randomized dose.
  - The use of block margins >5 cm.
Evidence for Quality

QA makes a clinical trial stronger: evidence-based medicine in radiation therapy
Weber D, Tomsej M, Melidis C, Hurkmans C. Radiotherapy and Oncology 105 (2012) 4-8

“These QA data stemming from prospective clinical trials show undisputedly that non adherence to protocol specified RT requirements is associated with reduced survival, local control and potentially increased toxicity.”
Quality in Medical Physics and Beyond

Quality

- Donabedian
  - What is Quality?
  - Evidence for Quality?
  - Information about Quality?
  - What constitutes Quality?

- Medical Physics Quality
- Radiotherapy Program Quality
- Bottom Lines

Spring Clinical Meeting, March 2015
Information about Quality?

Quality Assessment in Oncology
Jeffrey M. Albert, M.D., and Prajnan Das, M.D., M.S., M.P.H.

Measuring the Quality of Care in Radiation Oncology
James A. Hayman, MD, MBA

Quality Indicators in Radiation Oncology
Jeffrey M. Albert, MD, MPH, and Prajnan Das, MD, MS, MPH
Quality in Radiotherapy

- The degree to which radiotherapy is consistent with current professional knowledge

- The prescription is appropriate, i.e. evidence based.

- The prescription is delivered within consensus determined tolerances.

What is Quality?
Information about Quality?

That safety in radiotherapy matters is self-evident.

We will explore the relationship between quality and safety.

If we can convince ourselves that quality and safety are largely different ways of looking at the same issue, i.e. the best outcome for the patient, then we can apply the recommendations for safer radiotherapy to quality radiotherapy.
Quality in Radiotherapy

The degree to which radiotherapy is consistent with current professional knowledge

- The prescription is appropriate, i.e. evidence based.
- The prescription is delivered within consensus determined tolerances.
To explore this let’s just look at the technical aspects of radiation therapy:

Is the prescription delivered within consensus determined tolerances?
Quality in Radiotherapy

Our preferred world view: all patients receive beneficial treatments?

Our world view following the NYTimes articles: almost all patients receive beneficial treatments with a miniscule number subject to harm?

Information about Quality?
Quality in Radiotherapy

Or is this more realistic: there’s a continuous distribution from beneficial treatments to harmful treatments?
If you believe this distribution there is no clear demarcation between quality radiotherapy and unsafe radiotherapy. Unsafe conditions can be viewed as a major compromise of quality.
What are we trying to accomplish?

Information about Quality?
So, if you accept the relationship between quality and safety we can adopt many of the measures aimed at improving safety to improve quality too.
Quality in Medical Physics and Beyond

Quality
- Donabedian
  - What is Quality?
  - Evidence for Quality?
  - Information about Quality?
- Medical Physics Quality
- Radiotherapy Program Quality
- Bottom Lines

Spring Clinical Meeting, March 2015
What constitutes Quality?
Recommendations for safer radiotherapy: what’s the message?

Peter Dunsmore*
Department of Oncology, University of Calgary, Calgary, A.B. Canada

<table>
<thead>
<tr>
<th>Report</th>
<th>Advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Towards safer Radiotherapy</td>
<td>37</td>
</tr>
<tr>
<td>Radiotherapy Risk Profile</td>
<td>15</td>
</tr>
<tr>
<td>Preventing Accidental .....</td>
<td>15</td>
</tr>
<tr>
<td>Hendee and Herman</td>
<td>20</td>
</tr>
<tr>
<td>Heirarchy of Actions</td>
<td>19</td>
</tr>
<tr>
<td>ASTRO</td>
<td>6</td>
</tr>
<tr>
<td>TG 100</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>117</strong></td>
</tr>
</tbody>
</table>

What constitutes Quality?
## Recommendations for safer radiotherapy: what’s the message?

**Peter Dunscombe**

Department of Oncology, University of Calgary, Calgary, A.B. Canada

<table>
<thead>
<tr>
<th>Training (7)</th>
<th>QC and PM (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staffing/skills mix (6)</td>
<td>Dosimetric Audit (4)</td>
</tr>
<tr>
<td>Documentation/SOP (5)</td>
<td>Accreditation (4)</td>
</tr>
<tr>
<td>Incident Learning System (5)</td>
<td>Minimizing interruptions (3)</td>
</tr>
<tr>
<td>Communication/questioning (4)</td>
<td>Prospective risk assessment (3)</td>
</tr>
<tr>
<td>Check lists (4)</td>
<td>Safety Culture (3)</td>
</tr>
</tbody>
</table>

What constitutes Quality?
Donabedian’s Outcomes Model

- University of Michigan 1961-2000
- Founder of the study of quality in health care.
- Coined the term “outcomes” to refer to patient follow-up assessment.
- Modeled quality based on structure, process, and outcome.
Donabedian’s Outcomes Model

- **Structure**: all factors affecting care delivery.
- **Process**: all actions making up healthcare.
- **Outcome**: all effects on patients or populations.

Adapted from Battles 2003.
Structure

- The necessary, but not sufficient, fundamentals of an organization for the delivery of quality.
- Fundamentals need to be present irrespective of volume.
- Providing an adequate structure is a management function.
Examples of structural fundamentals are:

- Equipment: e.g. calibrated linac inventory.
- Staffing: appropriate numbers/ competence
- Documentation: current and high quality

And

- Radiation Safety Committee.
- Staff continuing professional development program.
- Safety Culture.
Quality in Medical Physics and Beyond

Quality

Donabedian

Medical Physics Quality

Structure

Process

Outcome

Radiotherapy Program Quality

Bottom Lines

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Process

Å Processes happen within the structure and are focused on individual units (patients or equipment).
Å # processes is volume dependent.
Å Processes are carried out by front line staff.
Examples of processes are:
Å Controlling the quality of a particular linac.
Å Verifying the dose for an IMRT patient.

And
Å Planning a treatment for a patient
Å Delivering a treatment to a patient.
Quality in Medical Physics and Beyond

Donabedian

Medical Physics Quality

Structure

Process

Outcome

Radiotherapy Program Quality

Bottom Lines

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Outcome

- Measures of the effectiveness of the system
- Outcomes can be patient related or organizational
Patient Related Outcomes

Examples of Patient Related Outcomes are:
- Survival.
- Quality of life.
- Re-admissions.
- Patient satisfaction.
Examples of Organizational Outcomes

- Postal dosimetry (IAEA program).
- IROC Houston (formerly RPC) phantom results.

And

- Misadministrations.
- Participation in advanced training
- Publications.
- Accreditation recommendations.
Organizational Outcomes

Examples of Organizational Outcomes

- Postal dosimetry (IAEA program).
- IROC Houston phantom results.

*Organizational outcomes should be used in a feedback loop to improve the structure and process dimensions of quality.*
Global treatment machine inventory

Low and middle income countries* encompass 82% of the world’s population and experience 57% of the world’s cancer cases.

One treatment machine per $1.4 \times 10^6$ inhabitants.

*GNI per capita ≤ $12,745$ per annum

Clin Onc 27 (2015) 107-114
European treatment machine inventory

Fig. 2. Histogram showing the average number of radiotherapy treatment machines (MV units) per million inhabitants in 28 European countries.

Radiotherapy and Oncology 112 (2014) 155-64
US treatment machine inventory

An Elekta presentation at ESTRO in 2012 stated that there were 12 machines per $10^6$ Inhabitants in the US.
Treatment machine inventory

Global (LMIC): 1.4 machines per $10^6$ inhabitants

Europe: 5.3 (median) machines per $10^6$

US: 12 machines per $10^6$
Treatment machine inventory

- Global (LMIC): 1.4 machines per $10^6$ inhabitants
- Europe: 5.3 (median) machines per $10^6$
- US: 12 machines per $10^6$

But, availability ≠ access
Currently 96% of results are within 5% acceptance limit after follow-up
European (France) machine calibration accuracy

Tests in France (mandatory - every 3 years)

- Results within 5% limit (%)
- Results over the 10% limit (%)

Year:
- Tests in France (mandatory - every 3 years)
  - d < 5%
  - d > 10%
US (IROC) machine calibration accuracy

Photon beams
Average: 0.998 +/- 0.017
6826 results

Electron beams
Average: 0.998 +/- 0.019
8676 results

# results

OSLD/Institution

Photsns
Electrons
Global Medical Physics staffing

Data from the DIRAC (IAEA) database – probably an underestimate.

DIRAC (LMIC)*: 0.6 physicists per $10^6$ population

*GNI per capita ≤ $12,745$ per annum
European Medical Physics staffing

Radiotherapy and Oncology. 112 (2014) 178-86

Medical Physics Quality: Structure, Staffing
U.S. Medical Physics staffing

- U.S. population: $320 \times 10^6$
- AAPM Therapy Physicists: 4200
- 13 Medical Physicists per $10^6$ inhabitants
Medical Physics staffing

- Global (LMIC): 0.6 physicists per $10^6$ population
- Europe: 11 physicists per $10^6$ population
- U S: 13 physicists per $10^6$ population
Medical Physics staffing

Å Global (LMIC): 0.6 physicists per $10^6$ population
Å Europe: 11 physicists per $10^6$ population
Å U S: 13 physicists per $10^6$ population

But, quantity ≠ quality
A comparison of the relative frequencies of Basic Causes of Incidents in two centres.

1 Standards/Procedures Practices
2 Materials/Tools/Equipment
3 Design
4 Planning
5 Communication
6 Knowledge/Skill
7 Capabilities
8 Judgment
9 Natural Factors
Most documented processes from 114 Safety Profile Assessment surveys

<table>
<thead>
<tr>
<th>Clinical Performance Indicator</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>68. Patient identification is verified prior to each treatment.</td>
<td>91</td>
</tr>
<tr>
<td>77. Physics chart checks are performed weekly.</td>
<td>87</td>
</tr>
<tr>
<td>63. An initial physics plan review is completed consistent with the appropriate guidelines.</td>
<td>82</td>
</tr>
<tr>
<td>64 Pre-treatment patient-specific dose verification performed</td>
<td>81</td>
</tr>
<tr>
<td>51. Patient identity is verified before simulation.</td>
<td>80</td>
</tr>
<tr>
<td>75. Staff maintains visual and audio contact with patients throughout treatment.</td>
<td>80</td>
</tr>
<tr>
<td>70. The staff acquires portal imaging and/or isocenter images in accordance with published guidelines.</td>
<td>80</td>
</tr>
<tr>
<td>91. A physicist performs a final chart check.</td>
<td>78</td>
</tr>
<tr>
<td>76. Physicians routinely review localization images.</td>
<td>76</td>
</tr>
<tr>
<td>78. Physicians perform weekly treatment management visits.</td>
<td>77</td>
</tr>
</tbody>
</table>
Least documented processes from 114 Safety Profile Assessment surveys

<table>
<thead>
<tr>
<th>Clinical Performance Indicator</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>56. Import of complementary imaging for planning includes verification of patient orientation.</td>
<td>32</td>
</tr>
<tr>
<td>47. Curative Intent cases undergo multidisciplinary review to determine treatment options.</td>
<td>32</td>
</tr>
<tr>
<td>55. Site and side are verified with a secondary source document at the time of planning.</td>
<td>36</td>
</tr>
<tr>
<td>73. The physician treatment directive specifies motion management strategies to be used where appropriate.</td>
<td>37</td>
</tr>
<tr>
<td>60. The impact of previous radiation treatments on the current treatment plan is evaluated by both the planner and the physician.</td>
<td>39</td>
</tr>
<tr>
<td>57. Electronic transfer of patient information from simulation to planning system is verified for each patient.</td>
<td>39</td>
</tr>
<tr>
<td>59. The physician communicates patient-specific planning goals to the treatment planning team.</td>
<td>40</td>
</tr>
<tr>
<td>80. Prescription revisions are communicated to the involved team members at time of revision.</td>
<td>44</td>
</tr>
<tr>
<td>58. Patient information is verified for all data used for treatment planning.</td>
<td>45</td>
</tr>
<tr>
<td>49. The staff adheres to a guideline for managing IV contrast reactions.</td>
<td>46</td>
</tr>
</tbody>
</table>
Opportunities for improvement

Å Equipment: More emphasis on machine calibration at commissioning?
Å Staffing: More accessible approaches to training and skill development?
Å Documentation: Boilerplate documents?
Quality in Medical Physics and Beyond

Quality

Donabedian

Medical Physics Quality

Structure

Process

Outcome

Radiotherapy Program Quality

Bottom Lines

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Could this be true?

RPC/IROC H & N Phantom Results

7% and 4mm

Med Phys 40, 022101 (2013); doi: 10.1118/1.4773309
“The most common acceptance criteria and published actions levels therefore have insufficient, or at least unproven, predictive power for per-patient IMRT QA.”

*Per-beam, planar IMRT QA passing rates do not predict clinically relevant patient dose errors*

Nelms BE, Zhen H, Tome WA. Med Phys 38 (2011) 1037 – 1044

“The results of this study raise questions on the efficiency of IMRT patient specific checks in detecting important errors for the treatment outcome.”

*Relating dosimetric outcome to compliance with patient specific quality control in IMRT*

Rangel A, Dunscombe P. Radioth Oncol 99 (Suppl 1) (2011) S512
Opportunities for improvement

- Better understanding of process issues: TG-100
- Standardization: MPPG, i.TS
- More research into the connection between outcomes and QA.
Medical Physics: Process: TG 100

Medical Physics Quality: Process
AAPM Medical Physics Practice Guideline 2.a: Commissioning and quality assurance of X-ray–based image-guided radiotherapy systems

Task Group Authors: Jonas D. Fontenot, Hassaan Alkhatib, Jeffrey A. Garrett, Andrew R. Jensen, Steven P. McCullough, Arthur J. Olch, Brent C. Parker, Ching-Chong Jack Yang, Lynne A. Fairobent, AAPM Staff
Medical Physics: Process: i.treatsafely
Quality in Medical Physics and Beyond

Quality

Donabedian

Medical Physics Quality

Structure

Process

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Radiotherapy Program Quality

Bottom Lines

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Since 1969 the IAEA Dosimetry Laboratory has provided dosimetry audits to 2,150 radiotherapy centres in low and middle income countries. This required 11,000 sets of TLDs.
IROC Houston worldwide monitoring

- 3,237 distinct RT sites in database
- 63% (2,046) monitored beam calibration
- ~14,000 – 15,000 beams annually
- 33% (1,055) performed IMRT E2E phantom audit
Medical Physics: Outcome

We appreciate that among the about 1000 European centres, 70% at least have external dosimetry audits performed by national or international organisms.

Attila VERES
Equal-Estro
An external audit of radiation output is performed annually on all therapeutic beams: 94/114

An external audit of radiation output is performed prior to clinical implementation of new treatment delivery equipment: 72/114

1. Strongly Agree  
2. Agree  
3. Neutral  
4. Disagree  
5. Strongly Disagree

Medical Physics Quality: (Organizational) Outcome
Machine Physics: Outcome

Global: >25% of centers monitored by IAEA
Europe: 70% of centers monitored.
US (per IROC Houston database):
1628 institutions monitored by IROC Houston
793 institutions monitored by RDS
Medical Physics: Outcome

Opportunities for improvement:

- Greater participation in dosimetry audits, particularly at commissioning?
- More comprehensive (non-reference conditions) dosimetry audits.
- Physics peer review.
AAPM Task Group 103 report on peer review in clinical radiation oncology physics

Per H. Halvorsen,1 Indra J. Das,2 Martin Fraser,3 D. Jay Freedman,4 Robert E. Rice III,4 Geoffrey S. Ibbott,5 E. Ishmael Parsai,6 T. Tydings Robin Jr.,7 and Bruce R. Thomadsen8
Quality in Medical Physics and Beyond

Quality
Donabedian
Medical Physics Quality
Radiotherapy Program Quality
Bottom Lines

Accreditation
QUATRO
APEX
SPA

Spring Clinical Meeting, March 2015
### Quality standards in radiation medicine

Holly Donaldson MPH, Jeffrey Cao MD, John French MSc, Caitlin Gillan MED, Michael Milosevic MD, Catarina Lam MBA, Peter Dunscombe PhD

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<table>
<thead>
<tr>
<th>Data Source</th>
<th>Document and Website Link</th>
<th>Country/Region</th>
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<tbody>
<tr>
<td>American College of Radiation Oncology (ACRO)</td>
<td>Radiation Standards Medical Physics (external beam therapy)</td>
<td>United States</td>
</tr>
<tr>
<td>American College of Radiology (ACR)</td>
<td>Practice Guideline For Radiation Oncology</td>
<td>United States</td>
</tr>
<tr>
<td>Canadian Partnership for Quality Radiotherapy</td>
<td>Quality Assurance Guidance for Canadian Radiation Treatment Programs</td>
<td>Canada</td>
</tr>
<tr>
<td>European Commission Guideline on Clinical Audit</td>
<td>European Guidelines on Clinical Audit for Medical Radiological Practices (Diagnostic Radiology, Nuclear Medicine and Radiotherapy)</td>
<td>Europe</td>
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<tr>
<td>IAEA (Quality Assurance Team for Radiation Oncology (QUATRO))</td>
<td>Comprehensive Clinical Audits of Diagnostic Radiology Practices: A Tool for Quality Improvement</td>
<td>International</td>
</tr>
<tr>
<td>Royal Australian and New Zealand College of Radiologists (RANZCR)</td>
<td>Tripartite Radiation Oncology Practice Standards</td>
<td>Australia, New Zealand</td>
</tr>
</tbody>
</table>

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Radiotherapy Program Quality: Accreditation/Auditing
Quality standards in radiation medicine

Holly Donaldson MPH, Jeffrey Cao MD, John French MSc, Caitlin Gillan ME, Michael Milosevic MD, Catarina Lam MBA, Peter Dunscombe PhD

Radiotherapy Program Quality: Accreditation/Auditing
7 accreditation/auditing protocols
5 evaluators
454 indicators/standards

Structure: 64%
Process: 26%
Outcome: 10%

Practical Radiation Oncology 4 (2014) 208=2014
Quality in Medical Physics and Beyond

Quality
- Donabedian

Medical Physics Quality
- Radiotherapy Program Quality
- Bottom Lines

Accreditation
- QUATRO
- APEX
- SPA

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QUATRO audit procedures

- Auditors: RO, MP, RTT
- Typically 5 days per RT centre
- Entrance briefing
- Assessment: tour of facility, staff interviews, review & evaluation of procedures and documentation, measurements, tests, observation of practical work
- Exit briefing: feedback to the department, preliminary recommendations, questions, discussion.
Training of auditors and regional QUATRO workshops in all regions
- 70 QUATRO missions to date: Africa - 6; Asia - 18; Europe - 30 + 3 re-audits; Latin America - 13
QUATRO audit procedures

<table>
<thead>
<tr>
<th>Audit criteria</th>
<th>Adequacy</th>
<th>Comments</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality manager roles and responsibilities</td>
<td>Y   N   I  N  NA</td>
<td></td>
<td>Important quality improvement initiatives would be:</td>
</tr>
<tr>
<td>Quality assurance committee</td>
<td>Y   N   I  N  NA</td>
<td></td>
<td>— Recommendation 1;</td>
</tr>
<tr>
<td>Quality assurance committee records</td>
<td>Y   N   I  N  NA</td>
<td></td>
<td>— Recommendation 2;</td>
</tr>
<tr>
<td>Quality management activity coverage</td>
<td>Y   N   I  N  NA</td>
<td></td>
<td>— Etc.</td>
</tr>
<tr>
<td>Quality management staff</td>
<td>Y   N   I  N  NA</td>
<td></td>
<td>QUAADRIL guideline references:</td>
</tr>
<tr>
<td>Quality manual or equivalent</td>
<td>Y   N   I  N  NA</td>
<td></td>
<td>(Cut and paste the pertinent QUAADRIL guidelines into the summary to support the recommendations.)</td>
</tr>
<tr>
<td>Quality manual review process</td>
<td>Y   N   I  N  NA</td>
<td></td>
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</tbody>
</table>
QUATRO: selected preliminary results

- 30 audits – mainly Eastern Europe
- 742 recommendations (7-83)

Frequent recommendations
- more or replacement machines
- education, training, development
- quality management
- documentation
Quality in Medical Physics and Beyond

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                - SPA

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RT Program Quality: APEx

ASTRO Accreditation Program for Excellence
Safety and quality for radiation oncology practice

Radiotherapy Program Quality: APEx
Standard 12: Quality Management of Treatment Procedures and Modalities

The radiation oncology practice (ROP) operates a comprehensive quality management program and safe practices for each treatment procedure and modality.

The ROP's comprehensive quality management program for each treatment procedure and modality:

12.1 Is consistent with American Association of Physicists in Medicine (AAPM) or equivalent body standards of practice for:

12.1.1 External beam radiation therapy dosimetry, mechanical, safety and respiratory management checks.

12.1.2 Brachytherapy dosimetry, mechanical and safety checks.

12.1.3 Quality assurance of measurement equipment.

12.1.4 Acceptance testing, clinical commissioning and clinical release.

12.1.5 End to end dosimetric system testing.

12.1.6 Simulation dosimetry, mechanical, safety and respiratory management checks.
At the Miami Meeting, Dr. Tripuraneni reported that

- Since 1986 only 240 out of 2000 US Radiation Therapy facilities were accredited.
- Only two States actually require accreditation with a third one thinking about it.
- A major cause of failing to satisfy accreditation criteria was inadequate QA on the treatment planning system.
- This system has now been discontinued.
Quality in Medical Physics and Beyond

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Accreditation
  └ QUATRO
    └ APEX
      └ SPA

Spring Clinical Meeting, March 2015
Safety Profile Assessment

SPA is a Safety Profile self Assessment Tool developed by the AAPM’s Work Group on the Prevention of Errors in Radiation Oncology.

spa.aapm.org
Safety Profile Assessment

4 topic areas
92 questions

- Institutional culture
- Quality management
- Managing change and innovation
- Performance indicators

Radiotherapy Program Quality: SPA
Safety Profile Assessment

4.4 Performance Indicators Sub-section: PRE-TREATMENT Radiation Planning

63. An initial physics plan review is completed consistent with the appropriate guidelines.

- Always / Strongly Agree
- Most of the time / Agree
- Sometimes / Neutral
- Rarely / Disagree
- Never / Strongly Disagree
- Don’t know / Not Applicable

Our department has a formal policy for this

- Yes
- No

ACR guidelines indicate this should occur prior to treatment start if there are 5 or fewer fractions, or before the 3rd fraction in cases with greater than 5 fractions; this includes the MU calculation check.
Safety Profile Assessment

View results by question
Compare to others

Radiotherapy Program Quality: SPA
Safety Profile Assessment

Tracking improvement over time

Radiotherapy Program Quality: SPA
SPA results

1. Patient evaluation, care coordination, follow-up
2. Treatment planning
3. Patient specific safety interventions
7. Culture of safety
12. Quality management
## SPA results

Highest compliance from 114 Safety Profile Assessment surveys

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>AVG</th>
<th>Sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>31. Dosimetry equipment is calibrated every two years by an accredited dosimetry calibration laboratory.</td>
<td>1.03</td>
<td>II</td>
</tr>
<tr>
<td>64. Pre-treatment patient-specific dose verification is performed for the following treatment modalities: b. IMRT QA</td>
<td>1.06</td>
<td>IV</td>
</tr>
<tr>
<td>85. The Authorized User approves the plan and written directive before treatment. (brachytherapy)</td>
<td>1.11</td>
<td>IV</td>
</tr>
<tr>
<td>75. Staff maintains visual and audio contact with patients throughout treatment.</td>
<td>1.12</td>
<td>IV</td>
</tr>
<tr>
<td>26. Pre-clinical validations are performed for: a. Treatment delivery systems</td>
<td>1.13</td>
<td>II</td>
</tr>
<tr>
<td>83. The source strength is verified prior to clinical use. (brachytherapy)</td>
<td>1.14</td>
<td>IV</td>
</tr>
<tr>
<td>86. The location of the source(s) is verified immediately after treatment. (brachytherapy)</td>
<td>1.14</td>
<td>IV</td>
</tr>
<tr>
<td>63. An initial physics plan review is completed consistent with the appropriate guidelines.</td>
<td>1.17</td>
<td>IV</td>
</tr>
<tr>
<td>77. Physics chart checks are performed weekly.</td>
<td>1.18</td>
<td>IV</td>
</tr>
<tr>
<td>51. Patient identity is verified before simulation.</td>
<td>1.19</td>
<td>IV</td>
</tr>
</tbody>
</table>

## SPA results

Lowest compliance from 114 Safety Profile Assessment surveys

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>AVG</th>
<th>Sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>52. A time out is performed at simulation.</td>
<td>2.23</td>
<td>IV</td>
</tr>
<tr>
<td>20. Standard operating procedures for safety-critical clinical processes are reviewed regularly.</td>
<td>2.25</td>
<td>II</td>
</tr>
<tr>
<td>79. Therapists perform weekly chart checks.</td>
<td>2.27</td>
<td>IV</td>
</tr>
<tr>
<td>24. Clinical staff competencies are reviewed regularly.</td>
<td>2.29</td>
<td>II</td>
</tr>
<tr>
<td>38. An independent review of commissioning results is performed prior to implementation of new clinical systems and processes.</td>
<td>2.32</td>
<td>III</td>
</tr>
<tr>
<td>90. A therapist performs a final chart check.</td>
<td>2.33</td>
<td>IV</td>
</tr>
<tr>
<td>39. Potential risks associated with the introduction of new clinical systems and processes are assessed prior to implementation.</td>
<td>2.34</td>
<td>II</td>
</tr>
<tr>
<td>65. Physician peer review of new treatment plans occurs within the first week of treatment.</td>
<td>2.43</td>
<td>IV</td>
</tr>
<tr>
<td>15. The Radiation Oncology Department formally reviews reports of near-misses.</td>
<td>2.59</td>
<td>I</td>
</tr>
<tr>
<td>13. Clinical staff submits written reports of near-miss incidents.</td>
<td>2.72</td>
<td>I</td>
</tr>
</tbody>
</table>

1. Strongly Agree  
2. Agree  
3. Neutral  
4. Disagree  
5. Strongly Disagree

Radiotherapy Program Quality: SPA
Quality in Medical Physics and Beyond

Spring Clinical Meeting, March 2015
Bottom Lines: Structure

✔ Nationally, no shortage of machines.
✔ Opportunities exist to ensure calibration accuracy.
?
Independent validation at commissioning.
✔ Nationally, no shortage of medical physicists.
✔ Opportunities to upgrade education and skills.
?
More effort required on documentation (SOPs)
Bottom Lines: Process

✔ TG-100 will help focus on process.
✔ Medical Physics Practice Guidelines should help standardize processes.

❓ Less *craftsman* and more *equivalent actor*.
*(More emphasis on following SOPs.)*

❓ More research on the relationship between QA/QC and patient outcome.
Bottom Lines: Outcome

✔ APEx provides an independent assessment of some dimensions of quality.

✔ AAPM’s Safety Profile Assessment is an accessible, low resource QI tool.


? Medical Physicists need to get more involved in developing and promoting the quality agenda.
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