2006 Therapy Oral Type Questions- I

1. orthovoltage/ superficial ? workload/permissible dose ? spun this into linac Q
2. pic of linac - describe what happens in each step
3. pic of linac ? flattening filter
4. pic of linac ? identify 5 structures
5. diodes ? identify various regions, describe usefulness
6. flatness & symmetry: E vs %dd
7. another flatness & symmetry
8. CT Imaging ?evaluate IMRT plan vs 3dCRT plan
9. CT Imaging ? identify structures in H&N (i.e., ventricles, cord, parotid, etc)
10. MR Imaging - T1or T2 benefits of each
11. DRR ? quality issues
12. DRR ? electron density, HU
13. compare Cs-137, Ir-192 & I-125 brachytherapy
14. Evaluate an LDR prostate implant ? doses, isotope, isodose lines, structures
15. IMRT
16. weighting factors ? skin, breast, gonads, bone marrow. Also eff dose eq & dose eq
17. TG51 electrons ? step by step
18. timer error / MU end effect
19. fusion of CT & MR ? advantages of each (CT, MR, Fused), which image set is base
20. broad beam v narrow beam geometry
21. Pion question ? others had Ppol
22. scanned beam, continuous beam, pulsed beam
23. heterogeneity & homogeneity

2006 Therapy Oral Type Questions- II

The morning of: My exam started at 7:00 in the morning. You wander over to a particular room where around 30 of your colleagues are seated and waiting. You turn in your pink sheet and your ID and check in. Once everyone is accounted for, you get your schedule and your scanning labels (more later) and the examinations started at 7:30. Most people had at least a half hour break at some point.

Scoring and format: There are 5 examiners, who ask 5 primary questions from each of the 5 subjects. The scoring is secretive, but basically, they'll give you a score from either below 60, 60-65, 65-70, 70-75, and 80+ in the 5 categories. You are allowed to fail one question per category, but if you fail more than one question in that category you fail the subject. You can fail one subject and conditional pass. If you fail more than one category, you fail. So, theoretically you could fail 4 questions and completely pass, you could fail 4 questions and conditional pass, or you could fail 4 questions and completely fail. It's all about the categories. I actually couldn't tell what questions fell into what category some of the time, for example an Epid question might be an imaging question or an equipment question.

The format is such your examiners are in their hotel rooms listed on the sheet. You go stand outside their door, and they come and get you when they are ready for you. You sit down at a desk which has a monitor, and they take one of your scanning labels and scan it to get your first question. They are usually seated next to you. You have to read the question to them, and then you begin your answer. There is a notepad that you can draw on, but in my experience this was largely unnecessary. You would start with answering the main questions, and depending on what you said, follow up (FU) questions were asked at their discretion. They kept time, so you would get 5 minutes per question approximately.

My exam: I can't remember all of my questions, mostly the hard questions, and the easy questions you forget. ☺ Here's what I do remember.

- Examiner 1: Her demeanor was serious, but not unfriendly. She was not overly helpful, she would just nod and say "okay" pretty much no matter what you said.

  Q1: You find a seed in the toilet. What do you do? What if the seed is in a hospital toilet? What about at the patient's home? What if it is the garbage? What if it is on its way to the landfill?

  I discussed prevention of losing seeds, possibly giving them a lead pig with tweezers, how the regulations were fuzzy regarding flushing radioactive seeds, what likely exposures to the rest of the staff and what TEDE likely were.

  Q2: Cartoon picture of a waveguide. What is this? Is it SW or TW? How does it function?

The image showed a waveform below the waveguide that was not in phase so I said it was a TW and discussed the cavities, the E field, the acceleration, etc. FU: where do the e- come from?

Q3: HDR T&O Showing 4 planes of the dose distribution. What is this? What are the planes? What points are involved? Is this a good implant?

The planes were an orthogonal, a lateral, the lateral throw off plane, and another plane that looked like a lateral but I wasn't sure what it was (and I said that). She asked what the lateral throw off plane was. I said it was probably a HDR T&O because there were optimization points along the ovoids and tandem. Described all the points. FU: What is point A? (Uterine vessels cross the ureter). What is point B? (lymph nodes). What are other points? I described B and R, how they are found. The implant looked pretty high (80cGy per hr to pt A) but I said I really didn't know what HDR rates were and I discussed typically in LDR you get 60 cGy/hr to pt A, but it also seemed like pts B and R were hotter than point A.

Q4: Picture of an Epid with different layers. What is this? What is each of the layers? How does it work? One of the detectors was labeled A-Si.

I actually thought there was one too many layers (!) but I talked about a metal layer, then a phosphor layer, then a detection mechanism behind an amorphous silicon detector. FU: What's the difference between MV and kV imaging? I talked about contrast and soft tissue visibility.

- Examiner 2: Very friendly, helpful, and quiet. When you got stuck he gave you the answer instead of making you suffer. I did get stuck on one of the follow up questions and he was merciful and we moved on quickly.

Q1: What's the difference between geometric, physical, and dosimetric penumbra? How does this affect lung treatments? What about the effects of blocks?

Talked about different types, isodose curves, and planning issues with lateral coverage. Blocks increase penumbra unless they are on the skin, etc. FU: What about Cobalt? How does that change those items?

Q2: Shown H&N IMRT plan. What's this? What are the PTVs? OARs?

I basically pointed to the brain stem, the optic chiasm, lenses, and eyeballs. I said you typically treat to 45Gy + a 15 Gy boost depending on OAR tolerances. This case was not particularly complicated, and he seemed unimpressed with the question and moved on.

Q3: Cartoon picture of a Linac. Name the components. What's the difference between this and a conventional simulator?

Named the e- gun, the accelerator, bending magnet, target/filters, collimators, monitor chamber, etc. I basically pointed to everything above the target and said this stuff would be gone in a simulator. FU: What about the jaws? I mentioned they were about 9 cm thick of tungsten before and a lot smaller afterwards, but I didn't know how small. He told me they were only a few mm thick, and probably made of iron. FU: More discussion of the components of the linac.

Q4: Picture of an Elekta MLC. What's this? What's it used for?

It was double focused so I mentioned that it was Elekta, but that I was used to Varians. I said it replaces blocks and you do IMRT with it. FU: What is your monthly MLC QA? What about your IMRT QA? I discussed that monthly we run picket fence tests and do gantry angle vs MLC position, and walked him through our IMRT QA process.

Q5: Cartoon of 3 patient rooms. What's this? How about for brachy?

Very vague question, giving the examiner lots of leeway. I mentioned that I would put the brachy patient on the end. He said "nah, lets put it in the middle". I discussed putting shielding in the walls and putting the beds as far apart as possible, public exposure limits, portable shields. He wanted to know typical readings from a T&O implant at a meter.

- Examiner 3: Pleasant, helpful, friendly.

Q1: Picture of a Varian MLC. What's this?

I basically ran through the exact spiel I gave Examiner #2. He wanted to know about leakage and what % of the CAX dose they typically were. We also talked about Radiation/Light field offset, what its value typically was, how you measured it.

Q2: Prostate IMRT plan. What's this? Discuss.

I went into typical doses, what the OAR's were, what some of the tissue tolerances were, what some of the different targets might be.

Q3: Picture of K'R50 vs Energy graph from TG51 showing different parallel plate chambers. What's k'R50? What's going on in this graph?

I wrote out the TG51 formalism and described all the components, down to k'R50. I talked about the construction of the various pp chambers (I think there was Markus, Exradin, and a Roos chamber plotted), about guard ring with, etc., and how that might cause some curve variation.

Q4: Neutron questions. What are the issues with neutrons? When are they a problem?

I talked about threshold at 10MV, and an issue at 15MV. You shield for 100-200 kV neutrons at the door and discussed Lead/BPE/Lead. He asked about photoneutron production and about the capture gammas and how they occurred. I whipped out that the capture gammas in the BPE were 478 keV and that's why you needed the Lead on the back of the door. FU: How do you detect them? Why do you moderate them? What so special about BPE that makes them a good moderator? (Hydrogen/Boron content)

Q5: Two pictures of pelvic fields. What are these?

I was really thrown for a loop because the left sided picture was very clear and nice, and the one on the right was crummy. I said the one on the left was a DRR and the one on the right was a port film. He said, no, the one on the left is a simulator film and the one on the right was a DRR. He was kind of facing away from the monitor so I turned the monitor and asked him if he thought that looked like a DRR. He looked at it at said "No, that's quite bad, isn't it?" So then he asked what made a DRR bad and I talked about slice width, motion, etc. and I still thought that was the worst DRR I'd ever seen.

- Examiner 4: She took notes on everything I said which was a little unnerving. She would repeat things back to me as she wrote it down which made me feel like I was saying something wrong, even I (sometimes!) knew this wasn't the case.

Q1: Picture of a Mantel field with 2 points. How do you calculate dose to the point when there's a block there?

I thought I could get away with a simple explanation of the Clarkson about dividing the pieces up into segments and subtracting out the scatter loss from the block from the total SAR. But that wasn't enough, or I wasn't saying the correct thing because it went downhill from there and I've blocked the rest of out my mind. Thinking back on the question, I wonder what would have happened if I had mentioned doing superposition convolution instead of Clarkson. She may have asked me how to do a hand calc, but she may have let me describe a TPS algorithm too. Upon reflection, I should have considered all my options before I opened my mouth. ☺

Q2: Picture of a lung PET- CT image. What's this? How is it used in RT?

I talked about PET and uptake to find GTV's. FU: Why is there uptake in the lung? I talked about how anything metabolizing can uptake the FDG, you had to look at the SUV's and discussed how they were normalized for each PET slice If they had previous RT it maybe uptake there. FU: What determines the metabolism? I talked about converting the FDG into sugar. FU: What are some problems with PET and PET/CT fusion? Talked about lack of electron density and that it were difficult to fuse a PET to a CT unless it was an indexed PET-CT.

Q3: Design of a hot lab with Cs-137.

I talked about having a locking door, and L blocks and a safe. FU: How thick are the walls of the safe? I said I wasn't sure but had to be thick enough for you to get down to 2mR/hr. FU: Well, what's the TVL for Cesium? At this point I blanked… I said I couldn't remember but it was probably around a few mm. It kind of went downhill from there. She started asking about what would be different if we picked up the Cs safe and put it in another room. I said you'd still have to have 2mR/hr, though the annual exposure rates for the general public would apply, so it would also have to be less than 0.02 mSv/week. She asked how do you identify the CS sources? I talked about a sheet on the wall with the drawer contents and that they were color coated and labeled. She said "What if I'm colorblind and I can't see the colors?" I said she could always ask someone else, because you'll always have to verify the source activity before you put it in someone. She didn't seem satisfied, however, so I might have missed something here.

Q4: How do you calibrate a brachytherapy source?

I talked about getting an ADCL calibrated well chamber (FU: Draw me a well chamber and discuss the components) and a NIST calibrated source to check the calibration. Using standard sources to check between calibrations. What sources did we have calibrations for? How did we calibrate sources that came in ribbons? I said we always ordered 10 extra seeds from the same batch and calibrated those. What happens if one is off? What are the limits? Do you still implant the source?

- Examiner 5: Nice, friendly, helpful. We actually finished a few minutes ahead of schedule so we just chatted at the end.

Q1: After you've done a radiation safety test and a mechanical safety test, what are the next 5 tests you'll do on an acceptance test?

I mentioned that since you've probably already done quick output check prior to the radiation safety survey, I'd do some PDD measurements and make sure the energy was what I ordered. Then I discussed mechanical and radiation isocenter with a brief description of those tests. Fourth, I picked laser/ODI/ pointer check, and last I talked about perhaps doing some MLC checks and we got into radiation light field, leakage of the MLC, and radiation offset. FU: What's the tolerance of the MLC leakage?

Q2: Picture of a TLD system readout. What's this?

I talked about how TLD's work, and how you read them out, annealing, etc. FU: Are TLD's energy dependent? What are they made of? Why are they so great? He then briefly asked about neutron detection for TLD's and I said I think there are some out there and talked about putting them inside some moderator.

Q3: More H&N. Picture of an IMRT H&N and a 3 field conformal H&N. What's the PTV and the OARs? How good are the plans?

Very similar to the question to Examiner 2's question. I pointed out the PTV, the optic chiasm, the brainstem, the lenses. The IMRT plan had beams coming through the eyes, and I think that was supposed to be what you noticed, because then we talked about cataract formation and tolerances and a quick discussion about stochastic vs non stochastic effects and LNT theory. I also quickly noted that the IMRT plan had hot spots outside the target area.

Q4: Another brachy room question. This question specifically asked how do you apply ALARA principles to a brachy treatment room?

This picture had a window outside the treatment room, so I mentioned finding out what was outside the window, if it was a playground, etc. Same discussion as with Examiner #2.

Q5: Electron depth dose curve shown. Why does it look like this? Why is the surface dose so high?

I talked about electron scattering and typical surface dose numbers. He wanted to know what the difference was between e- build up regions and photon buildup regions and typical skin doses for both.

Over all Impression: I thought the exam was very fair. The examiners were, for the most part, helpful, friendly, and nice. I was surprised by how little special procedures questions and how few very complicated questions there were – at least in MY exam. I had spent a lot of time memorizing equations which was just not necessary in the end. This not an examination of memorization, they just want to know you've been there and done that before. My suggestions to those studying is to read Khan, know what you do in your own clinic, and why you do it that way.