Purpose: Interventional Radiological (IR) procedures result in the highest individual doses in most radiology practices. Recently FDA unveiled initiative to reduce unnecessary radiation exposure from medical imaging. To achieve this goal, the understanding of dose metrics and their relationships from IR procedures is a must. This study aims to summarize dose metrics, investigate the relationship and develop strategies for IR dose reduction and overdose alert.

Methods: A Rando phantom was used to investigate entrance skin dose (ESD) in two Siemens flat panel fluoroscopy systems (Artis and Atris Biplane) using typical protocols for neuro, chest and abdominal interventional procedures. Fluoroscopy time, dose-area product (DAP), and reference dose were recorded from consoles. Exposure rate and cumulative dose at different surface (skin) locations of the imaged areas were measured with a RadCal dosimeter and a Unfors Patient Skin Dosimeter (PSD, with 4 sensors). The relationships among dose metrics were then analyzed for different clinical settings and dose reduction/overdose alert strategies were discussed.

Results: Linear relationships among different dose metrics are observed for fixed clinical setting (SID, image area, fluoroscopy mode, etc). With changes in clinical settings, the linear relationship changes accordingly, which causes difficulty in directly predicting ESD by any single dose metric. However, combining different settings may give a reasonable estimation of patient skin dose during IR procedure.

Conclusions: Considering different clinical settings, ESD can be estimated from dose metrics in the current fluoroscopy systems and used as indicator of patient dose during IR procedures. This information and related strategies may potentially reduce the risk of patient overdose.