

AbstractID: 9794 Title: Tradeoffs in CT Image Quality and Radiation Dose

In CT scanning, image quality has many components and is influenced by many technical parameters. While image quality has always been a concern for the physics community, clinically acceptable image quality has become even more of an issue as strategies to reduce radiation dose – especially to pediatric patients – become a larger focus in radiology practices.

The purpose of this presentation will be to first describe several of the components of CT image quality – noise, slice thickness (Z-axis resolution), low contrast resolution, high contrast resolution and uniformity – as well as radiation dose and to describe how each of these may be affected by technical parameter selection. This presentation will pay particular attention to the tradeoffs that exist between different aspects of image quality, especially when the reduction of radiation dose is one of the objectives.

The presentation will then explore several mechanisms that can be used to reduce radiation dose in CT exams and the implications for the diagnostic image quality of the exam. Specifically, the implications of varying the tube current*time product (mAs), pitch or table speed (or for axial imaging, the table increment), slice thickness, beam energy (kVp), patient (or phantom) size and dose reduction options (such as varying tube current during exposure) will be described for both radiation dose and diagnostic image quality. These strategies will be described for both single and various multidetector scanners as, unfortunately, the tradeoffs are not uniform across scanners. In addition to these direct effects, this presentation will describe possible *indirect* effects that both collimation and reconstruction algorithm *may* have on radiation dose and image quality when compensatory actions are taken to overcome increased noise levels. Finally, this presentation will emphasize that the tradeoffs between radiation dose and image quality are clinical-task dependent; this will be illustrated with examples from selected diagnostic imaging exams.

Educational Objectives:

1. To describe several key components of image quality in CT scanning as well as reinforce CT radiation dose concepts.
2. To describe the impact that technical parameter selection has on the various aspects of image quality and radiation dose.
3. To specifically examine the tradeoffs between various aspects of image quality as well as radiation dose.
4. To examine some clinical imaging tasks and illustrate the task-dependence of image quality requirements.