MAYO CLINIC

REAL-WORLD IMPLEMENTATION OF RECENT TG REPORTS

TG-263: STANDARDIZING NOMENCLATURES IN RADIATION ONCOLOGY

Courtney R Buckey, PhD, DABR
Mayo Clinic Arizona

AAPM VIRTUAL SPRING CLINICAL MEETING
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Parent Session: From Page to Clinic - Bringing Good Ideas to Your Physics Group

LEARNING OBJECTIVES

- At the conclusion of this talk attendees will…

1. Understand the rationale for implementing standardized nomenclature in their clinic, department or group

2. Be familiar with the guidelines and recommendations found in TG-263

3. Feel more comfortable with beginning a new nomenclature initiative, including how to motivate others and how to keep oneself on track

DISCLOSURES

I have no relevant financial interests to disclose related to this talk or this work

Some of the tools discussed in this presentation may be adapted for commercial applications in the future

I am a brand-new member of TG-263U1, but was not involved in the original report

Romeo and Juliet
Painting by Jody Hewgill

NOMENCLATURE: WHAT'S IN A NAME?

From personal identity to brand recognition, and from classic literature to modern science (and even science fiction!), names have an impact in how we perceive and interact with the world

BENEFITS OF STANDARDIZATION

Broadly speaking, standardization drives decreases in variation, stress, and training time; increases in quality and reliability; and forms a baseline for continuous improvement

AAPM REPORT NO. 263

CHARGE STATEMENT

To provide nomenclature guidelines in radiation oncology for use in clinical trials, data-pooling initiatives, population-based studies, and routine clinical care by standardizing:

CHARGE 1

structure names across image processing and treatment planning system platforms

CHARGE 2

nomenclature for dosimetric data (e.g., dose/volume histogram [DVH]-based metrics)

CHARGE 3

templates for clinical trial groups and users of an initial subset of software platforms to facilitate adoption of the standards

CHARGE 4

formalism for nomenclature schema which can accommodate the addition of other structures defined in the future

TOWARDS SAFER PATIENT CARE

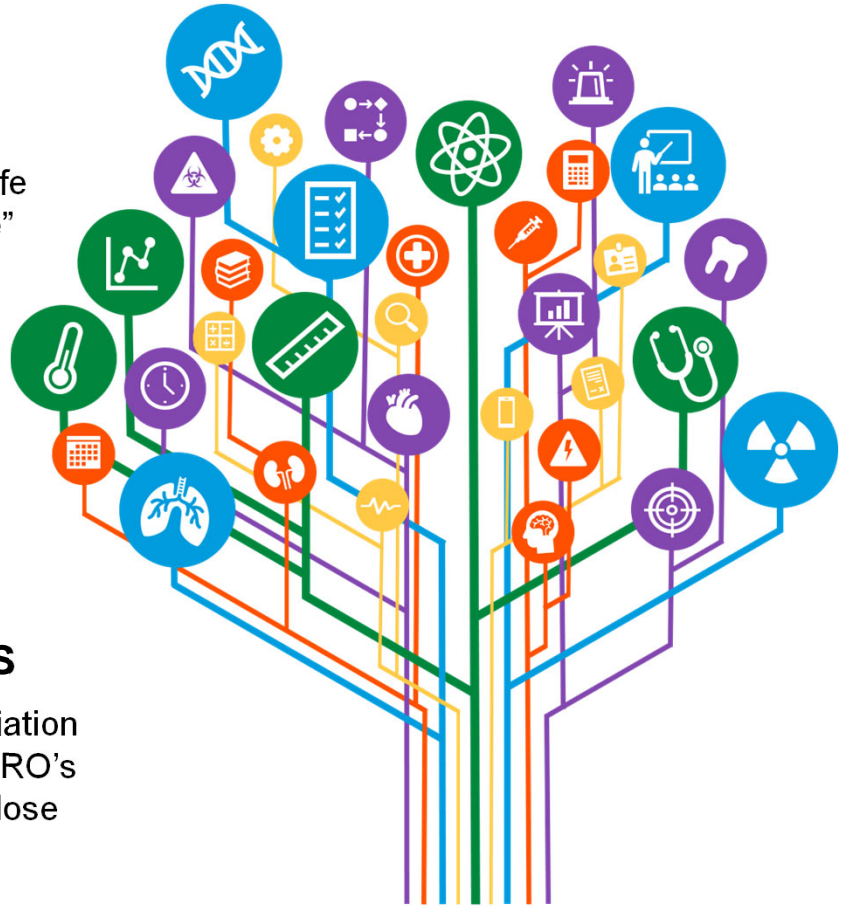
- "Common nomenclature increases safety by minimizing variability and ambiguity"
- Standardized rules permit automated solutions to check nomenclature itself, and trigger evaluations of plan quality metrics that are driven by the consistent application of names and conventions
  - Targets
  - Laterality
  - Planning approaches

WHAT IS OUR GOAL?

"The difference between a safe practice and special practice"

POSITIVE INFLUENCES

Improved communication in radiation therapy is a cornerstone of ASTRO's white paper on standardizing dose prescriptions



CHALLENGES

DESPITE SOME PROGRESS

- Vendor-based challenges
  - Inter-vendor variation on constraints for character strings used for structures, including length, special characters, and capitalization
- Multi-institutional-based challenges
  - Lack of a clear multi-institutional oversight group to take charge of coordinating the standards
  - Lack of guidelines that extend across multiple languages, even when the specific names cannot
  - Challenges with mapping previously utilized nomenclature to new standards
- Single institutional-based challenges
  - Cost and effort to implement a new nomenclature
  - Consistent use of standards by the range of staffing groups interacting with patient charts (e.g., physicians, physicists, therapists, and dosimetrists)
- Clinical staff challenges
  - Inconsistent approaches to consider/define laterality and other structure qualifiers
  - Lack of detailed and site-specific guidelines for the definition of target structures to enable automated computer algorithms to extract relevant information
  - Lack of clear guidelines for clarifying or incorporating new elements of a standard nomenclature

NEED HELP JUSTIFYING THIS TO YOUR TEAM?

- Standardized nomenclature:
  - enhances safety and quality efforts within and between clinics for routine ongoing practice
  - enables data pooling for outcomes research, registries, and clinical trials
  - is a vital precursor to the development of scalable uses of scripting for quality assurance and treatment plan evaluation

NEED HELP GETTING THE WORK STARTED?

- TG-263's Section 13 has an implementation plan and good advice
- "Even a basic effort to change to standardized structure naming is beneficial for the individual clinic, as well as the radiation oncology community as a whole"
- The authors recommend gradual implementation, to allow time to build familiarity

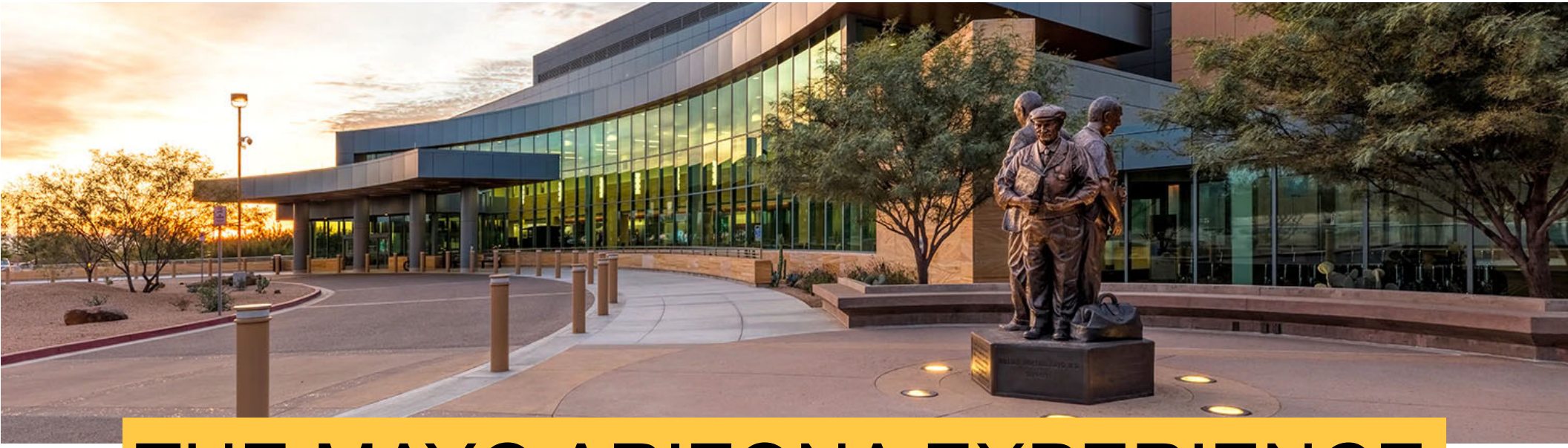
1. Identify common treatment sites and corresponding staffing groups affected by changes in nomenclature
2. Detail commonalities already in use for those treatment sites
3. Discuss the final list, and guidelines with the disease site groups and other stakeholders in your clinic as required by your organizational structure
4. Identify local documentation templates used in the clinical practice that may need to be adjusted along with changes to the nomenclature
5. Develop a plan for gradual rollout of the nomenclature into clinical practice
6. Develop a short list and create templates in your treatment planning system containing your new standard structures

RECOMMENDATIONS

- Physicians, dosimetrists, physicists and therapists would all like to convey the maximum amount of information
- There are meaningful limitations within the software that we use (image acquisition, treatment planning, record and verify, quality assurance…)
- With that in mind, the authors of TG-263 aimed to develop a nomenclature system that could
  - be widely adopted in the vended systems as they currently exist and
  - permit new definitions of data element representations for encapsulating a fuller representation of the data

• Defined structure is human-readable

• Sufficient information avoids ambiguity between similar items in the system



THE MAYO ARIZONA EXPERIENCE

14 PHYSICIANS

4 RESIDENTS

16 DOSIMETRISTS

18 PHYSICISTS

4 RESIDENTS

48 THERAPISTS

4 LINACS

4 PROTON GANTRIES

2 CT SIMULATORS

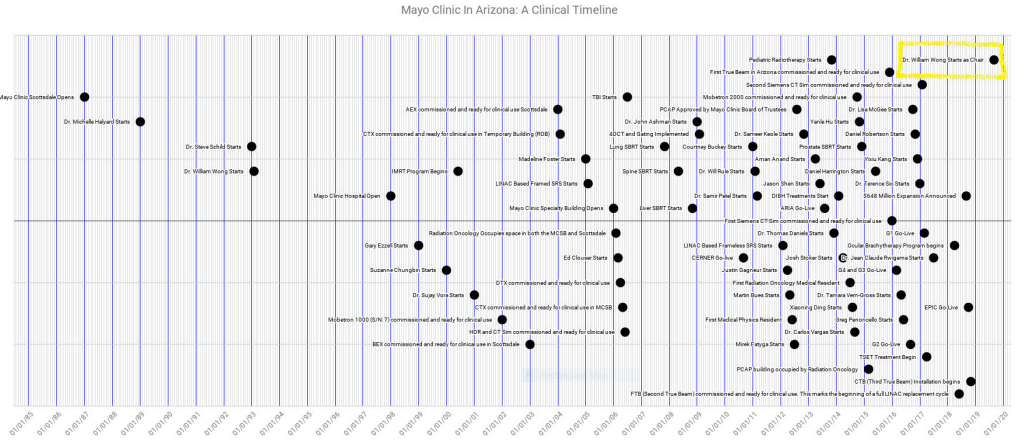
1 IORT

1 HDR

BACKGROUND AND MOTIVATION

How frustrations lead to change

- Our department has grown, complexity has increased
- Yet common RT plans require multiple orders/data entry points: Epic, ICIS, ARIA, Eclipse
- Physicians have historically written a ‘custom’ Rx in Aria Prescribe Treatment window, few used templates
- Intra- and Inter-physican discrepancies in Rx naming
- Prescriptions (ARIA) were unlinked to treatment plans (Eclipse)
- ARIA Rx was symbolic, dosimetrists would transliterate into Eclipse
- Dosimetrist and Physicists often would modify Plan ID in Eclipse then change name in ARIA



How key staff have joined the department, from 1985 through 2020

RX STANDARDIZATION CAME FIRST

- Our very first steps, in 2018:
  - Initiated a standardization effort
  - Canvassed opinions, but kept decision making to a small group
  - Kept Rx simple and predictable
  - Got buy-in from key stakeholders and then hit the campaign trail

- This was spearheaded by one of our newer radiation oncologists, Dr. Thomas Daniels
- His enthusiasm and gusto had a tremendously positive effect on this initiative
- His subsequent ascension to a leadership role in the clinical practice of the department gave weight to his projects

Dr. Daniels is now service chief of the Department of Radiation Oncology at Perlmutter Cancer Center–Sunset Park

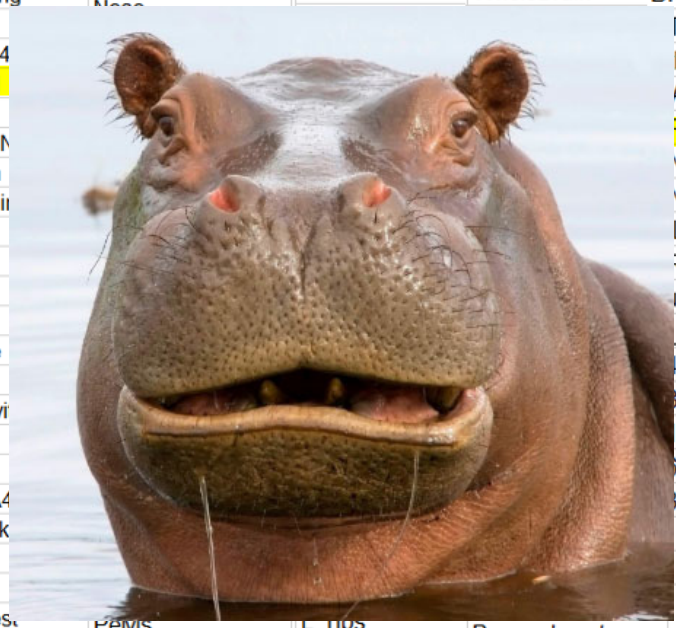
WITH THE RX SUCCESS, WE BROADENED THE HORIZONS

- We decided to aim for a complete overhaul of our internal nomenclature
  - Course ID
  - Plan ID
  - Target ID
  - Rx Name
  - Reference Point ID
- Formed a *very* small group: one physician, two physicists
  - Held many *many* meetings
  - Used many *many* whiteboard markers
- Carefully reviewed TG-263
- Looked back at the wide variety of names and identifiers that had been used previously
- Thought about our technological limitations (Aria/Eclipse, Epic, Varian TrueBeam, Hitachi)

- Single institutional-based challenges
  - Cost and effort to implement a new nomenclature
  - Consistent use of standards by the range of staffing groups interacting with patient charts (e.g., physicians, physicists, therapists, and dosimetrists)
- Clinical staff challenges
  - Inconsistent approaches to consider/define laterality and other structure qualifiers
  - Lack of detailed and site-specific guidelines for the definition of target structures to enable automated computer algorithms to extract relevant information
  - Lack of clear guidelines for clarifying or incorporating new elements of a standard nomenclature

hippo sparing

RT BRST BST:1	LUL NEW	TBI CTB Adult	Prost Fossa	HN_replan	T10_L3	Abdomen	L Breast	Lt Femur	
Rt Breast	SRS Cone 5A4T	L1_3	R Cheek	Whole Brain	Abdomen	PreSacralNode	Pelvis	Lt Axilla	R_pelvis
R_breast	SRSV5A4T RCer	R Lung SBRT	LLung SBRT	C7_T6	Oral Cavity	T1_T4Spn	SRS V 5A4T	L Humerus	R_scar boost
RT BRST TOTAL	Rectum_boost	Sternum	pancreas retx	Bilat Ribs	SRS V 5A4T	WholeBrain	Pelvis Boost	R Humerus	HN
LT BRST TOTAL	Rectum	T9	LUL	SRS V 5A4T	R Humerus_FiF	LtFemur	Lt Breast	T8_11	RtCWSCV
SRS	Pros Bed	WholeBrain	Vagina	scalp	R Parotid	Tspine	LBRST	nasal 6e_9e	AbdomenRABst
LRec	boost pelvis	LtBreast_FiF	Rt Flank				PA node	BOT_necksRP	AbdomenRA
T5_T							LS SPINE	ProstateBed	Lt Breast Bst
L Ilia							RtScapula	SRS V 5A4T	Left Breast
Rt Fe					vity		SRS Pituitary	Prostate SBRT	T7_T9 1fx
L Hip							CT SPINE	LT Sacrum_C3	Lt Hip 1fx
RP1 R Lung							Prost SBRT	T4-T9 V3:1	L3_L4 1fx
L Bronchus	Pancreas	Rt Ribs	Scar Bst R CW	SRT V 5A4T	Eso_T5_T9_FiF	SRS V 5A4T	RtCW	R_upper_lip	L_cheek
NODES	R Lung	Lt Ribs	SRS V 5A4T	Rt Shoulder	SRT Mening	head_neck	RUL	RT SHLDR	Brain
Abdomen	Prostate_SV	LtKnee	SRS 4 Mets	Sacrum_FiF	H_N		TBI	WholeBrain	HIP
SRS RtPariet	RtLung	Lt Breast	Rt Lung	WBRT_FiF	SRT V 5A4				Lung
PROST FOSSA	SRS2 R pariet	Prostate	prost_sv	pelvis	L H_N_C1				Adrenal
SRS LtFrontal	SRS1 R front		L_lung hybrid	LtLung	Abdomen				RS V R 4A4T
SRS PTV01 LCC	Pelvis_PA	Forehead	SRS LtParagan	T5_L2	PreSacralN				N_Boost
SRS PTV02 ROL	Pros Bed	T2_T8__FiF	TBI CTB Adult	Left Breast	T1_T4Spn				N
SRS RtPariet	celiac node	R_foot	L Breast Bst	WholeBrain	WholeBrai				Lung SBRT
SRS LtPariet	Prostate_SV	Prostate1	TSpineSBRT	HN	LtFemur				RT V 5A4T
LtHumerus	RtThigh	LT FLANK	Lt Thigh	Mesenteric	Tspine				ings
RUL Lung	LtHip	C5_T1	RT BRST	Prost Bed	HN				neck
THYROID	RtHip	Sternal CW	LBRST_SCV_FIF	Mediastinum	LtChest				T8
replan 2_18fx	TBI CTB Adult	Lt Breast	RtLung	LLL SBRT	Lt Clavicle				
RtTibia_FiF	L1_3	BreastBoost	L1_5 Spine	ProstateBed	T5_L1				1 reRT
Rfemur_AP_FiF	R Lung SBRT	RBreast_Sclv_	L Breast Bst	T10_L3	L_oral cavi				
Rfemur_PA_FiF	Sternum	Pelvis_Prost	Prostate_SV	Abdomen	Sternum				L5
RT HIP	T9	HN	RT HIP	Oral Cavity	Rt Hip				Femur PA
SRS R Occ Cav	WholeBrain	RLL SBRT	Brain_FiF	SRS V 5A4T	SRS V 5A4				Femur AP
	LtBreast_FiF	LtBreastBoost	T5_T8 Spine	R Humerus_FiF	head_neck				
	PelvisSBRT	RUL Lung	LT BRST	R Parotid	Nose				
	SRS Cone L Fr	PROST BED	L2_Sacrum	boost	LtAdrenal				
	RIGHT LUNG	Pros Bed	Whole Brain	pelvis	upper ches				
		Pleural mass						R_scar boost	



WORKING WITHIN THE CONFINES OF OUR TECHNOLOGY, AND THE HISTORICAL CHARACTERISTICS OF OUR CLINICAL CULTURE WE DEVELOPED A SCHEMA

- All sites will abide by the following ground rules, unless specifically indicated:
  - Course ID (16): Course Number(2)AnatomicSites(9)MajorTechnique(4) "MultiSite" is only appropriate within a Course ID
  - Rx Name (16): AnatomicSites(9)Laterality(1)Boost(3)orMajorTechnique(4)
  - Plan ID (13): AnatomicSites(9)Laterality(1)Boost(3)orReplan(3)
  - Target ID (16): VolumeDescriptor(3)AnatomicSites(9)Level(4)
  - Reference Point ID (16): DoseLevelincGy(4)Modality(1)AnatomicSites(9)Course(2)

DECISIONS, DECISIONS

C

CASE

camelCase

PascalCase

O

ORDER

OPrimary

ReverseO

A

ABBREVIATION

We selected 9 characters for anatomic site to severely limit the need for abbreviations

S

SPATIAL CATEGORIES

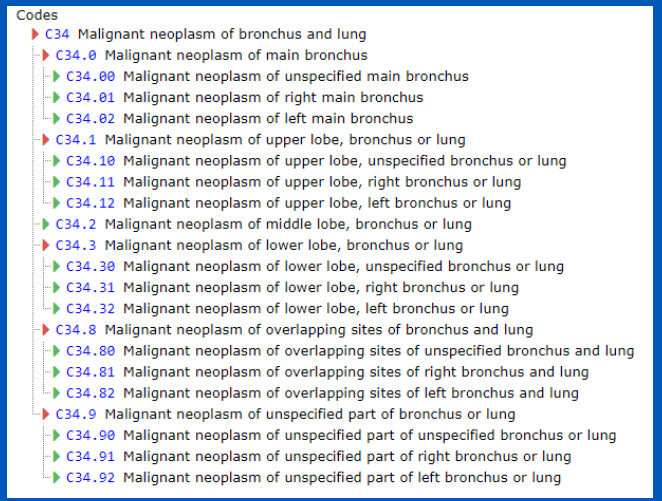
We permit these for specific cases:
Extended SSD plans
Plans where ambiguity remains

Making these decisions early allows for faster introduction of new paradigms

But making them too soon might lead to a lot of re-work, be thoughtful and engage stakeholders early and often

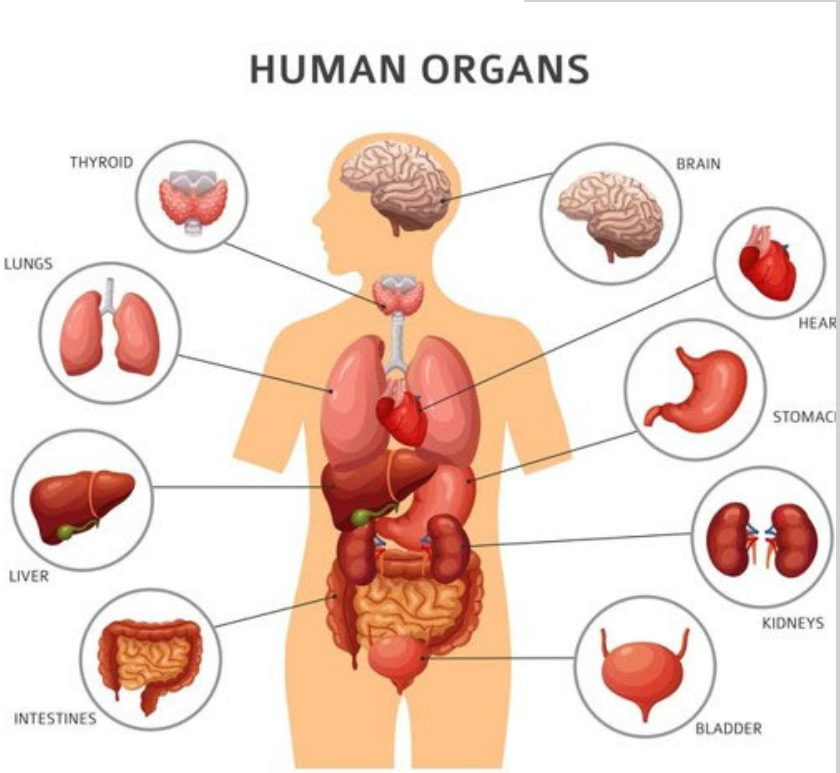
AND THEN WE MADE THE BIG LEAP

- The entire system is driven by ICD-10 and anatomy
  - Also drives the insurance approval and reimbursement
  - Limit the number of possible names i.e. for bone mets
  - We have nearly 900 ICD-10 codes with anatomic site names identified and mapped
- Plan names are simple (not a 13 character descriptor of plan nuances)
  - Site, Laterality (when applicable), Boost *or* Replan
  - Does not include
    - What is being spared, dosimetric facts, elective nodal basins, retreatments
- Goal of 90% predictability
  - Special cases: Peds, CSI, WhBrain, WhAbdomen, TSE, TBI
    - Many ‘iconic’ radiation fields, particularly for peds, are not going to fit into the strictest confines, but can have unique rules to permit reliability
  - Remained committed to protocol mandates, but will ask for small amounts of duplicate work (eg copying and renaming targets) for data integrity



THE ROLLOUT PLAN

- Anatomically specific ICD 10
  - GU
  - Lung
  - Brain
  - Head and neck
  - GI
  - Gyn
- Histologically specific ICD 10
  - Lymphoma
  - Sarcoma
  - Bone and Bone mets
  - Skin
- And finally…
  - Breast cancer



NOMENCLATURE INITIATIVE TIME LINE

PROSTATE ROLL OUT

Jan 2020

ADDITIONAL SITES

Every 2 weeks

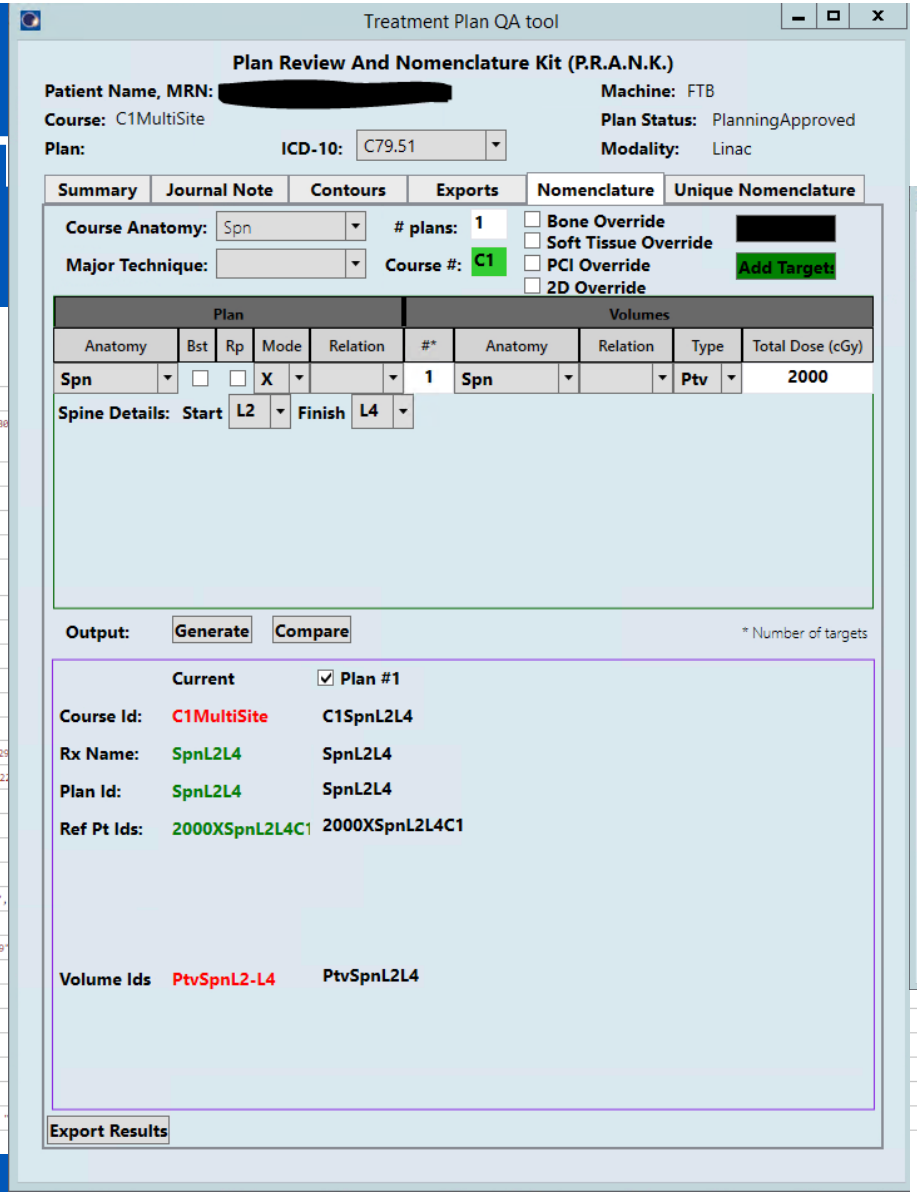
GLOBAL PANDEMIC

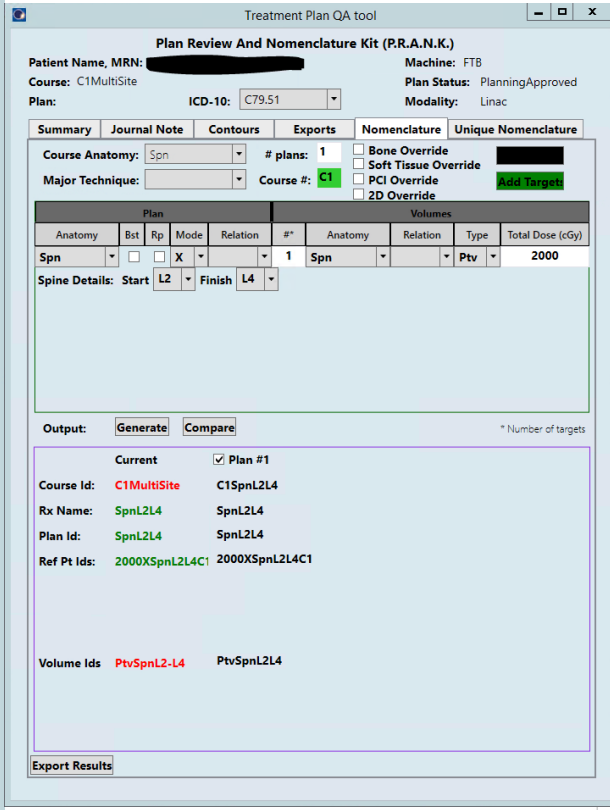
TURNING DIFFICULTIES INT OPPORTUNITIES

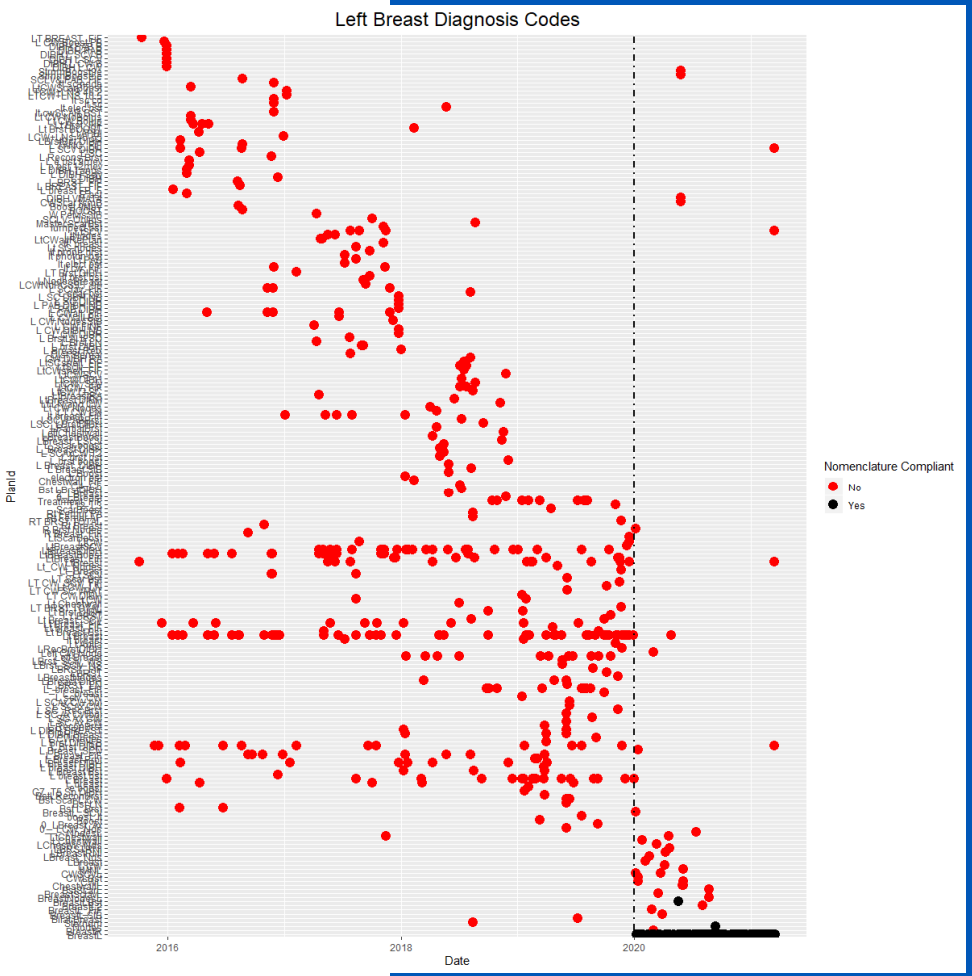
Bone Skin and Misc Nomenclature

Return to Main Nomenclature Page

Diagnosis Code(s) Covered:
Bone Mets or primary unspecified: "C79.51", "C79.52", "C41.9", "C40.00", "C40.10", "C40.20", "C40.30", "C40.80
Primary Bone of Skull/Face: "C41.0"
Primary Bone of Mandible: "C41.1"
Primary Bone of Spine: "C41.2"
Primary Bone of Thorax: "C41.3"
Primary Bone of Pelvis: "C41.4"
Primary of Rt Arm bones: "C40.01", "C40.11"
Primary of Lt Arm bones: "C40.02", "C40.12"
Primary of Rt Leg bones: "C40.21", "C40.31"
Primary of Lt Leg bones: "C40.22", "C40.32"
Lip Skin: "C44.00","C44.01","C44.02","C44.09","C43.0","C4A.0"
EyeLid Skin: "C44.101", "C44.111", "C44.121", "C44.131", "C44.191", "C43.10", "C4A.10"
Rt EyeLid Skin: "C44.1991", "C44.1091", "C44.1092", "C44.1992", "C44.1191", "C44.1192", "C44.1291", "C44.129
Lt EyeLid Skin:"C44.1921", "C44.1021", "C44.1022", "C44.1922", "C44.1121", "C44.1122", "C44.1221", "C44.122
Ear Skin: "C44.211", "C44.201", "C44.221", "C44.291", "C43.20", "C4A.20"
Rt Ear Skin: "C44.212", "C44.202", "C44.222", "C44.292", "C43.21", "C4A.21"
Lt Ear Skin: "C44.219", "C44.209", "C44.229", "C44.299", "C43.22", "C4A.22"
Nose Skin: "C44.301", "C44.311", "C44.321", "C44.391", "C43.30", "C4A.31"
Face Skin:"C44.300", "C44.309", "C44.310", "C44.320", "C44.329", "C44.390", "C44.399", "C43.30", "C43.39",
Scalp & Neck Skin: "C44.40", "C44.41", "C44.42", "C44.49", "C43.4", "C4A.4"
Trunk Skin: "C44.501", "C44.511", "C44.521", "C44.591", "C43.52", "C4A.52", "C44.509", "C44.519", "C44.529
Arm Skin: "C44.601", "C44.611", "C44.621", "C44.691", "C43.60", "C4A.60"
Rt Arm Skin: "C44.602", "C44.612", "C44.622", "C44.692", "C43.61", "C4A.61"
Lt Arm Skin: "C44.609", "C44.619", "C44.629", "C44.699", "C43.62", "C4A.62"
Leg Skin: "C44.701", "C44.711", "C44.721", "C44.791", "C43.70", "C4A.70"
Rt Leg Skin: "C44.702", "C44.712", "C44.722", "C44.792", "C43.71", "C4A.71"
Lt Leg Skin: "C44.709", "C44.719", "C44.729", "C44.799", "C43.72", "C4A.72"
Skin, across multiple sites or not specific: "C44.80", "C44.81", "C44.82", "C44.89", "C44.90", "C44.91", "C44.92", "







SO, HOW HAVE WE DONE AFTER APPROXIMATELY 12 MONTHS?

Even though we rolled out sites one at a time, the physicians and dosimetrists were really and truly excited!

They tried to incorporate the schema, even before a particular “site” was fully codified

It makes for slightly dirty data, but we couldn’t have paid for that type of enthusiasm and willingness to try something new!

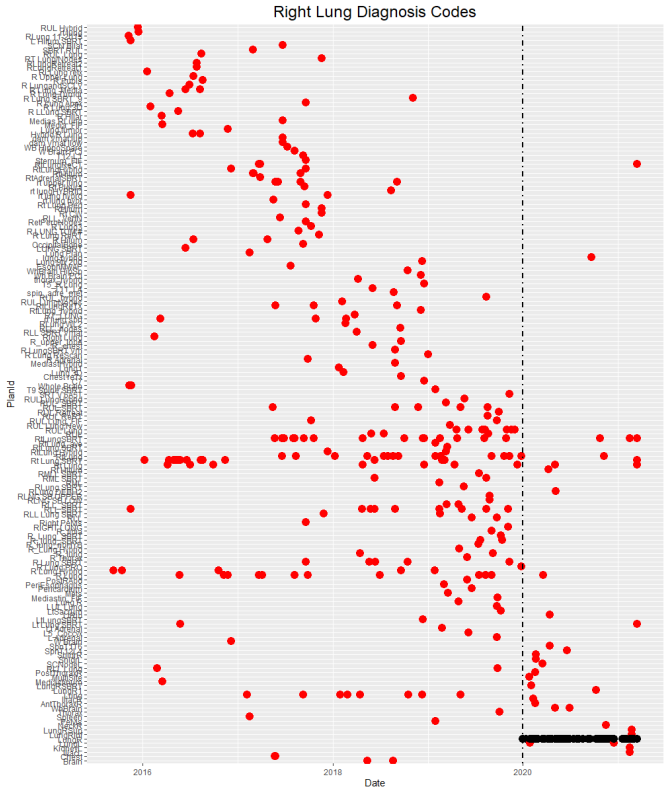
Our dosimetry team has been so patient and gracious, they are rock stars

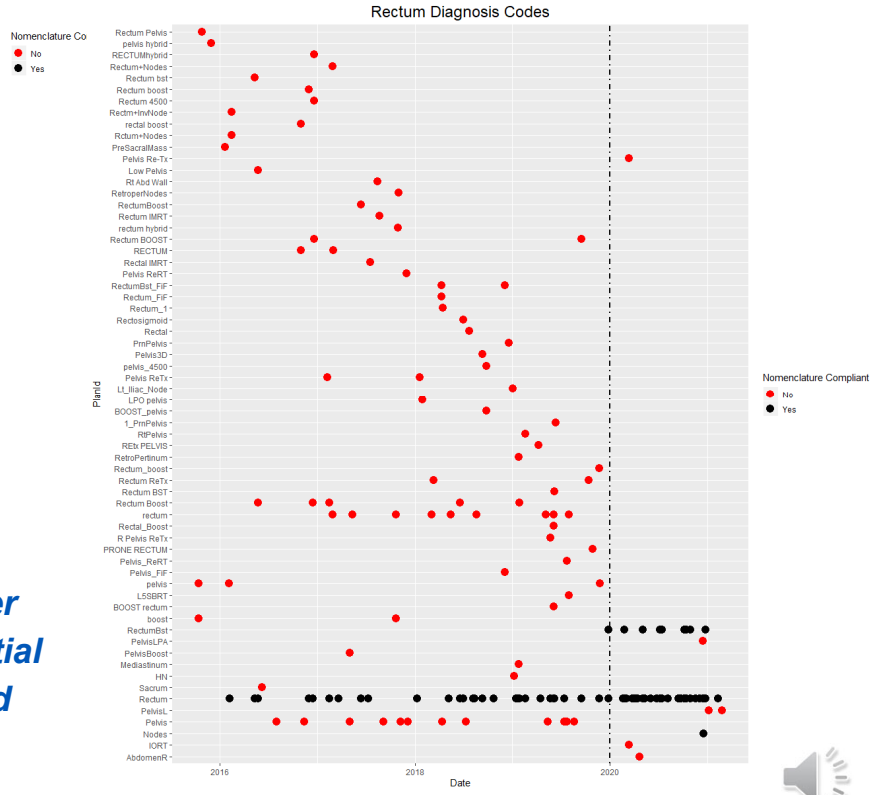
ALL SITES GAINED *SOMETHING*

Breast and Lung were reduced form hundreds of plan names, to just a handful

Compliance has been amazing

Always more work to do, some of it with nomenclature, but some of it with modifying physician behavior





Palliative cases with large less "anatomic" volumes remain a challenge

Isolated nodes, nodes as part of a larger volume, and nodes as part of a sequential boost, were our very last challenge, and after much effort, even they have been made to fit the standards

FUTURE WORK

We're hoping physicians will see the usefulness in adding the "met" code to previously treated patients

We'll be doing more robust data analysis as we have more months and years of results

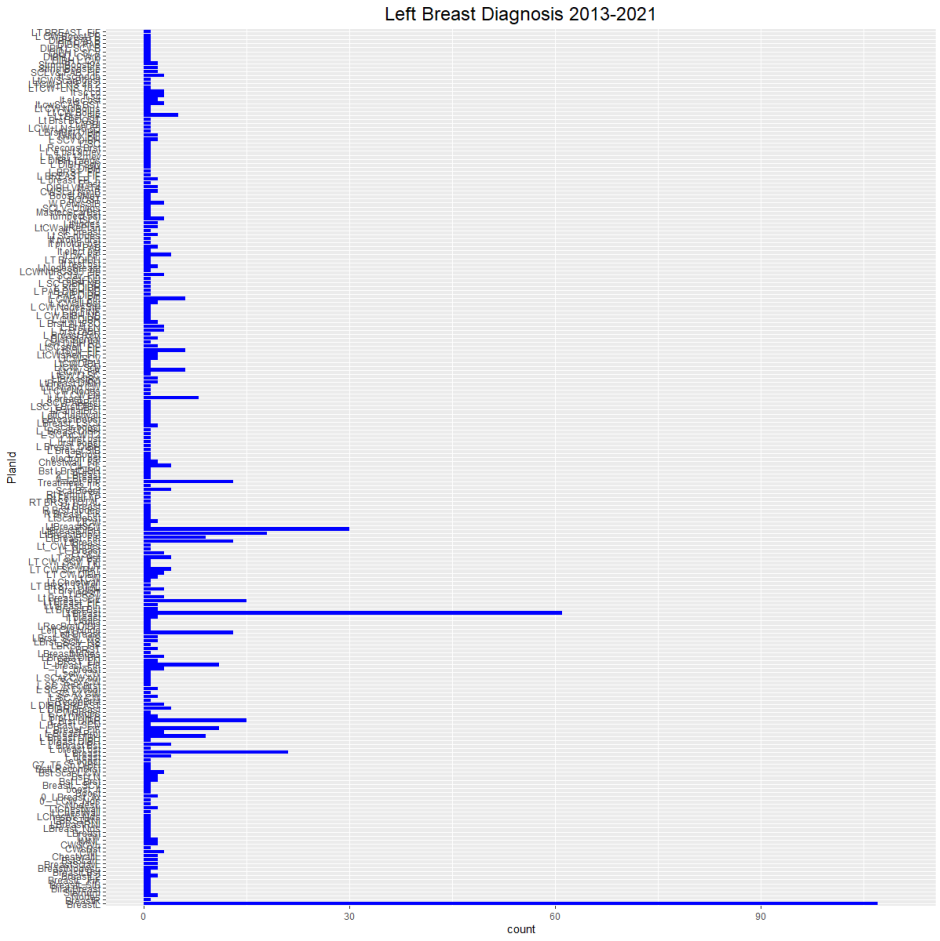
Any change to ICD Codes, will require remapping of our code-to-anatomy correspondence

We continue to refine rules for unusual and nuanced cases, and add in ICD-10s for sites previously unseen in our department

We're working to automate more, and better, which Ed will talk about in his presentation

We eagerly await any updates to TG-263

We didn't attempt any type of non-target nomenclature revisions, that will be a large undertaking, but we have a framework and team in place to help make it a reality at some future time



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THANK YOU

A SINCERE THANKS TO THOMAS DANIELS, ED CLOUSER, AND RACHEL GER FOR THEIR WORK ON THIS EFFORT

HOPING TO TAKE QUESTIONS VIA THE CHAT, OR BY EMAIL AT BUCKEY.COURTNEY@MAYO.EDU

HAPPY NOMENCLATURE STANDARDIZING TO ONE AND ALL