

# **ASTRO/ARRO**

## **Meet Me In Treatment Planning: Gastrointestinal Malignancies**

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# Disclosure

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  - NIH NCI R25CA240134-01
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  - Radiological Society of North America
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- Manager of [www.RadOncQuestions.com](http://www.RadOncQuestions.com) and [www.HemOncReview.com](http://www.HemOncReview.com)



# Clinical Milieu

- Assistant Professor of Radiation and Cellular Oncology at University of Chicago
- Practice at a University of Chicago Medicine network location affiliated with a private hospital
  - 2 radiation oncologists
  - 4 medical oncologists
  - Gynecologic oncology
  - Breast surgeon
  - Plastic surgeon
- All other medical services are unaffiliated private individuals or groups
- Provides a “private practice” perspective on clinical care
- 1 academic day per week at main campus (teaching, research, etc)



# Resources

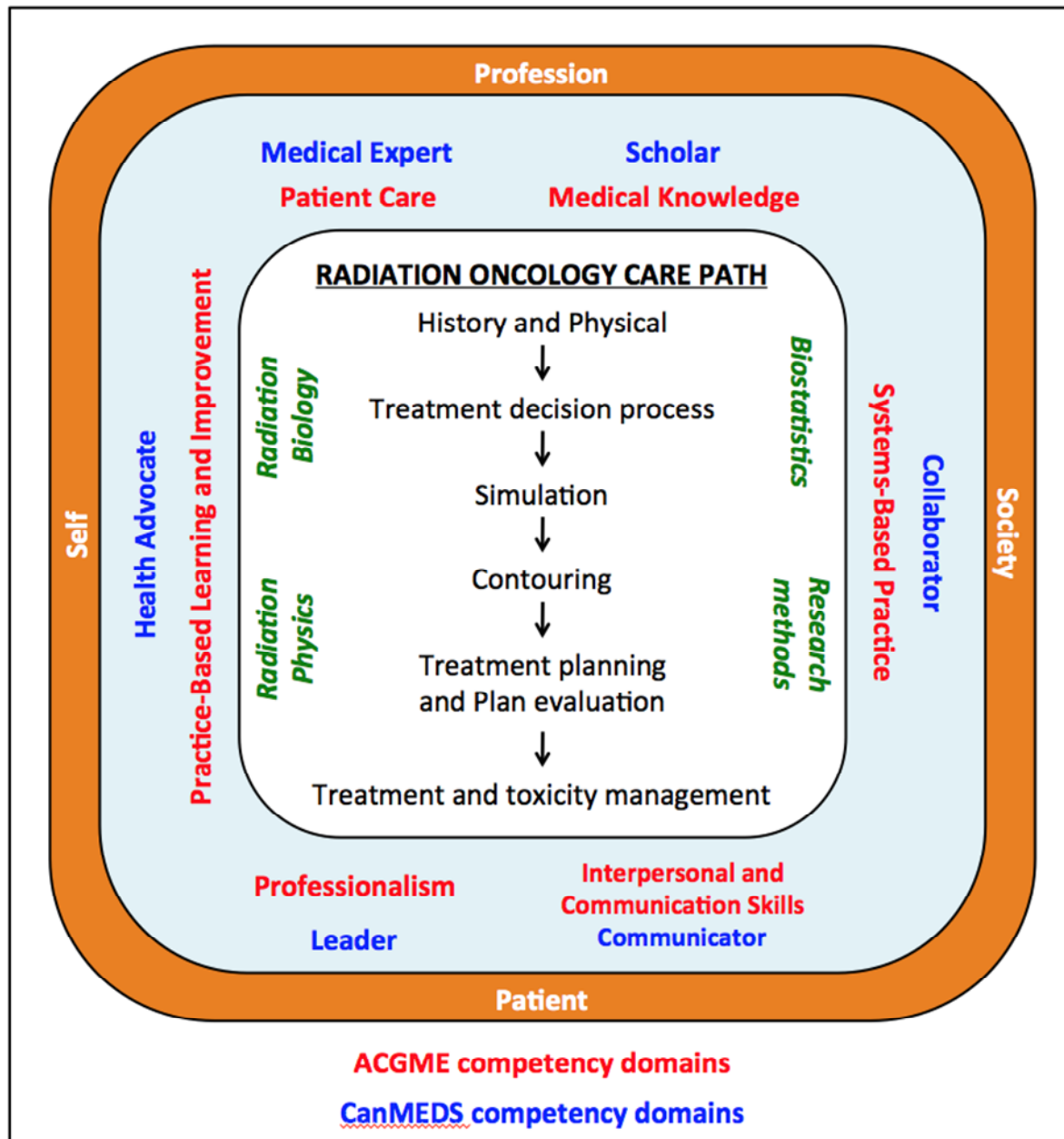
- NCCN
- Handbooks (Lee, Hansen, etc)
- RTOG/NRG/Alliance protocols
- Contouring papers (e.g. inguinal nodes)
- YOU SHOULD BE ABLE TO REPRODUCE YOUR CONTOURS FROM SCRATCH.



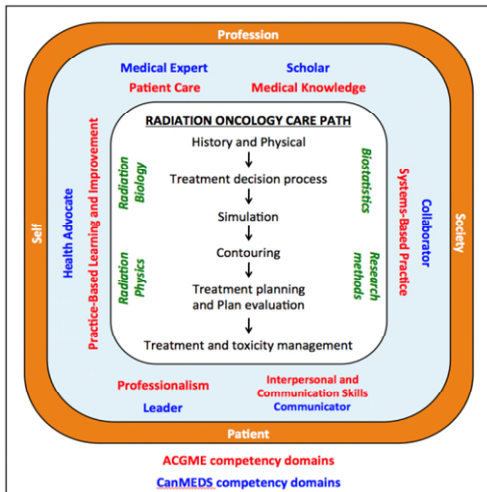
# Goal and Objectives

- **Goal:** Provide a framework for evaluating radiotherapy treatment plans using GI cases as case examples
- **Objectives:** At the end of this webinar, participants will be able to...
  - ...define a new conceptual framework for radiation oncology education
  - ...define CB-CHOP as a mnemonic for treatment plan evaluation





Golden DW and Ingledew PA. "Radiation Oncology Education" In Halperin EC, Brady LW, Perez CA, and Wazer DE (Eds.). *Perez & Brady's Principles and Practice of Radiation Oncology*. Seventh edition. Philadelphia, PA: LWW.



	Lymphoma	Head and neck	GU	Palliation	Breast	GI	Gyn	Lung	Adult CNS	Pediatrics
H&P										
Treatment decision process										
Simulation										
Contouring										
Planning and plan evaluation										
Treatment and toxicity management										

# What is your method to the madness?

## **CB-CHOP**

**C** - Contours

**B** - Beams

**C** - Coverage

**H** - Hot spots

**O** - Organs at risk (OARs)

**P** - Prescription

Dean M, Jimenez R, Mellon E, Fields E, Yechieli R, Mak R. CB-CHOP: A simple acronym for evaluating a radiation treatment plan. *Appl Rad Oncol*. 2017;6(4):28-30.



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# Quantitative Metrics for Assessing Plan Quality

Kevin L. Moore, PhD,\* R. Scott Brame, PhD,\* Daniel A. Low, PhD,<sup>†</sup> and Sasa Mutic, PhD\*

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Despite many studies over the last 3 decades that have attempted to explicitly quantify the decision-making process for radiotherapy treatment plan evaluation, judgments of an individual plan's degree of quality are still largely subjective and can show inter- and intra-practitioner variability even if the clinical treatment goals are the same. Several factors conspire to confound the full quantification of treatment plan quality, including uncertainties in dose response of cancerous and normal tissue, the rapid pace of new technology adoption, and the human component of treatment planning. However, new developments in clinical informatics and automation are lowering the bar for developing and implementing quantitative metrics into the treatment planning process. This review discusses general strategies for using quantitative metrics in the treatment planning process and presents a case study in intensity-modulated radiation therapy planning whereby control was established on a variable system via such techniques.

Semin Radiat Oncol 22:62-69 © 2012 Elsevier Inc. All rights reserved.

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# Case review

- Case summary
- Simulation
- CB-CHOP



# Case #1: Palliative Esophageal Cancer



# Case #1

- 79 year-old female who presented with dysphagia with solids, chest pain and epigastric pressure, and 20 pound weight loss in the past 6 months
- No hematemesis, hematochezia, or BRBPR
- Known diagnosis of SCC of the esophagus from OSH, transferred care to be near family
- PMH: atrial fibrillation, HTN, CKD, gout
- PSH: rotator cuff repair
- SH: former tobacco smoker and history of heavy EtOH abuse



# Case #1 Workup

- PE: No palpable cervical/SCV LNs
- EUS: Circumferential esophageal thickening from 23-27cm with stricture
- PET CT: Soft tissue mass in mid-esophagus. FDG-avid right supraclavicular and bulky celiac lymph node.
- Pathology: Celiac lymph node biopsied and confirmed poorly differentiated SCC



# Case #1 Treatment Recommendations

- Poor performance status
  - Nodal disease from supraclavicular to celiac
  - Not a candidate for curative intent chemoRT
  - Patient/family requested palliation
  - Stent and PEG placed
- 
- 20Gy/5# to primary tumor for palliation of pain



# Case #1: CT Simulation

- Supine
- Arms up
- Head extended
- Upper immobilization, lower knee sponge
- No contrast (can see stent)
- No 4DCT (palliative, central)
- 3mm slices



# Case #2: Rectal Cancer





# Case #2

- 69 year-old female presents with bloating, constipation, and hematochezia
- PMH: GERD, HTN
- PSH: cholecystectomy, endometrial ablation, tubal ligation
- SH: Denies history of tobacco, alcohol, illicit drug use



# Case #2 Work up

- PE: Mass palpable at tip of finger
- CT C/A/P: circumferential soft tissue mass in mid to high rectum with regional lymph nodes measuring up to 6 mm. No metastatic disease.
- EUS: mass involving  $>2/3$  of the circumference and penetrating through the muscularis propria approximately 10 cm from the anal verge.  $\geq 2$  malignant-appearing lymph nodes  $\sim 1$  cm in greatest dimension.
- MRI: Irregular rectal wall thickening  $\sim 8$  cm from the anorectal junction. Integrity of the muscularis cannot be confirmed with mild adjacent stranding.
- Pathology: Biopsy of rectal mass confirmed colonic adenocarcinoma



# Case #2 Treatment Recommendations

- Rectal adenocarcinoma
  - uT3N1M0 Stage IIIB
- Neoadjuvant chemoRT → robotic LAR/TME → chemo
  - 45/50.4Gy/28#, 3DCRT
  - Concurrent capecitabine



# Case #2: CT Simulation

- Prone on belly board
- Arms up
- Upper and lower immobilization
- PO contrast for small bowel
- 3mm slices
- Fuse MRI for primary delineation



# Case #3: Anal Cancer



# Case #3

- 46 year old female who presented with pelvic pain and blood/mucous in stool
- PMH: Cervical dysplasia, diverticulitis, C-diff
- PSH: Hysterectomy, cone biopsy
- SH: Never smoked, occasional EtOH



# Case #3 Work Up

- PE: Rectal exam showed posterior anorectal mass, firm and fixed
- Colonoscopy: 8 cm fungating bleeding partially obstructing malignant appearing mass ~2 cm from anal verge.
- Pathology: Anal mass biopsy = squamous cell carcinoma, mod diff
- MRI pelvis: 6.0 cm anorectal involving the anorectal junction. Extension across the internal anal sphincter muscles and across the intersphincteric plane into the external anal sphincter fibers on the right. No extension into the ischiorectal fossa. 2 abnormal heterogeneous perirectal lymph nodes ~1.2 cm.
- PET/CT scan: midline anal mass extending farther to the right with hypermetabolic 1.2cm right perirectal lymph node.



# Case #3 Treatment Recommendations

- Anal squamous cell carcinoma
  - cT3 N1a M0 Stage IIIC
- Definitive chemoradiotherapy
  - 45Gy/25# to whole pelvis and inguinal nodes
  - 54Gy/30# to primary tumor (+LN falls in tumor volume)
  - Sequential boost
  - Concurrent 5FU/MMC





# Case #3: CT Simulation

- Supine
- Arms on chest
- Frogleg
- Upper/lower alpha cradle
- Vaginal dilator

Briere et al. MD Anderson Radioth Oncol 2012

- PO contrast for small bowel
- 3mm slices
- Fuse MRI and PET for target delineation



# Case #4: Pancreatic Cancer

# Case #4

- 75 year-old male presents with upper abdominal pain, jaundice, and a 20 pound weight loss
- PMH: DM, BPH, CVA, GERD, HTN, HL
- PSH: TURP
- SH: Accountant, Never smoker, Occasional EtOH



# Case #4 Work Up

- PE: Port, abdomen soft, NTND
- CT C/A/P: vague low density 4.1 x 2.4 cm mass along the posterior margin of the pancreatic head. SMA involved ~180 degrees. Dilatation of the common bile duct with slight distention of the gallbladder.
- EUS: Mass arising in head of the pancreas compressing the bile duct causing upstream dilation. Abutting SMA. ERCP with stent placement.
- Pathology: FNA showed adenocarcinoma



# Case #4 Work Up

- Initial treatment recommendation for neoadjuvant chemotherapy alone
- Completed gemcitabine/abraxane x12
- CT Abdomen: pancreatic ductal dilation involving the body and tail as well as the neck extending to a mass in the head and uncinate process measuring 4.1 x 2.4 cm, not changed with surrounding inflammatory change. + SMA (180°) involvement, + SMV (120-180°) involvement.
- Surgeon requested neoadjuvant chemoRT with intent of downstaging for resection.



# Case #4 Treatment Recommendations

- Pancreatic adenocarcinoma
  - cT4N0M0, Stage 3
- ChemoRT for further downstaging
  - 45/55Gy/25# SIB
  - Concurrent capecitabine
  - Anisotropic PTV<sub>boost</sub> margin to cover SMA, spare duodenum



# Case #4: CT Simulation

- Supine
- Arms up
- Upper alpha cradle, knee sponge
- PO contrast for small bowel
- 3mm slices
- 4DCT
- Used outside CT w/ contrast for vessel delineation



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