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Characteristics, Performance Evaluation, and Clinical Implementation of LCDs used for Medical Image Display

Accurate presentation of radiographic images requires high-quality electronic displays. Currently, the liquid crystal display (LCD) is the technology of choice for medical image display. This lecture will provide an overview of the technology and characteristics of LCDs as they relate to medical imaging. Fundamental characteristics that will be discussed include the pixel matrix size, optical resolution, spatial noise, ambient light reflection, influence of viewing angle, color tone, and grayscale response function (DICOM calibration).

Assessment of many relevant LCD properties can be performed with a set of test patterns, a photometer, and a trained eye. More advanced measurements can be acquired using custom equipment, including a high-quality CCD camera. Both standard and advanced display assessment methods will be discussed. Also, the physical and psychophysical influences of environmental lighting conditions will be introduced.

LCDs currently used for medical imaging range from consumer-grade color to “medical imaging grade” color and gray displays. It is important that the display used is appropriate for the clinical task. For example, diagnosis from digital x-ray images likely has greater display requirements than clinical review of MRI images. Considerations required to match the display to the imaging task will be presented.

Finally, routine display maintenance is required to ensure that LCDs used for medical imaging perform at a high level throughout their life cycle. Medical imaging grade displays have software that maintains the luminance output at an acceptable level. All LCDs require on-site quality control periodically to help ensure performance.

Educational Objectives
1) Understand LCD technology.
2) Understand the fundamentals of display quality assessment.
3) Understand imaging requirements to match a display to a modality and task.