

Every MR system has its strengths and weaknesses, often varying tremendously both within and between the various system designs. Added to that, each site will have its own priorities and styles of use of their system. For an MR physicist to best assist in optimizing imaging procedures, it is extremely important for that individual to be both well-versed in basic MR physics, and to be able to recognize (and understand) the impacts and trade-offs of the technology in a large variety of imaging situations. The physicist should be able to determine and evaluate problems in patient images as well as phantom tests.

For this presentation, the basic relationships between MR imaging parameters will be reviewed with an emphasis on their implementation in common clinical protocols. Examples of how they are adapted for specialized procedures will then be given to demonstrate trade-offs between contrast requirements; imaging speed; spatial resolution; geometrical accuracy, and patient safety issues. How specific field strength and gradient configurations affect these options will also be examined. Differences in RF coil properties will be discussed from the perspective of optimizing applications for a facility.

Educational objectives:

1. Understand the primary tissue contrast characteristics of the standard clinical sequences; methods of selective elimination of tissue signals; and the role of exogenous agents to alter contrast.
2. Know how to consider the interactions between SNR, spatial resolution and imaging speed and how their combined effects determine image quality for a variety of clinical situations.
3. Understand circumstances under which patient physiology and system configuration may require modification of image acquisition parameters to achieve optimal image quality.