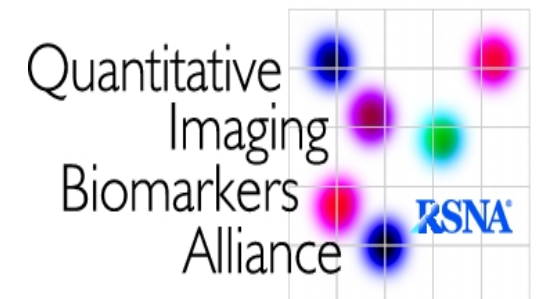# QIBA SPECT BIOMARKER COMMITTEE: BIG MEETING

2016 07 15, 10:00 E**DS**T (**UMT/GMT-4, London -5**)

big BC #10 since inauguration in 2015, #6 in 2016

2016 telecon #19 (not counting Steering Committee meetings)

agenda

time (EDT)	Item
10:00-10:05	roll call, review specific aims for today's meeting, etc.
10:05-1025	review of technical subcommittee progress since last meeting in May: Dr. Dewaraja
10:25-10:30	housekeeping about push to public comment

10:30-10:40	**profile review: THE main event for big BC meetings**
	    A. Section 2: review revised Claims
	    B. Sections 4: harmonization, gaps, & time lines

10:40-10:45	list of editing assignments
1045-1050	review revised meeting schedule
10:50-10:55	AOB?
10:55	adjourn

Specific Aims for big BC of 15 July 2016

- to briefly review all three (3) measurands in Section 2
    - set up an ad hoc subgroup to review Claim 2
- to finalize content of Section 4
- then to harmonize organization of Sections 3 & 4, or not
- to identify all outstanding issues, & then either
    - make editing assignments, or
    - park, and delete, any issues that will not be resolved prior to public comment (with notes about what was parked)

Progress since last meeting: update from technical subcommittees

- Image Acquisition & Reconstruction. Eric Frey & Yuni Dewaraja
  - Acquisition Section (3.6)
  - Reconstruction Section (3.7)
  - Some parts of Assessment (4.0)

- Image Analysis. Robert Miyaoka & John Seibyl
  - Image Analysis (3.10)

- Phantoms/DRO. John Dickson & Brian Zimmerman
  - Periodic QA (3.3)
  - Image QA (3.8)
  - Assessment (4.0)

Image Acquisition (3.6) update

- Based on consensus, finalized some previous open issues (pixel size, energy windows, resolution requirements, CT parameters based on Image Wisely …) .

  - For example: previously 'A collimator that has sufficient spatial resolution to allow accurate separate definition of Caudate and Putamen in the reconstructed image shall be used'. Changed to 'A collimator that provides planar system resolution of < 8 mm FWHM (in 'air' at 10 cm distance) shall be used.'

  - Almost complete, but will need public feedback and/or phantom studies to solidify some of the recommended numbers
    - For example, 'Acquisitions are obtained over 25 to 45 min, or a minimum of 1.5 million counts'

Image Reconstruction (3.7) update

- Specification table (Table 3.7.2) completed
  - Iterative **OR** Analytic reconstruction methods
  - Uniform **OR** non-uniform attenuation correction
  - Scatter correction preferred
  - Some methods (use of post-filtering and collimator detector response) depend on VOI image analysis method (whole striatum or small VOI)
  - Section almost complete. May need phantom studies to solidify some of the recommendations

Image Analysis (3.10) update

- DRO and physical phantom details added
    - DRO will have one healthy side and one diseased side. Diseased side will have a gradient between caudate and putamen.
    - Will include numbers in definition of DRO phantom and target concentrations for physical phantoms. Ratios will be provided by Dr. Siebyl.

- Modification to directions of slice summing for small VOI analysis approach

- Went over all suggested edits included in the 05 July 2016 version of the profile.
    - Qualified systems: SBR ±15% of reference value
    - Qualified systems: coefficient of repeatability of <15% for VOIs size of whole striatum

Assessment Procedure (4.0) update

- **Phantom Preparation and Imaging**
  - Moved from Section 3 and updated
  - Still need some finalizing (for example, concentrations for filling compartments)

- **Assessment Procedures for the following were added:**
  - Planar Spatial Resolution
  - Motion & Artifacts
  - Appearance of basal ganglia (Image quality)
  - Voxel Noise in the Background Region

- **Section 4 still needs a bit of work**
  - Some parts may belong in Section 3 (Periodic QA). For example 'Center of Rotation' , 'Uniformity'
  - Need to make the assessment procedures more detailed(?). Or do we avoid details and simply refer to existing documents like NEMA, ACR guidelines etc.
    - See the example in the template (Assessing Voxel Noise). Quite specific. For example to determine standard deviation of pixel values: 'An approximately circular region of interest (ROI) of at least 400 mm^2 shall be placed near the center of the phantom.'

QIBA Profile Stages

Stage Name	Stage Meaning	Stage Criteria
The tag we hang on the profile doc.	*What we want users of this document to understand about what it means*	*The checklist items/metrics/Rules-Of-Thumb the document should have cleared before it can be released with this tag*
Stage 1: Version for Public Comment	The Biomarker Committee (BC) finds that the Profile describes the key factors that affect the claim and has proposed recommended procedures that address each/most of the factors. The BC reserves the right to make modifications.	• All open issues have been clearly listed • Most open issues have candidate resolutions drafted into the Profile • Some groundwork projects may be underway • All major solution components and Profile details are complete enough to implement • For each actor in the Profile, it is clear what is required for a system or organization to claim conformance • Each activity in the Profile has a justification based on literature data, phantom studies, or TC consensus. • Conformance requirements appear sufficient to accomplish the Claim of the Profile
Stage 2: Publicly Reviewed Version (Consensus	The BC has formally addressed each issue raised during Public Comment. All Profile changes based on received public comments are documented. Implementers are encouraged to start implementing the Profile. The BC may later modify the claim or requirements if necessary to complete Technical Confirmation (Stage 3).	• All public comments have been addressed • All open issues necessary for conformant deployment have been resolved • Few, if any, groundwork projects remain active • All recommended procedures have been tested in one or more groundwork project(s) or referenced studies. (Reasonable deviations from Profile details may exist.)

Verbatim from Kevin O'Donnell & Process Committee 13 April 2016

goal line: cross over into Stage 2 in early 3Q2016, i.e., ASAP

evolving housekeeping rules: Dropbox

- seems to be working very well:
  - we consistently place new versions of the Profile back in our Dropbox with a new suffix that reflects the date of your work
  - we consistently put the version you started with in the z.drafts folder
- now shift gears into much more aggressive editorial mode:
  - accept all changes you make that are not likely to be controversial
  - propose changes in the text that might need compromise to achieve consensus, i.e., no more "naked" comments

https://www.dropbox.com/home/QIBA%20SPECT%20Profile

Section 2 claims review: again

- Specific Aim: To enhance consensus that we have a Profile

- Background:
  - Claim 1: key constituents want a claim that promotes the discrimination-thing, i.e., distinguishing disease from not-that-disease; **note some recent pushback from QIBA leadership**
  - Claim 2: calibration claim: how much +/- C.I.
  - Claim 3: longitudinal; "no" controversy, strongest hand, but smallest constituency

- Methods today:
  - place doubts in "open issues section"
  - close as many as possible, and then let the public help

Claims: verbatim

- **Claim 1: Cross sectional discrimination.** During the initial presentation of newly symptomatic patients, a diagnosis of Parkinson's disease (PD) is consistent with a finding of a SBR in the posterior putamen that is 50% or less than the value in aged-matched controls, or 80% or less than the value in the whole striatum.

- **Claim 2: Cross sectional. Calibration.** For a striatal binding ratio (SBR) of Y, a 95% confidence interval for the true SBR is the square root of the sum of the square of the coefficient of variation plus the square of the bias, that is, $Y \pm (1.96 \times Y \times 0.106)$. For example, if a patient's measurement of SBR=4, then 1.96x4x0.106=0.83. So the 95% CI for the true SBR is [4 -0.83] to [4+0.83], or [3.17 to 4.83].

- **Claim 3: Longitudinal.** A measured change in SBR of $\Delta\%$ indicates that a true change has occurred with 95% confidence if $\Delta\%$ is larger than the repeatability coefficient (RC), which is estimated to be about 10% for the whole striatum. If Y_1 and Y_2 are the SBR measurements at the two time points, a 95% confidence interval for the true change is $$(\mathbf{Y_2 - Y_1}) \pm \mathbf{1.96}\sqrt{(\mathbf{Y_1} \times \mathbf{0.036})^2 + (\mathbf{Y_2} \times \mathbf{0.036})^2}.$$

cross sectional claims

- we still need to know if we must constrain the claim, e.g.,
  - "For subjects who have become symptomatic on only one side of their body for at least 6 weeks, an SBR in the putamen that is equal to the SBR in the corresponding head of the caudate on the affected side of the brain is NOT consistent with Parkinson's disease, while a SBR ratio of 100-to-1 is consistent with, but not definitively diagnostic of, Parkinson's disease in the proper clinical context."
  - SBRs in the posterior putamen that are less than half the SBRs in the head of the caudate are consistent with Parkinson's disease in the proper clinical context.

- **SWITCH TO PROFILE VIEW**
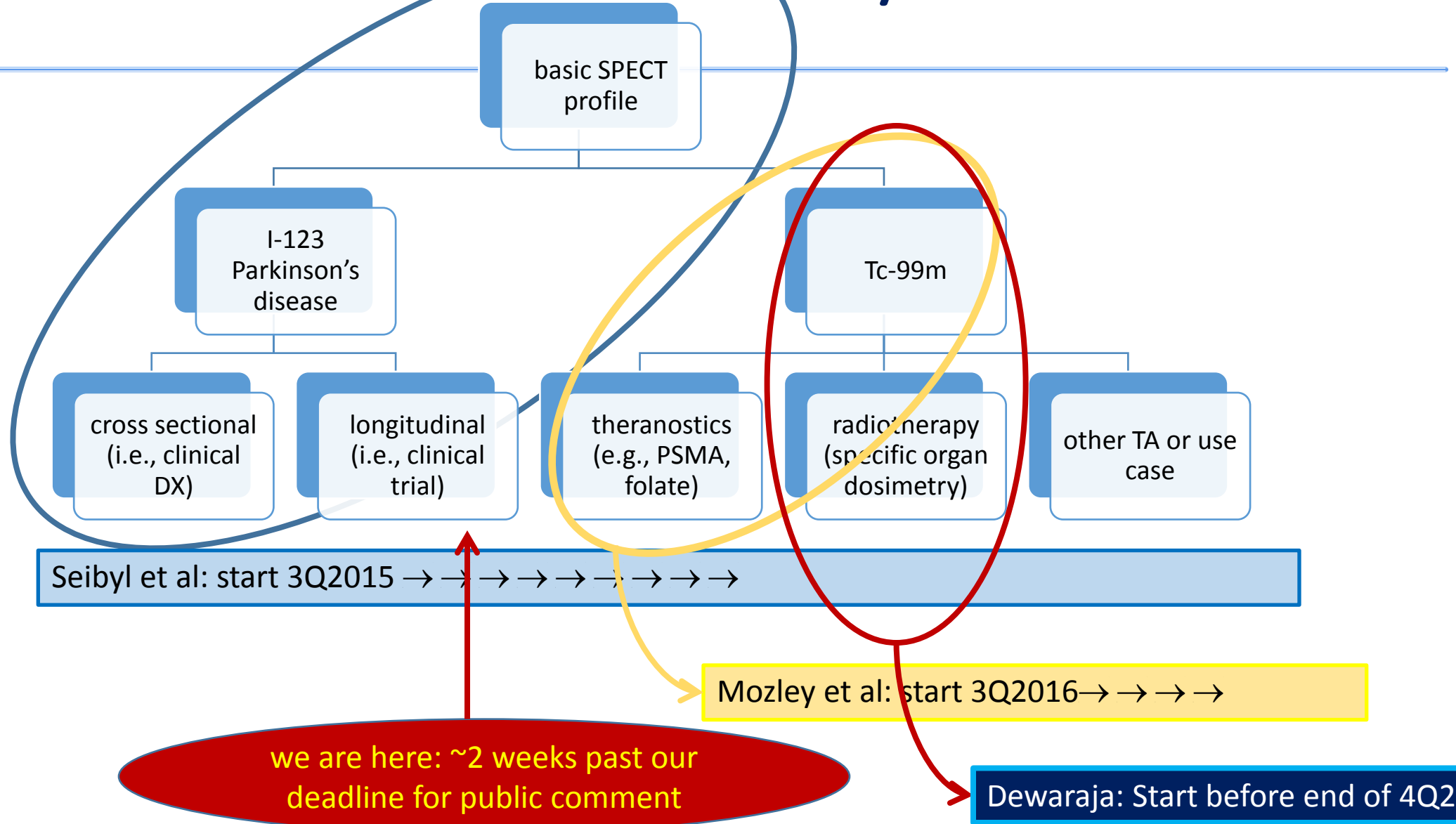
Profile Sections 3 and 4

- ## Section 3
  - lists the **Profile Activities** (and Actors), which contain the requirement "checklists".
- ## Section 4
  - is the library of **Assessment Procedures** for any requirements that require complex assessment. (Most don't).
  - Note: these procedures could be used in multiple contexts, e.g. both at installation time, and monthly QA.
- The procedure in Section 4 says how to determine a parameter value.
  The requirement in Section 3 says what a passing score is.

Verbatim from Kevin O'Donnell & Process Committee
13 April 2016

completing Sections 3 & 4

- Section 3: "thou shall . . ."
- Section 4: "here's how thou shall . . ."
  - informative text: rationale & descriptions of how others have achieved conformance
  - normative text: minimal acceptable behaviors when required
  - recall, "most don't", i.e., most "thou shalt statements do not require "complex assessments"

time lines: where we are today

basic SPECT profile

I-123 Parkinson's disease

Tc-99m

cross sectional (i.e., clinical DX)

longitudinal (i.e., clinical trial)

theranostics (e.g., PSMA, folate)

radiotherapy (specific organ dosimetry)

other TA or use case

Seibyl et al: start 3Q2015 → → → → → → → → →

Mozley et al: start 3Q2016→ → → →

Dewaraja: Start before end of 4Q2016

we are here: ~2 weeks past our deadline for public comment

revised meeting schedules

- 3rd Friday of every month until end of 4Q2016: big BC meetings:
  - focus on issues that are relevant to all stakeholders
  - task forces seek high level consensus for their work products
- starting 3Q2016
  - 1st Tuesday: I-123 in PD subgroups set agenda
  - 2nd Tuesday: oncology 1 alternates with oncology 2 in setting agenda
  - 3rd & 4th Tuesday: ad hoc p.r.n. (default is no meeting)
  - greater reliance on individual contributors & small groups
- **starting in August: re-purposing Tuesday task force meetings? September?**

Checklist Extract

IMPORTANT
This checklist document is an adjunct to the Profile on which it is based.
In the event of a discrepancy with this document, the base Profile is considered correct.
The base Profile may be accessed at: http://rsna.org/QIBA_.aspx

10
11

Technologist

Parameter	Specification	Check
	Subject Handling	
Use of intravenous contrast	Shall use intravenous contrast parameters consistent with baseline.	
	Shall document the total volume of contrast administered, the concentration, the injection rate, and whether a saline flush was used.	
Contrast Protocol	Shall use a contrast protocol that achieves enhancement consistent with baseline	
Use of oral contrast	Shall use oral contrast parameters consistent with baseline.	
	Shall document the total volume of contrast administered and the type of contrast.	
Subject Positioning	Shall position the subject consistent with baseline. If baseline positioning is unknown, position the subject Supine if possible, with devices such as positioning wedges placed as described above.	
Artifact Sources	Shall remove or position potential sources of artifacts (specifically including breast shields, metal-containing clothing, EKG leads and other metal equipment) such that they will not degrade the reconstructed CT volumes.	
Table Height & Centering	Shall adjust the table height for the mid-axillary plane to pass through the isocenter.	
	Shall position the patient such that the "sagittal laser line" lies along the	

AOB?

wrap up

- review action items

- Ask about meeting behaviors: Did everyone have a chance to contribute what they wanted to? Did people feel closed out? Do we have problems sharing the microphone? Is dead air a problem?

- Pls e-mail co-chairs (e.g., mozley@gmail.com) with suggestions about how to make the meeting more user friendly & effective.

back up slides