“When you put something of yourself into what you are doing, whatever it may be.”
“The mind, once stretched by a new idea, never returns to its original dimensions.”

-- Ralph Waldo Emerson
SAME OLD WAY

CHALLENGE

SOMETHING NEW
“Competition has been shown to be useful up to a certain point and no further, but cooperation, which is the thing we must strive for today, begins where competition leaves off.”

-- Franklin D. Roosevelt
“WITHOUT DATA, YOU’RE JUST ANOTHER PERSON WITH AN OPINION”
-- W. E. DEMING
“You treat a disease, you win, you loose. You treat a person, I guarantee you’ll win, no matter what the outcome.”

-- Patch Adams
What if we could facilitate knowledge sharing?
Participation by Role

- Dosimetrist: 48%
- Physicist: 16%
- Student: 36%

Statistics provided by Benjamin Nelms, PhD
Everyone has a story
Let me introduce you to:

JOHN
Commercial Fisherman

Retired Air Force

Pet Lover

Generous

Pay it forward
But, of course, this is not exactly how John was initially introduced to me.
JOHN
History:

40 year old male

Found lying on the floor in his home by the mailman

Living conditions were less than optimal with no running water
Presented to ER with:

Large Left Neck and Soft Tissue Mass
7.5x9x2.5cm

Right Anterior Chest Wall Lesions x 2
• CT Chest – no distinct abnormalities

• CT Brain N/C – large mass left ear and face

• CT Chest N/C – ulcerative process ant chest

• CT Neck N/C – left ear mass with extension into canal/mid-ear; 14mm Level 2 Lymph Node
• Note: Infectious Disease consult with subsequent antibiotic regimen

• Biopsy Left Ear: Moderately differentiated squamous cell carcinoma with extensive necrosis extending to specimen margins
• Patient Comments:
  The lesion on his anterior chest wall has been present for about 10 years slowly growing.
  The lesion on his left ear he feels like has been there for about 8 months.
  ** Did not seek medical attention as he doesn’t wish to be a burden on anyone **
1) SCC Left ear with questionable 14mm anterior cervical node (possibly reactive or metastatic)
2) Probable skin cancer right anterior chest wall-superiorly
3) Probable skin cancer right anterior chest wall-inferiorly
1) Punch Biopsies of the two right chest wall lesions in order to consider treatment.....
2) Long discussion with patient concerning options in reference to his left ear.........

(before we make any directives, lets look at what we have to work with)
Transverse Left Neck/Ear
Transverse Inferior Anterior Chest
What would you choose as your “planning adventure”? 

Critical Thinking

Resources Available

Technology and Skills
Responses to 12 Questions

Statistics provided by Benjamin Nelms, PhD

- Answered ALL 65%
- Answered SOME (But Not All) 14%
- Answered NONE 21%
Question #1: “Do you see cases like this in your current setting?”

Question #2: “Would a case like this fit into a protocol, class solution or would you be given creative freedom?”
“I’ve seen a similar case, but did not plan it.” -- Rachelle

“Yes, but they are not frequent.” -- Diego

“No.” – Mark, Erika, Adam
“Negative.” – Charles
“Not common.” – Andrea
“I’ve never seen anything like this one.” -- Max
“We would discuss the patient at our weekly tumor board to see what options we thought were viable and then “improvise”. – Michael

“A case like this would require a lot of out of the box thinking: several plans, techniques and input would be required”. – Jennifer
IMPROVISE!

(produce something from whatever is available)
Participation by TPS

Statistics provided by Benjamin Nelms, PhD

- Varian (Eclipse) 59%
- ADAC/Philips (Pinnacle) 15%
- Tomotherapy (Hi-Art) 8%
- RaySearch (RayStation) 8%
- Elekta (Monaco/XiO) 8%
- .decimal (Astroid) 2%
Question #3 :
“Did you consult with physicians? If so, did they have a preferred method of treatment?”

Question #4 :
“Did you consider other methods and/or did you generate any trial comparisons?”
Responses to 12 Questions (cont.)

Response Length (# Words) Per Question

Statistics provided by Benjamin Nelms, PhD
“Questioning of reasoning is rare unfortunately.” – Kevin

“Physician suggestion: Surgery for Left Ear mass to reduce tumor burden.”
-- Thomas

“Dr. agreed that IMRT was the best choice….his opinion was it is the obvious choice.”
– Frank
“No, did not consult physician. Usually they will ask ‘what would you do?’.”
-- Danny

“Multiple Dr.’s with multiple ideas and methods: simple ap/pa to IMRT. Not to mention the insurance question.”
-- Peter

“...use half beam FinF tangents near the brain and half beam IMRT for lower neck tumor region.”
-- Iqbal
Modality (for Left Ear Target)

- IMRT: 37%
- VMAT: 51%
- Helical Arc: 8%
- Proton: 2%
- 3D: 2%

Statistics provided by
Benjamin Nelms, PhD
“They all agreed that their volumes would look vastly different.” – Vivi

“It was a case that definitely called for IMRT with Tomo Helical delivery. Bolus is required...we found 3mm used every day is best. We would construct a “wet towel” bolus to conform to the irregular shape.”

-- Carol
The clear result is:

“Choosing your own adventure is not always that clear.”
“Relative Value Unit” -- Anne Greener, PhD
Question #5:
“In plan design, what consideration did you make based on practicality of delivery?” (do you consult with the radiation therapist at any time? ... how visible are you in the clinic?)

Question #6:
“What considerations, if any, did you make regarding delivery efficiency and/or patient comfort?”
“I consulted with fellow dosimetrists. I attempted to make it simple, yet effective to minimize set up/tx error in the tx room. Knowing the patient would be treated in a mask with multiple sites, the tx time would be considerable. I used VMAT to try and reduced the patients time on the table in the mask.”

-- Erika

*Varian VMAT, 5-photon with electrons*
Erika .... *Varian 3 Photon VMAT / 2 Electron*

Vertex Arc with Bolus

Clockwise and Counterclockwise with Bolus
Erika .... *Varian 3 Photon VMAT / 2 Electron*

Superior Chest e- with Bolus

Inferior Chest e- with Bolus
Erika .... *Varian 3 Photon VMAT / 2 Electron*
Erika .... *Varian 3 Photon VMAT / 2 Electron*
Erika .... *Varian 3 Photon VMAT / 2 Electron*
Erika .... *Varian 3 Photon VMAT / 2 Electron*
Erika .... *Varian 3 Photon VMAT / 2 Electron*
Erika .... *Varian 3 Photon VMAT / 2 Electron*
Anthony .... *CMS Monaco 2 Photon VMAT/2 Electron*

<table>
<thead>
<tr>
<th>BEAM [n] Name (Machine)</th>
<th>TYPE</th>
<th>MODALITY</th>
<th>FRACTIONS</th>
<th>ENERGY</th>
<th>METERSET</th>
<th>TIME (Sec)</th>
<th>ISOCENTER (mm)</th>
<th>GEOMETRY SUMMARY (1CC degrees)</th>
<th>MODIFIERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 [1] Arc1 (TRNEkAgility)</td>
<td>Treatment</td>
<td>VMAT</td>
<td>33 (Group 1)</td>
<td>6FFF MV</td>
<td>222.5731 MU</td>
<td>Invalid Dose Rate</td>
<td>0.0</td>
<td>0.0 (DICOM 58.8, -348.5, 412.6)</td>
<td>Gantry (Dynamic CW): 180 to 180, Collimator: 15, Couch: 0</td>
</tr>
<tr>
<td>2 [2] Arc2 (TRNEkAgility)</td>
<td>Treatment</td>
<td>VMAT</td>
<td>33 (Group 1)</td>
<td>6FFF MV</td>
<td>248.0655 MU</td>
<td>Invalid Dose Rate</td>
<td>0.0</td>
<td>0.0 (DICOM 58.8, -348.5, 413.6)</td>
<td>Gantry (Dynamic CCW): 180 to 180, Collimator: 345, Couch: 0</td>
</tr>
<tr>
<td>3 [3] AP (Demo/Synergy/Elec)</td>
<td>Treatment</td>
<td>Electron (Shaped)</td>
<td>33 (Group 2)</td>
<td>8 MeV</td>
<td>260.079 MU</td>
<td>Invalid Dose Rate</td>
<td>-151.3, -115.3, 107.1 (DICOM 92.5, -455.6, 298.3)</td>
<td>Gantry: 332.2, Collimator: 0, Couch: 50</td>
<td>Application: A 14 x 14 (ElectronSquare), Block 1: Block (Aperture), Bolus</td>
</tr>
<tr>
<td>4 [4] AP (Demo/Synergy/Elec)</td>
<td>Treatment</td>
<td>Electron (Shaped)</td>
<td>33 (Group 3)</td>
<td>8 MeV</td>
<td>259.541 MU</td>
<td>Invalid Dose Rate</td>
<td>-130.3, -271.5, 138.7 (DICOM -71.5, -487.2, 142.1)</td>
<td>Gantry: 0, Collimator: 0, Couch: 0</td>
<td>Application: A 10 x 10 (ElectronSquare), Block 1: Block (Aperture)</td>
</tr>
</tbody>
</table>

**Full Clockwise Arc**

**Full Counter Clockwise Arc**
Anthony .... *CMS Monaco 2 Photon VMAT/2 Electron*

Superior Chest e- with Bolus

Note : Enface with Couch Kick

Inferior Chest e- with Bolus
Anthony .... *CMS Monaco 2 Photon VMAT/2 Electron*
Anthony .... *CMS Monaco 2 Photon VMAT/2 Electron*
Anthony …. *CMS Monaco 2 Photon VMAT/2 Electron*
Anthony .... *CMS Monaco 2 Photon VMAT/2 Electron*
Anthony .... *CMS Monaco 2 Photon VMAT/2 Electron*
Anthony .... *CMS Monaco 2 Photon VMAT/2 Electron*

Cumulative DVH [Vol (%) vs. Dose]

- Lt Middle Ear
- Lt Parotid
- At Risk LNs
- Mandible
- Cord_Canal
- Targets

Dose (Gy) --->
Volume (%) --->
“I tried to keep the same snout size but was unable to. I decided to go with fewer beams. In hindsight I would have gone with the larger snout and a larger aperture so the snout would have only needed to be changed once instead of twice.”

-- Keitt

*.decimal, astroid dicom app, 4 ion beam static gantry *
Keitt …. *decimal Astroid Dicom App 4-ion beam static gantry*

<table>
<thead>
<tr>
<th>BEAM [4] Name (Machine)</th>
<th>TYPE</th>
<th>MODALITY</th>
<th>FRACTIONS</th>
<th>ENERGY</th>
<th>METERS ET</th>
<th>-TIME (Sec)</th>
<th>ISOCENTER (mm)</th>
<th>GEOMETRY SUMMARY (IEC degrees)</th>
<th>MODIFIERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 [0] (Machine Not Specified)</td>
<td>Treatment</td>
<td>Ion Beam</td>
<td>30 (Group 1)</td>
<td>198.586</td>
<td>0.000 NotSpecified</td>
<td>N/A for ion beam</td>
<td>0, 0, 0 (DICOM 0, 0, 0)</td>
<td>Gantry: 0, Collimator: 0, Couch: 0</td>
<td>--</td>
</tr>
<tr>
<td>2 [0] (Machine Not Specified)</td>
<td>Treatment</td>
<td>Ion Beam</td>
<td>30 (Group 1)</td>
<td>155.458</td>
<td>0.000 NotSpecified</td>
<td>N/A for ion beam</td>
<td>0, 0, 0 (DICOM 0, 0, 0)</td>
<td>Gantry: 90, Collimator: 0, Couch: 0</td>
<td>--</td>
</tr>
<tr>
<td>3 [0] (Machine Not Specified)</td>
<td>Treatment</td>
<td>Ion Beam</td>
<td>30 (Group 1)</td>
<td>126.671</td>
<td>0.000 NotSpecified</td>
<td>N/A for ion beam</td>
<td>0, 0, 0 (DICOM 0, 0, 0)</td>
<td>Gantry: 335, Collimator: 0, Couch: 90</td>
<td>--</td>
</tr>
<tr>
<td>4 [0] (Machine Not Specified)</td>
<td>Treatment</td>
<td>Ion Beam</td>
<td>30 (Group 1)</td>
<td>124.635</td>
<td>0.000 NotSpecified</td>
<td>N/A for ion beam</td>
<td>0, 0, 0 (DICOM 0, 0, 0)</td>
<td>Gantry: 0, Collimator: 0, Couch: 0</td>
<td>--</td>
</tr>
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</table>

Static Photon

Static Photon
Keitt .... *decimal Astroid Dicom App 4-ion beam static gantry*
Keitt .... *.decimal Astroid Dicom App 4-ion beam static gantry*
Keitt .... *.decimal Astroid Dicom App 4-ion beam static gantry*
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Keitt .... *.decimal Astroid Dicom App 4-ion beam static gantry*

Cumulative DVH [Vol (%) vs. Dose]

- **Targets**: Lt Parotid
- **At Risk LNs**: Lt Middle Ear, Mandible
- **Other Structures**: Cord_Canal
“Assume that the mask is reproducible, comfortable and a good fit. Also assume that we would be doing CBCT daily frequently if not daily to monitor for volume changes that can be assessed for replan possibility.”

-- Kevin

* Raysearch Raystation, 2-Photon/VMAT *
Kevin .... *Raysearch Raystation 2 Photon VMAT / 2 Electrons*

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<tr>
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<th>- TIME (Sec)</th>
<th>ISOCENTER (mm)</th>
<th>GEOMETRY SUMMARY (IEC degrees)</th>
<th>MODIFIERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 [1] CCW (VMAT, Varian)</td>
<td>Treatment</td>
<td>VMAT</td>
<td>33</td>
<td>6 MV</td>
<td>131,5035 MU</td>
<td>36.0</td>
<td>0, 0, 0</td>
<td>DICOM: 764, -350, 34592</td>
<td>Gantry (Dynamic CW): 0 to 179, Collimator: 15, Couch: 0</td>
</tr>
<tr>
<td>2 [2] CW (VMAT, Varian)</td>
<td>Treatment</td>
<td>VMAT</td>
<td>33</td>
<td>6 MV</td>
<td>154,1655 MU</td>
<td>37.0</td>
<td>0, 0, 0</td>
<td>DICOM: 764, -350, 34592</td>
<td>Gantry (Dynamic CW): 0 to 179, Collimator: 15, Couch: 0</td>
</tr>
</tbody>
</table>

Partial Counter Clockwise Arc

Partial Clockwise Arc
Kevin .... *Raysearch Raystation 2 Photon VMAT / 2 Electrons*
Kevin .... *Raysearch Raystation 2 Photon VMAT / 2 Electrons*
Kevin .... *Raysearch Raystation 2 Photon VMAT / 2 Electrons*
Kevin .... *Raysearch Raystation 2 Photon VMAT / 2 Electrons*
Kevin .... *Raysearch Raystation 2 Photon VMAT / 2 Electrons*
Kevin .... *Raysearch Raystation 2 Photon VMAT / 2 Electrons*

**Cumulative DVH [Vol (%) vs. Dose]**

- **Targets:** Lt Parotid
- **At Risk LNs:** Cord_Canal, Lt Middle Ear
- **Targets:** Lt Parotid
- **At Risk LNs:** Cord_Canal, Lt Middle Ear
- **Targets:** Lt Parotid
- **At Risk LNs:** Cord_Canal, Lt Middle Ear

**DVH CURVES**

- **Volume (%)** vs. **Dose (Gy) --->**
  - 0 to 85 Gy
  - 15, 30, 45, 60, 75, 90 Volume (%)
5-Gantry Stop IMRT with split fields with Bolus (total 8-fields)

Taylor .... *ADAC Pinnacle 3  8-Field IMRT / 2-Electron *
Taylor .... *ADAC Pinnacle 3  8-Field IMRT / 2-Electron *

Superior Chest e- with Bolus

Inferior Chest e- with Bolus
Taylor .... *ADAC Pinnacle 3  8-Field IMRT / 2-Electron *
Taylor .... *ADAC Pinnacle 3  8-Field IMRT / 2-Electron *
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Taylor .... *ADAC Pinnacle 3  8-Field IMRT / 2-Electron *
Taylor .... *ADAC Pinnacle 3  8-Field IMRT / 2-Electron *
Taylor .... *ADAC Pinnacle 3  8-Field IMRT / 2-Electron *
“One physician would say, “do whatever you want” while another would state their preference. I would not have consulted the therapists for planning, however I will explain how to set up the bolus for the ear.”

-- Vanessa

* Varian ARIA, 12 Photon/electron IMRT – Static Gantry *
Vanessa .... *Varian ARIA 9-Field IMRT / 2-Electron * .... By way of comparison for two static beam IMRT plans ....

Cumulative DVH [Vol (%) vs. Dose]

- Targets
  - Lt Parotid
  - Lt Middle Ear
  - At Risk LNs
  - Cord_Canal
  - Mandible
  - Mandible

- Structures
  - 0.5cm Inf
  - 0.5cm Sup
  - At Risk LN Regio
  - Body
  - Brain
  - Brainstem
  - Carina
  - Choosm
  - Cord_Canal
  - GTV Inf Rt Chest
  - GTV Left Ear
  - GTV Sup Rt Chest
  - Heart
  - Inf Inner Wire
  - Inf Outer Wire
  - Left Ear Wires
  - LN Left Neck
  - Lt Lens
  - Lt Lung
  - Lt Middle Ear
  - Lt Optic nerve
  - Lt Orbit
  - Lt Parotid
  - Mandible
  - Rt Lens
  - Rt Lung
  - Rt Optic nerve
  - Rt Orbit
  - Rt Parotid
  - Sup Inner Wire
  - Sup Outer Wire
  - Whole Lung

Dose (Gy) --->

Volume (%) ---
“For Tomo, always try to keep the delivery time to a minimum, but the longer a volume is, the longer it takes to deliver. Make sure the gantry period and open leaf histogram are acceptable.”

-- Carol

* Tomotherapy Hi-Art,
  1-Photon_Arc*
Carol .... *Tomotherapy HiArt 1-Photon Arc (exclude chest)*

Clockwise Arc
Carol .... *Tomotherapy HiArt 1-Photon Arc (exclude chest)*
Carol .... *Tomotherapy HiArt 1-Photon Arc (exclude chest)*
Carol .... *Tomotherapy HiArt 1-Photon Arc (exclude chest)*
Question #7: “Were steps taken to verify plan calculation and delivery accuracy?”

Question #8: “What considerations did you give to dose distribution? (Homogeneity/Heterogeneity/Conformality/D1%) ... “Do you extract any of these metrics for review?”
VMAT

IMRT
“Would I be a good dosimetrist if I didn’t?”

-- Charles

“Yes. IMRT QA with 3D Gamma Analysis was performed with a 3%/3mm tolerance (passing is considered to be 90%)”

-- Anna

(%Difference and DTA-distance to agreement)
Total number of pixels: 19629
Minimum Signal: 0.00
Maximum Signal: 1.93
Average Signal: 0.34
Standard Deviation: 0.25
Pixels in Ranges:
  0.00 to 1.00 : 19156 (= 97.59 %)
  1.00 to 1.93 : 473 (= 2.41 %)
Physicist to QA the Plan

Set Table Parameters in TPS and verify in room with trial run for couch kicks and gantry rotations

Foremost, steps are taken to ensure delivery that is achievable clinically and not just on paper.”

-- Jennifer
Conformality Index:
RTOG Definition – volume of reference or Rx Isodose divided by the Target Volume:
\[ CI \text{ (RTOG)} = \frac{V(RI)}{TV} \]

Homogeneity Index:
RTOG Definition – The Maximum Isodose in the Target divided by the Reference Isodose:
\[ HI = \frac{I_{\text{max}}}{RI} \]
\[ \text{of } HI = \frac{(\text{max-min})}{RI} \]

Integral Dose:
AAPM Definition – the volume integral of the dose deposited in the patient and is equal to the mean dose times the volume. "Total Energy Adsorbed by the Body"
\[ \text{ID} = \text{average dose received by the entire volume excluding the PTV} \]
When reviewing the plans, it was decided that dose homogeneity was not a top priority. Top priorities were maintaining 95% coverage and limiting OAR’s. On final review, attention was given to the location of the “hot spot” regions.” -- Joel

“Dose homogeneity was not a priority, rather the focus was on adequate coverage of the target.” -- Jobin
“All information has meaning to guide the potential outcome. Is it conformal? Is it homogeneous? Do you want that result? Was there an unexpected result? At the end of the day, I am responsible for the information that I have.”

--Jeff
Question #9: “Would you have considered a different dose or fractionation?”

Question #10: “Are there any treatment aids (bolus, compensators, etc) that you would consider?”

Question #11: “Do you monitor treatment response over the course of treatment?”
- 2.75cGy/tx x 20 = 5500cGy
- 70Gy/63Gy/57Gy in 33fx’s
- 300cGy x 2fx’s then 200cGy

- Custom Bolus placed inside the mask for CT Sim
- Possibly Irregular Surface Compensator is IMRT is not available
- Wet Gauze Bolus for conformality
- 3mm Bolus if possible for conformality
- For IMRT, flash the MLC’s to avoid under dosing skin

For Immobilization:
- Mask
- Vac-loc
- Acuform Cushion
- Bolus (3,5,7mm)
  Superstuff and Superflab
“CBCT and Therapist monitoring for reduction of gross tumor size.” -- Thomas

“Monitor the two chest lesions for skin reaction and/or response (no imaging). If they continue to increase, then re-think the plan. Use adaptive-radiotherapy approach for the Left Neck. Monitor response with CBCT and replan per MD.” -- Jennifer
“Measure skin dose with TLD’s” -- Simon

“Utilize adaptive software which takes calculates dose to the MVCT. If a dramatic change occurs in volume, then it will be shown by the adaptive software and Re-CT and Plan per physician would be necessary.” -- Charlie

“Daily separation measurement with Re-CT at halfway point. Minimum 10Gy remaining.” -- Joel
We started our conversation by introducing you to John.

Here’s the adventure that was determined for him .....
1) Punch Biopsies of the two right chest wall lesions in order to consider treatment.....
2) Long discussion with patient concerning options in reference to his left ear........
- Lives alone when he has a place
- Not Married, No Children, No Family
- Has not visited a physician for as long as he can remember and attests to not taking care of himself
- Surgical Evaluation: Not a surgical candidate due to co-morbidities (BP/BUN/CREAT etc)

- Medical Oncology: Squamous Cell Skin – not requiring therapy unless metastatic; Administer iron infusions with follow up
- Radiation Oncology: Bx proven malignancy, left-sided enlarged lymph node on CT exam (Non-Contrast), ulcerative chest wall lesions (secondary vs met)
- Non-Contrast Imaging only, No PET, Non-Surg, Non-Chemo
“Hey Chris, come and take a look at this case with me!

Get me a CT Sim that’s reproducible and I want to give 66Gy-70Gy to the Left Ear/Neck and 66Gy to the chest lesions.

Call me when you have something.”

--Jeff
“My first thought .... well maybe not my first thought .... IMRT with Electrons to the chest wall. Bolus everything, QA the Neck, discuss the set up with the Therapists and move on to the next case.

Then the Dr. and I had an interesting discussion .....”

-- Chris
Chris ... * Varian ARIA  2-Photon / 2-Electron *

200cGy/fx to 5000cGy
Then Re-Eval

AP – No Bolus

PA – No Bolus
Chris ... * Varian ARIA 2-Photon / 2-Electron *

Superior Chest Lesion
0.5cm Bolus

Inferior Chest Lesion
0.5cm Bolus

200cGy/fx to 6400cGy @ 90%
Re-Eval Clinically
Chris ... * Re-CT Sim @ 4000cGy : Start Red after 50Gy *

APO – No Bolus

PAO – No Bolus

200cGy/fx to 1600cGy
Final Rx = 6600cGy
Initial GTV Volume = 633.5cc’s
New GTV Volume = 135.6cc’s

% Decrease approx = 78%
Chris ... * Initial 5000cGy*
Chris ... * Estimated Composite to 6600cGy *
Chris ... * Varian ARIA 2-Photon / 2-Electron *

Superior Chest

Inferior Chest
Chris ... * Estimated Composite to 6600cGy *

Estimated Composite DVH:
1) Left Neck + LN Initial = 5000cGy @ 95%
2) Left Neck + LN Reduced = 1600cGy @ 95%

Total Dose = 6600cGy
2-Week Post XRT Follow Up
1/5/2017 : 1 year Post XRT Follow Up
1/5/2017 : 1 year Post XRT Follow Up
Let me Re-introduce you to:

JOHN
Quality healthcare has two dimensions:

1) High Quality Decision Making – consistency of practice through professional judgement and peer review studying patterns of care.

2) High Quality Performance – minimizing process variation and moving the average closer to the optimum value.

Quality Radiation Oncology” – medphys.org
April 2007, Pg 1529-1534;
Todd Pawlicki and Arno J. Mundt
“Quality is more than just the avoidance of gross error and includes the consistent delivery of the full potential of the currently available technology and evidence.”

-- Xiaodong Zhang;
“Clinical Use of KBTP”; UTMDACC
“When you put something of yourself into what you are doing, whatever it may be.”