AbstractID: 9792 Title: Perspectives on Image Performance Assessment I: Defining Image Performance Criteria

Over the past few years, there has been increasing acceptance of the use of quantitative methods for evaluating diagnostic imaging systems in terms of statistical decision analysis, which allows an understanding of the limitations of imaging capabilities. These limitations are commonly described in terms of physical quantities, such as contrast, spatial resolution, and image noise. In addition, performance criteria must also include other quantities that assess diagnostic relevance from the physician's point of view.

Once appropriate performance criteria are defined, specific tests and tools can be formulated. Among these tools are phantoms that simulate basic tissue properties, such as speed of sound, attenuation and backscatter, and may also include tissue-equivalent structures that can challenge the system's range of imaging capabilities, based on the previously defined performance criteria. Several phantoms that are currently being used will be described.

Adequate performance tests must be able to produce objective data that can be used to measure a wide range of system performance capabilities and limitations. Currently, several organizations are formulating performance tests that are based on basic physics, statistical decision analysis, signal detection theory, and human performance considerations.

Besides clinical relevance, the testing methods must also meet accuracy and reproducibility criteria, which would allow confidence in comparing performance over the life of the equipment, or between systems within the lab, or with other laboratories. A short discussion will be given concerning the impact of error and variability of tests, phantoms, and measurements on the total system evaluation.

Educational Objectives:
1. To become familiar with basic physics of ultrasound imaging
2. To understand the role of speckle and noise in ultrasound images
3. To become familiar with the basics of statistical decision analysis
4. To become familiar with basic physical performance measurements
5. To understand the role of the human observer-based performance measurements
6. To understand the sources of error or uncertainty in performance measurements
7. To understand the distinction between performance measurements and QA tests.