MOC Exam Preparation - Therapy

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Overview

- MOC Exam Requirement
- Available Guidance
- What I did
- What I wished I did

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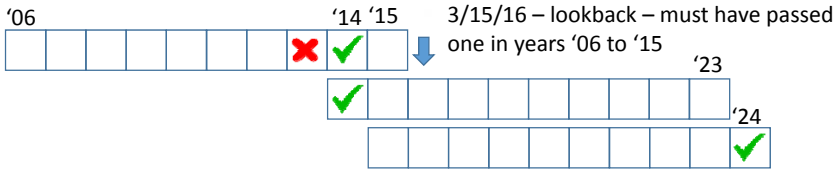
Department of Radiation Oncology

MOC Exam Requirement

- Rolling Window of 10 years
- Must pass one exam in this window
- You can take it in any year
- You can take it multiple times



Schedule Recommendation

- Take it in year 9
- If you fail:
  - you have year 10 to take it and still remain in compliance.
  - You have taken it once and can better prepare for year 10.
- If you pass:
  - The 10 year clock starts over.
  - You lose a year on the rolling window.
- Personal Impression: The exam is easy, but there is new material. If you fail, you shouldn't fail it a second time.

Exam Length

"In 2014 , the number of questions in the MOC exam will increase from 100 to 125. Due to the increased number of exam questions, the MOC exam will be lengthened from 3 hours to 3.5 hours.

In 2015, the number of questions in the MOC exam will increase from 125 to 150. Due to the increased number of exam questions, the MOC exam will be lengthened from 3.5 hours to 4 hours.

No further changes in the exam are anticipated in the near future. " (from Med. Phys. MOC Brochure)

When I took the exam in 2014, I had an hour to spare.
I think these increases are reasonable.

Available Guidance – 1 : ABR

- The website could be improved, not easy to find things.
- Instead of hunting around, go here:
- www.theabr.org/moc-rp-comp3
- It seems the study guides are updated every April?
  - A list of AAPM TG, NCRP, and ICRU reports
  - Selected journal articles
  - A list of articles dealing with QA and Quantec
  - Standard Reference Texts
  - Sample Questions

Available Guidance – 2 : Pearson

- http://www.pearsonvue.com/abr/
- Exam taking logistics
- Exam Calculator – the interface is quirky, do practice using it!
- Practice exam is only for the mechanics of the test, not the content.
- Do go over the practice exam so you don't lose time dealing with the interface.

ABR Study Guide - Reports

NCRP Report No. 151 (SHIELDING**)
AAPM Report 51 and updates (Task Group 43)
AAPM Report 62 (Task Group 53)
AAPM Report 67 (Task Group 51)
AAPM Report 76 (Task Group 61)
AAPM Report 83 (Task Group 66)
AAPM Report 87 (Task Group 62)
AAPM Report 91 (Task Group 76)
AAPM Report 95 (Task Group 75)
AAPM Report 101 (Task Group 101)
AAPM Report 106 (Task Group 106)
AAPM Report 142 (Task Group 142)
AAPM Report 148 (Task Group 148)
AAPM Report 166 (Task Group 166)
AAPM Report 179 (Task Group 179)
ICRU Reports No. 50 and 62

ABR Study Guide – Journal Articles

- Study articles ***such as***:
- Ezzell et al. Guidance document on delivery, treatment planning, and clinical implementation of IMRT: Report of the IMRT subcommittee of the AAPM radiation therapy committee. Med. Phys. 2003;30:2089-2115.
- Georg et al. Correct Status and future perspectives of flattening filter free photon beams. Med Phys 2011; 38:1280.2
- Reports from a 2007 symposium on Radiation Therapy Quality Assurance, published in the International Journal of Radiation Oncology Biology Physics. 71 S1 2008.
- QUANTEC Reports, published in International Journal of Radiation Oncology Biology Physics. 76 S1 2010.

ABR Study Guide – Standard Reference Texts

- Khan: The Physics of Radiation Therapy, 4th Ed, Lippincott Williams & Wilkins, 2010.
- Hendee, Ibbott, and Hendee: Radiation Therapy Physics, John Wiley & Sons, 2005.
- Van Dyk: "Imaging for Radiation Therapy Treatment Planning" in The Modern Technology of Radiation Oncology, Medical Physics Publishing, 2005.
- Hall and Giaccia: Radiobiology for the Radiologist, 7 th Ed, Lippincott Williams & Wilkins, 2011.

Content

- 30% standard practice – core therapeutic medical physics, technology and safety.
- 70% recent advances in the field
- NOTE: new knowledge always builds on established fundamental concepts.

Sample Question 1

- A linear accelerator is calibrated to deliver 1 cGy/MU at 100 cm source-to-surface distance (SSD). What is the approximate dose per monitor unit at an SSD of 400 cm used for total-body photon irradiation?
  - A. 16 cGy/MU
  - B. 4 cGy/MU
  - C. 1 cGy/MU
  - D. 1/16 cGy/MU

My take: standard stuff you can do in your sleep. MU calcs, implant times, attenuation, etc. all fall into this category.

Sample Question 2

- Which of the following statements regarding wedge orientation is true?
  - A. For breast tangents with supine setup, the heels are typically posterior.
  - B. For a 90° pair treating the parotid, the toes are directed toward each other.
  - C. When used on an anteroposterior (AP) field to compensate for the slope of the superior chest, the heel is superior.
  - D. For a three-field treatment to the rectum, the heels are typically anterior.

My take: Still standard stuff. If you haven't been checking plans or planning, you may want to refresh your memory. IN GENERAL – if you haven't done something fundamental in a while, refresh your memory.

Sample Question 3

- According to the American Association of Physicists in Medicine (AAPM), multileaf collimator (MLC) leaf position accuracy should be maintained at no more than:
  - A. 1 cm
  - B. 2 mm
  - C. 1 mm
  - D. 0.5 mm

My take: Be intimately familiar with the tables in the Task Group Reports. This type of question showed up a lot.

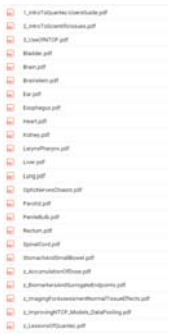
What I did

- A week before my test, I opened the study guide.
- I panicked.
- How do I study and still work in the clinic?
- I read what I could. Mainly NCRP 151 Shielding.
- Crammed in the rest of the material over the weekend with marathon reading sessions.
- No time to memorize anything. Conceptualization was very important.

Collect all your reading material

Binder for my TG reports. (17 reports)

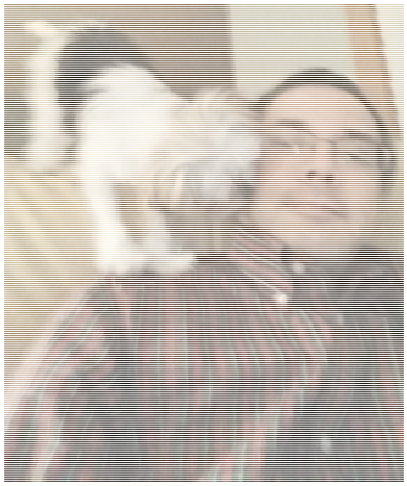
Quantec (24 articles)



QA (45 articles)

And the article on FFF. And an assortment of NCRP slides from the web. And ICRU 50 and 62.

Try to read. Find a place without distractions.



I did not read all of it … not possible in a weekend.

- Read all the TG reports.
- Found patterns in TG tables.
- Browsed through QA abstracts (IJROBP 71 S1 2008).
- Read the Summary Quantec Paper:

ELSEVIER

Int. J. Radiation Oncology Biol. Phys., Vol. 76, No. 3, Supplement, pp. S10–S19, 2010

0360-3016/10/$–see front matter

doi:10.1016/j.ijrobp.2009.07.1754

INTRODUCTORY PAPER

USE OF NORMAL TISSUE COMPLICATION PROBABILITY MODELS IN THE CLINIC

Lawrence B. Marks, M.D.,* Ellen D. Yorke, Ph.D.,† Andrew Jackson, Ph.D.,†
Randall K. Ten Haken, Ph.D.,† Louis S. Constine, M.D.,‡ Avraham Eisbruch, M.D.,†
Søren M. Bentzen, Ph.D.,§ Jiho Nam, M.D.,* and Joseph O. Deasy, Ph.D.¶

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What I should have done

- Open the study guide back in April!
- Read an article a day.
- Make notes while reading the article.
- Review my notes every evening for two weeks before the test.

How do you sift through all that?

- Concepts are important.
  - You can always reason your way to a logical answer and eliminate choices.
- Tables are important.
  - Sometimes, reasoning just doesn't cut it. At some level debates ensue, and a TG has to make a decision and put some value in a table.
  - Memorize.
  - Use patterns.
  - Group items with the same tolerance.
  - Find differences between tables.

Make your own cliff notes

- Write down concepts as you read reports, articles.
- This requires daily discipline over an extended time period.
- Start in April for the November test.
- Updates to study guides come out in April
- As you read, if you come across something that sounds like a good multiple choice question, write it down.

FFF cliff notes…

1280 Med. Phys. 38 (3), March 2011: Georg, Knöös, and McClean: Flattening filter free photon beams

1. FF scatter photons - major source of head scatter, causes
   - variation of the head-scatter factor or factor in-air with field size
   - the collimator exchange effect.

2. If the FF is removed, the electron fluence at the level of the monitor chamber is different and it is out of its usual mode of operation.

3. To use the monitor chamber for the servo system and to steer the beam, different plates have been tested, and are in use, to remove electrons. (PREVENT CHAMBER SATURATION)
   - 1.1 mm Al
   - 1.9 mm Cu
   - 11 mm nylon vs 2 mm Cu simulation
   - 1 mm Steel Plate
   - 6 mm Cu
   - 13 mm Al plug - thicker plates provide safety in case target breaks.
   - Cyberknife: thin lead filter at lower end of primary collimator.
   - Tomo: after thin target, an electron stopper and a beam hardener.

4. 1 or 2 mm Cu sufficient for beam steering but thicker plates for safety against target breaks.

5. in the FFF mode, variations in beam steering and bending currents exhibited only half of the position variation of a flattened beam.
   - The beam does not change shape
   - Field center position is important for beam fault measurement

6. X-ray spectra – by Monte Carlo: Softer beam. Minimal off-axis spectral difference. slightly softer off-axis. Makes it easier for dose calcs.

7. Contaminating electrons – greatly reduced in FFF
   - makes it much easier to calculate the dose in the buildup region more accurately

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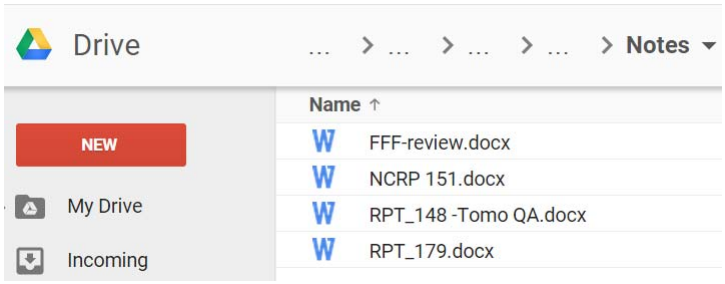
4 down, only 86 to go….



How would I write the questions?

- Categorize and think through the information
  - Devices – how to use, caveats, conditions
  - Processes – important steps, sequences
  - Definitions – critical items, e.g. point of measurement
  - Calculations – correction factors, dosimetry factors, etc.
- What do you think you would ask on the test?
- **Gut reaction**
- As you read through material, if you find something that looks like a good question, it will probably be asked.
- IT WON'T BE OBSCURE…for the most part.

Organize tables "mnemonically"

- Put like tolerances together
  - Group by tolerance since the multiple choice item is most likely the tolerance number
  - NOTE: questions, in general, are prepared such that you should be able to answer them without choices
- Organize items in decreasing tolerance
- Compare/contrast, e.g. daily to monthly
  - Note the principles involved, usually tighter tolerance on monthly, more things tested
    - E.G. Output constancy goes from 3% Daily to 2% Monthly.
    - Monthly adds beam profile constancy.

Daily QA from TG-142

Break down the table into rules and concepts

TABLE I. Daily.

Procedure	Machine-type tolerance: Non-IMRT	IMRT	SRS/SBRT
Dosimetry			
X-ray output constancy (all energies)		3%	
Electron output constancy (weekly, except for machines with unique e-monitoring requiring daily)			
Mechanical	**Non-IMRT**	**IMRT**	**SRS/SBRT**
Laser localization	2 mm	1.5 mm	1 mm
Collimator size indicator	2 mm	2 mm	1 mm
Distance indicator (ODI) @ iso	2 mm	2 mm	2 mm
Safety			
Door interlock (beam off)		Functional	
Door closing safety		Functional	
Audiovisual monitor(s)		Functional	
Stereotactic interlocks (lockout)	NA	NA	Functional
Radiation area monitor (if used)		Functional	
Beam on indicator		Functional	

Reorganize lines to see patterns

1. All Daily Output constancy is 3%.
2. Most Daily Mechanical is 2 mm. Exceptions – see the pattern.
   a) Laser drops by 0.5 mm as technique requires more accuracy.
   b) Collimator size drops only for SRS to 1 mm
3. All Safety – Functional. Stereotactic interlock only if SRS/SBRT

Monthly QA, TG-142

Procedure	Non-IMRT	IMRT	SRS/SBRT
Dosimetry			
X-ray output constancy Electron output constancy Backup monitor chamber constancy		2%	
Typical dose rate[a] output constancy	NA	2% (@ IMRT dose rate)	2% (@ stereo dose rate, MU)
Photon beam profile constancy		1%	
Electron beam profile constancy		1%	
Electron beam energy constancy		2%/2 mm	
Mechanical			
Light/radiation field coincidence[b]		2 mm or 1% on a side	
Light/radiation field coincidence[b] (asymmetric)		1 mm or 1% on a side	
Distance check device for lasers compared with front pointer		1mm	
Gantry/collimator angle indicators (@ cardinal angles) (digital only)		1.0°	
Accessory trays (i.e., port film graticle tray)		2 mm	
Jaw position indicators (symmetric)[c]		2 mm	
Jaw position indicators (asymmetric)[d]		1 mm	
Cross-hair centering (walkout)		1 mm	
Treatment couch position indicators[e]	2 mm/1°	2 mm/1°	1 mm/0.5°
Wedge placement accuracy		2 mm	
Compensator placement accuracy[f]		1 mm	
Latching of wedges, blocking tray[g]		Functional	
Localizing lasers	±2 mm	±1 mm	< ± 1 mm
Safety			
Laser guard-interlock test		Functional	
Respiratory gating			
Beam output constancy		2%	
Phase, amplitude beam control		Functional	
In-room respiratory monitoring system		Functional	
Gating interlock		Functional	

TG-142 Monthly QA remix

Procedure	Non-IMRT	IMRT	SRS/SBRT
X-ray, elect, backup monitor , respiratory gating output constancy	2%		
Dose rate constancy at technique DR	NA	2%	
Electron energy constancy	2%/2mm		
Accessory trays	2 mm		
Wedge placement	2 mm		
Jaw position symmetric	2 mm		
Light/rad field coincidence (Symmetric)	2 mm/1% on a side		
Treatment Couch position indicators	2 mm/1°	2 mm/1°	1 mm/0.5°
Localizing lasers	±2 mm	±1 mm	< ±1 mm
Gantry/collimator angle indicators, cardinal angles, digital	1°		
Distance check device for lasers compared w/ front pointer	1 mm		
Cross hair centering	1 mm		
Compensator placement accuracy	1 mm		
Jaw, asymm	1 mm		
Light/rad - asymm	1 mm/1 % on a side		
Photon/elect profile constancy	1%		
Latching of wedges, trays; laser guard-interlock; Gating phase/amplitude beam control; gating interlock; In-room respiratory monitoring system	Functional		

TG-142 Monthly QA more condensed

Procedure	Non-IMRT	IMRT	SRS/SBRT
X-ray, elect, backup monitor , respiratory gating output constancy, Dose rate constancy at technique DR	2% (3%)		
Electron energy constancy	2%/2mm		
Accessory trays, wedge placement, jaw position (symmetric)	2 mm		
Light/rad field coincidence (symmetric)	2 mm/1% on a side		
Treatment Couch position indicators	2 mm/1°	2 mm/1°	1 mm/0.5°
Localizing lasers	±2 mm	±1 mm (1.5mm)	< ±1 mm
Gantry/collimator angle indicators, cardinal angles, digital	1°		
Distance check device for lasers compared w/ front pointer (ODI 2mm); cross hair centering; compensator placement accuracy, jaw position (asymm)	1 mm		
Light/rad - asymm	1 mm/1 % on a side		
Photon/elect profile constancy	1%		
Latching of wedges, trays; laser guard-interlock; Gating phase/amplitude beam control; gating interlock; In-room respiratory monitoring system	Functional		

* Note differences from daily in red

TG-142 Annual

- I leave that exercise to you
- Organizing your own material also builds your memory of the material
- Another exercise – compare this to the tables in the other TG reports. What do they have in common? What are the differences?

If you implemented TG-142…

- Then you live these numbers, daily and monthly. Review the annual items.
- Several items on the test revolved around common clinical tasks.
- You need to keep your hands in the clinic to remember these.

On Test Day (1)…

- If you don't know the answer
  - eliminate choices
  - pick the best remaining one.
  - Don't leave blanks.
  - There is no penalty for "guessing".
  - Go with your gut.
  - Mark this as an item for review.
  - Don't get stuck, keep moving.

On Test Day (2)…

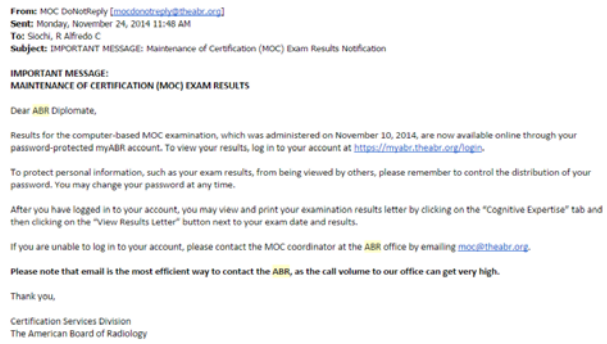
- With your left over time
  - make sure you have no blanks
  - The answer you need in one question might actually be available in another question or might prompt your memory. Mark it.
  - Go back and review the items you marked
- If you have a lot of left over time
  - Make a quick distribution count of your answers– how many As, Bs, Cs, Ds…
  - If you are flipping a coin on an answer, choose a letter that hasn't been chosen as much.

Some philosophizing…

- Studying for the exam = a hoop to jump through
  - Cramming was a way to get through it quickly.
  - How does that make me a better medical physicist?
- Take the long view.
  - Read the TG reports to do your job better, not to pass the test.
  - Passing the test will be a natural by-product.
- We should study TG reports as they come out.
- We should consider this as part of Continuous Improvement. Turn TG report into a PQI, SDEP. - 2 for 1.

Results…

- Despite the last minute cramming, I passed on the first try.
- I took the exam Nov. 10, got results on Nov. 24.



From: MOC DoNotReply [mocdonotreply@theabr.org]
Sent: Monday, November 24, 2014 11:48 AM
To: Siochi, R Alfredo C
Subject: IMPORTANT MESSAGE: Maintenance of Certification (MOC) Exam Results Notification

IMPORTANT MESSAGE:
MAINTENANCE OF CERTIFICATION (MOC) EXAM RESULTS

Dear ABR Diplomate,

Results for the computer-based MOC examination, which was administered on November 10, 2014, are now available online through your password-protected myABR account. To view your results, log in to your account at https://myabr.theabr.org/login.

To protect personal information, such as your exam results, from being viewed by others, please remember to control the distribution of your password. You may change your password at any time.

After you have logged in to your account, you may view and print your examination results letter by clicking on the "Cognitive Expertise" tab and then clicking on the "View Results Letter" button next to your exam date and results.

If you are unable to log in to your account, please contact the MOC coordinator at the ABR office by emailing moc@theabr.org.

Please note that email is the most efficient way to contact the ABR, as the call volume to our office can get very high.

Thank you,

Certification Services Division
The American Board of Radiology

To view your results, log in to your ABR account.

You don't get a score.

You don't know how many you got right.

You only know if you passed or failed.

Content…

- No one can give you exam questions.
- But I can tell you the study guide was fair.
- Be sure you know how to do all the standard clinical activities.
- TG tables dealing with frequency of tests and tolerance values. It's easy to write questions for such items – the answers suggest themselves in the table.
- TG dealing with devices – understand how the devices work.

Parting words…

- The exam was easy.
  - I either knew the answer or could narrow the choices to two items.
- BUT you do need to read the TG reports at a minimum.
- Many, many questions came from the reports listed in the study guide.
- START PREPARING NOW for Nov. 2015.
- Study TG Reports as they come out and implement improvements in your clinic.