Critical need for standardization in CT imaging

1. **Radiomics, imaging biomarkers and artificial intelligence (AI) are here to stay**
   a. They will make medical imaging more sensitive, specific, and predictive
   b. They will increase consistency among practitioners
   c. They will identify patterns not recognizable by the human eye

2. **These emerging and disruptive technologies train on reference data sets**
   a. Known diagnosis/outcome is associated with image-based features
   b. Standardization of those features across different manufacturers is critical
   c. Use of proven AI tool that was trained with one type of CT data set (manufacturer A, standard body reconstruction kernel) may fail when used with a different type of CT data set (manufacturer C, sharper body reconstruction kernel).
   d. It is untenable and a waste of resources to create new AI tools and/or retrain existing tools on new data sets for every combination of scanner manufacturer, dose level, noise level, sharpness, edge enhancement and reconstruction algorithm (filtered back projection or iterative reconstruction, which comes in many flavors and strengths)

3. **The path forward is for all manufacturers to produce, in addition to their proprietary reconstruction algorithms and kernels, a quantitative image set that meets specific standards, as agreed upon by the CT scientific community. The role of these images will be to provide a standardized input to software tools that provide computer aided detection, characterization or quantification.**
   a. The RSNA Quantitative Imaging Biomarkers Alliance (QIBA) was organized to unite researchers, healthcare professionals, and the industry to advance quantitative imaging and the use of imaging biomarkers in clinical trials and clinical practice.
   b. QIBA Protocols are developed in conjunction with QIBA Profiles and clearly describe standardized imaging procedures to achieve reproducible quantitative endpoints on tests performed using systems that meet specific performance claims outlined in QIBA Profiles.
   c. The ability to define a consistent reconstruction kernel across manufacturers to benefit such Protocols has to date been unsuccessful.
   d. The time is right to work with manufacturers to provide this essential set of images for the success of AI.
   e. This topic should be pursued with urgency, as a delay in standardization of CT image characteristics will delay, or limit, the success of radiomics, imaging biomarkers, and AI in CT data.

4. **Alternatively, a 3rd party reconstruction engine, including those accomplished with AI, could be used with exported "raw" data to create these standardized image data sets.**
   a. This would require manufacturers to allow 3rd party software tools to read their proprietary raw data formats, or alternatively, to store raw data additionally in the non-proprietary DICOM-like CT projection data format (DICOM-CT-PD), the latter being the more likely solution.