AbstractID: 7448 Title: Quantitative Assessment of Low-contrast Detectability in Fluoroscopic Imaging

Purpose: Fluoroscopic low-contrast detectability is commonly assessed by imaging a test object with targets of decreasing contrast and identifying the lowest contrast target visible. This approach suffers from problems with observer variability that makes consistent image quality assessment difficult. New fluoroscopic systems are being equipped with a "Fluoro Loop" feature that allows for storage of a fluoroscopy image sequence that can be output as a DICOM series. Utilizing this feature for equipment testing allows for quantitative measurements from low-contrast detectability test object images.

Method and Materials: Low contrast target images were obtained using an ACR Radiography Fluoroscopy Accreditation Phantom. This phantom consists of an abdomen-equivalent thickness of PMMA and aluminum imaged with a test plate object which has an aluminum disk with 8 holes drilled to graduated depths. Recorded DICOM fluoroscopy image frames were analyzed on an external PC, using ROIs to determine signal, background and standard deviation values. CNR was calculated for each hole and plotted against hole depth as a graphic representation of fluoroscopic image quality. For validation, the test object was imaged with a Siemens Artis dTA angiography system. Fluoro loops for different dose settings were acquired and stored on a CD-ROM for analysis.

Results: CNR versus hole depth plots correlate well with visual image quality as expected from variations in dose settings. Plots fit to a line have correlation coefficients > 0.99. A CNR value of 1.0 corresponds approximately to lowest target visible by an observer. Using the hole depth corresponding to this CNR value from the line fit provides the minimum detectable percent contrast for the acquisition kVp. For the high, medium and low dose settings, threshold contrast values of 2.8%, 4.3% and 17% were obtained.

Conclusion: Quantitative measurement of low contrast detectability provides a consistent and reproducible metric of fluoroscopic image quality.