Use of signal to noise ratio for daily quality control of fluoroscopes used for interventional radiology procedures

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INTRODUCTION

Complex fluoroscopically guided interventions (FGIs) are routine in many interventional radiology departments. Quality control (QC) is a necessary and appropriate activity to gauge the readiness of the fluoroscopes used in these procedures. We sought to identify a simple and reproducible metric to follow daily QC, helping to ensure that the fluoroscope is readily available for FGIs.

AIM

To evaluate a daily image quality control regimen in a busy academic intervention radiology (IR) department using signal-to-noise ratio (SNR) from fluoroscopic (fluoro) loops.

METHODS

Daily QC was performed over a 5 month period on 6 Siemens fluoroscopes (2 Artis Zeego, 2 Axiom Artis and 2 Artis Q) using a 10"x10"x3" custom-built patient equivalent phantom consisting of polycarbonate, copper, and aluminum. The phantom was placed on the table in the same position each day, which consisted of setting a source-to-image distance of 100 cm, raising the table to a height so that the phantom just met the receptor, and centering the phantom under the fluoroscope. Each room was programmed to use the default QC logic, a fluoro loop was selected to be reproducible, a fluoro loop was used for QA. Fluoro loops were stored using the "Store Fluoro" function. Fluoro loops were used to drive the Automatic Dose Rate and Image Quality control (AIRQ) to a level approximately equal to a 70 kg adult abdomen. Daily QC results showing the mean fluoroscopic (fluoro) loop SNR for each room over a 5 month period. Using statistical process control logic, the red dashed lines indicate 3 standard deviations above the mean (Upper Control Limit, UCL), while the blue dashed lines indicate 3 standard deviations below the mean (Lower Control Limit, LCL). Only 5 recordings out of 568 (0.88%) fell outside of the control values for all 6 rooms.

RESULTS

Automated and observer-independent quality control of units used during fluoroscopically guided interventions was piloted for a busy IR department. Minimal technologist effort and change in workflow were needed to regularly monitor system performance and readiness of the system for the day. This data allows for room specific SNR thresholds to be established and used as a criteria for providing immediate feedback on whether the system is operating at an expected level.

CONCLUSIONS

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