Purpose:
To evaluate in a phantom study image quality and dose reduction to the anterior surface with organ-based tube current modulation in head and thoracic CT.

Methods:
Organ-based tube current modulation is designed to reduce dose to superficial radiosensitive organs such as the lens of the eye, thyroid and breast by decreasing the tube current when the tube passes closest to these organs. Dose and image quality were evaluated in phantoms for clinical head and thorax exam protocols with and without organ-based tube current modulation. Surface dose reduction as a function of position was measured using a 32-cm CT Dose Index (CTDI) phantom, an anthropomorphic adult phantom and ion chambers. Surface dose reduction as a function of patient size was investigated using three semi-anthropomorphic phantoms with posteroanterior dimensions of 14, 25 and 31cm. Image noise (the standard deviation of CT numbers in regions of interest) was evaluated for the anthropomorphic and the semi-anthropomorphic phantoms.

Results:
For equivalent scanner output (Volume CTDI), dose to the midline of the anterior surface was reduced by 27-50%, depending on anatomic region (head or thorax) and phantom size; dose to the posterior surface was correspondingly increased. Image noise was not significantly different between scans with and without organ-based tube current modulation ($p=0.35$).

Conclusions:
Organ-based tube current modulation can reduce dose to the anterior surface of patients, without increasing image noise, by commensurately increasing dose to the posterior surface. This can reduce dose to anterior radiosensitive organs for head and thoracic CT scans.