I. Minutes 5/23 QIBA meeting
    a. Rosen test-retest
        i. Goals
            1. Test-retest repeatability
            2. 20% CV Ktrans IAUGC
            3. most DCE repeatability studies are single-institution or industry driven. Experience in practice lacking.
        ii. Proposal
            1. Test-retest evaluation prostate DCE and DWI in 30 patients across 6 centers
            2. Primary target"tumor" = whole prostate
            3. Secondary target = dominant prostate tumor nodule
        iii. Rationale
            1. Patient population – prostate cancer patients
                a. DCE and DWI already used
            2. Prostate good surrogate for mets
            3. No need for specialized training/education regarding "target lesion" selection
                a. Techniques for large volume DCE evolving which may in future obviate need for tumor "selection"
            4. No motion/physiologic variability
        iv. Statistics
            1. Endpoint statistics is a question. Which variables?
                a. COV
                b. Repeatability
                c. Interclass correlation
            2. Power test-retest study
                a. Upper limit/lower limit
            3. Absolute or relative units
                a. Effect of Shapiro-Wilk testing/log-transformation on type/units of repeatability result reporting
                b. Barboriak (Barnhardt) 2009 article has been revealing
            4. Ratio within SD(u)/SD(L) –
                a. Effect of patient number on test-retest "accuracy"
                b. Alternatively look at width of 95% CI of wSD
            5. Findings suggest that n-30 patients adequate for power analysis
        v. Challenges
            1. Avoid endorectal coil
                a. No coil correction
                b. Must have 3T
                    i. Ongoing QIBA evaluation of effects of susceptibility & B1 inhomogeneity on DCE and DWI accuracy
            2. Arterial inflow

a. Requires larger DCE-MRI slab
b. Parallel imaging for improved temp. resolution
c. Automatic AIF selection (see below)

vi. Aims
1. Primary
a. Test-retest performance repeatability coefficient of K_{trans} and $IAUGC_{BN}$ and measured by median pixel values of the whole prostate
b. Test-retest assessed by RC of D(t) and measured by median pixel values of whole prostate
c. ? add coffee break on visit 2
2. secondary
a. test retest on tumor
b. effect of reader on RC of DCE and DWI
i. 2 readers
c. determine whether t1-dependent or t1 independent methods for Gado quantification in DCE produce differing values for RC for Ktrans and IAUGC90bn
i. use subtraction (delta SI)
3. exploratory
a. explore the correlation between DCE and DWI metrics from both whole prostate and dominant tumor nodule as target lesions

vii. Target sites
1. 2 each: GE, Siemens, Philips
2. 30 total subjects
3. 5 subjects per site (max 10 per vendor)

viii. Qualifications
1. Available body MRI radiology PI
2. Adequate clinical prostate experience & referral base
3. Constant 3T imaging available
4. Phantom imaging specs met
a. DWI (Chenevert), DCE (Jackson/QIBA v2)

ix. Breast ADC data
1. Higher variance in Espree ADC values

x. Minimum tech specs for qualifying 3T MRI scanner with QIBA DCE phantom
1. VFA R1 fidelity relative to IR standard
2. SI linearity with respect to R1
3. Positional invariance of R1
4. Difficulties

xi. 3T imaging plan
1. Visit 1
a. Anatomic imaging
i. Include e-coil if clinically indicated at site

2. Visit 2
    a. Functional data
    b. ? coffee break DWI

xii. DWI
1. SE-EPI
2. Fat sat
3. AP phase
4. Parallel imaging 2x
5. 5mm
6. 0,100,600,800
    a. 100,600,800 ADC

xiii. ? dual transmission
1. only Phillips has the capability

xiv. Consensus
1. Axial spgr
2. Ap phase
3. Parallel 2x
4. 5mm SNR
5. increase slab to alleviate arterial in flow (32 slices)
    a. offset with prostate in inferior portion of slab
6. other specs per QIBA profile
7. 8-10 seconds temporal resolution
8. 2cc/sec

xv. Analysis
1. Single core lab
2. If fail replace with new subject
3. Reader study
    a. 2 readers
    b. each evaluate combined imaging
    c. visible tumor nodule > 5mm?
        i. if no (either reader), replace subject for tumor endpoints
4. Segmentation
    a. Whole prostate & dominant tumor nodule
    b. Performed on both DWI and DCE

xvi. Modeling
1. Automatic AIF
    a. Avoids reader choice of slices
    b. Avoids randomness of inflow error variation
    c. Quality of data for accurate AIF
    d. Future use of data for reference tissue method
2. 2 compartment modeling
    a. vp
    b. pixel-specific delay times
    c. dual analysis
        i. t1 specific primary analysis for aim 1

ii. signal difference method
3. improving temp. resolution
a. bandwidth
i. GE 250, S:400, P 314 ? higher
b. Matrix (phase)
i. Why not lower to 128
c. Increase frequency FOV
i. To allow partial phase fov <80
d. Partial K/fractional NEX
4. Automated AIF segmentation
a. ? Either utilize this methodology
b. ? second reader

xvii. ? exploratory aims of alternative modeling for assessing Kep, Vp
xviii. sites
1. PENN,

II. Profile v2
a. Claim
i. Based on clinical diagnostic challenges in areas utilizing DCE without quantitative rigor
b. Areas for consideration
i. 3T
ii. parallel imaging
iii. B1 inhomogeneity
c. Organ subtypes
i. Prostate
ii. Breast
iii. Glioma
d. Diagnostic protocol that is attempted to be more quantitative
e. User
i. Pharma for v1
ii. Now
1. Diagnostic challenges
iii. Profile for diagnostic assessment
f. Starting point for clinical practice
g. Action item
i. Topic list needs for 3T profile
ii. Post-processing (3rd compartment)
iii. Clinical applications

III. Phantom work
a. ?publish v1 phantom work
b. v2 phantom
i. 1 site, 2 field strength
ii. UM, UChicago (Phillips)
c. Endpoint is a recommendation on how we should do phantom work and which phantom to do.

IV. Publications

a. White papers
b. Profiles
c. Papers based on phantom work thus far

V. Activities for upcoming 3 years
    a. Version 1 extension for phantom work
    b. DCE version 2 profile (3T)
    c. DWI profile
        i. Timeline
        ii. ? additional need for phantom and analysis work
            1. need for more test retest in humans
            2. development of a phantom with varying ADC values
            3. digital reference object (ADC)
        iii. lack of funding will limit either the quality of the Profile or delay the Profile
    d. ?dynamic phantom
        i. Rajan FDA
        ii. Canadian dynamic phantom
    e. RIC
        i. Benefits to QIBA MR modality committee
        ii. Digital reference object comparison of vendor specific packages as compared to centralized approach
        iii. Working with users to troubleshoot
        iv. Working with vendors to see the utility of a centralized data storage site

VI. DICOM
    a. Need for adaptation of DICOM fields

VII. DWI assignments
    a. See Michael Boss' document.