AbstractID: 9844 Title: Optimizing MR Imaging Practices: The Physicist as a Consultant

PD, T1, T2, TE, TR, Flip Angle, Echo Train Length, Bandwidth, FOV, Slice thickness, matrix size, phase sampling ratio, inversion recovery time, saturation band, gradient echo, spin echo, fast spin echo, EPI, cardiac gating, respiratory gating, phase encode ordering, steady state, linear coil, quadrature coil, phased array coil, parallel imaging. This is just a partial list of the tissue characteristics and operator choices that can affect Magnetic Resonance Image appearance. With such a wide range of parameters, MRI, all by itself, is more complicated, *and more flexible*, than all other imaging modalities combined. With few exceptions, most technologists learn how to operate their $1.5 million scanner by simply pushing buttons. They have little understanding of how to optimize sequences for contrast, SNR and/or resolution. Further, the American College or Radiology now requires a daily, weekly and yearly quality control program to be supervised by a qualified medical physicist or MRI scientist. Experience with such programs has shown that maintaining such complicated equipment at peak operating levels can be more envolved than periodic preventitive maintenance visits from a service engineer. In this presentation, three categories of consulting opportunites shall be discussed, 1) ACR accreditation submision, 2) Supervising a quality control program and 3) Protocol optimization.

ACR Accreditation Submission: All ACR accredited MRI facilities must submit example clinical images (Brain, C-Spine, L-Spine and Knee) as well as T1 and T2 weighted images of the ACR Phantom once every three years. Although the medical physicist is not expected to evaluate the diagnostic quality of clinical images, most sites that fail their initial submission do so because they have not paid proper attention to the ACR's requirements in terms of image resolution and filming procedures. Common causes of failure and corrective actions will be outlined.

Quality Control Program: The QC program can be divided into two parts, that performed on a daily and weekly basis by the technologist and that performed yearly by the physicist. How to set up a QC program will be reviewed and examples of problems encountered during the yearly QC will be presented.

Protocol Optimization: Although all vendors provide a basic set of protocols, every imaging center develops their own protocols to fit their particular needs. With every change made to a scan sequences, there is always a tradeoff. Common protocol modifications and their tradeoffs will be reviewed and opportunities for protocol optimizations that are often missed will be outlined.

Educational Objectives

After attending this lecture, attendees will

1. Be familiar with the three categories of consulting opportunities
2. Be able to list common causes of ACR accreditation failure and how to correct them
3. Understand how to set up and supervise a daily and weekly QC program.
4. Be familiar with common problems encountered in the yearly site evaluation.
5. Understand the common tradeoffs in image quality as scan parameters are changed.
6. Be able to make suggestions for common sequence optimizations.