Image quality and dose in Computed Tomography – A regional audit

Nicola Bate – Clinical Scientist
Royal Infirmary of Edinburgh

Background

- Dose audits are good practice and required by IRR99
- Image quality optimisation ideally carried out on all sites
- What variations are there in dose and image quality across the regions I cover?
- Why do these variations exist?
- What factors affect the dose and image quality?

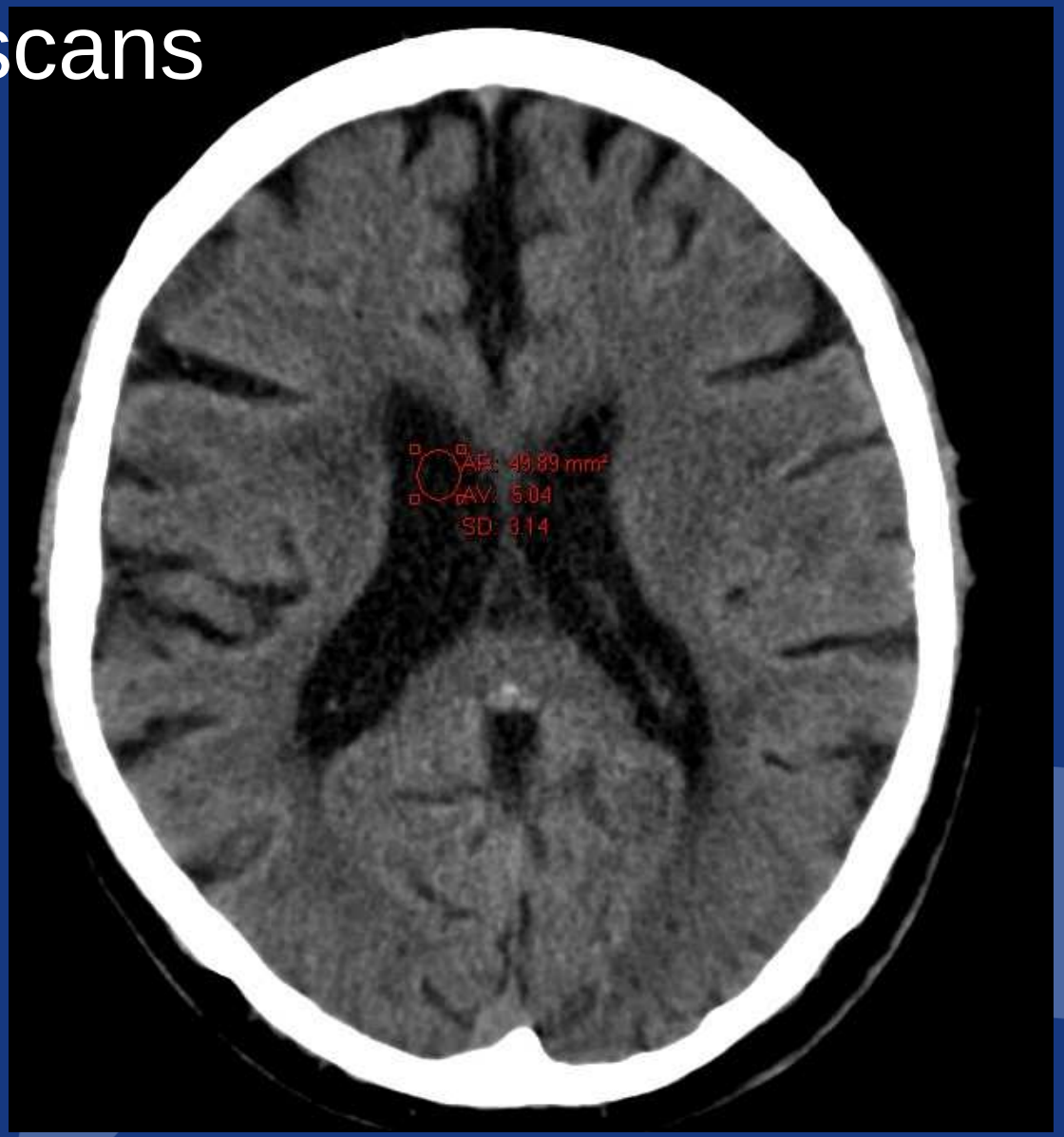
Methodology

- Look at 7 different scanners across the region – two different manufacturers
- Measure noise for three standard examinations – Routine head, Chest-liver, Abdo-pelvis
- DLP information already available
- Also collect protocol information, measure patient size and scan length to allow other trends to be investigated

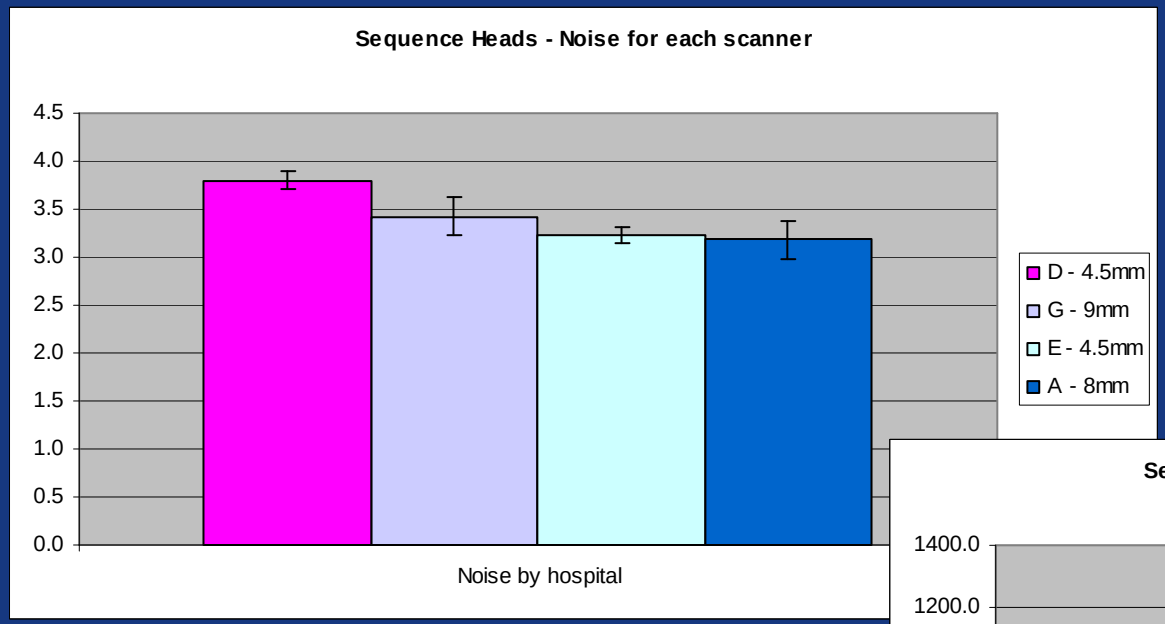
Data collection

- Approx. 30 patients per exam per scanner
- Region of interest drawn in the ventricle for head scans and the descending aorta for body scans
- Standard deviation of pixel values in the ROI taken as a measurement of noise

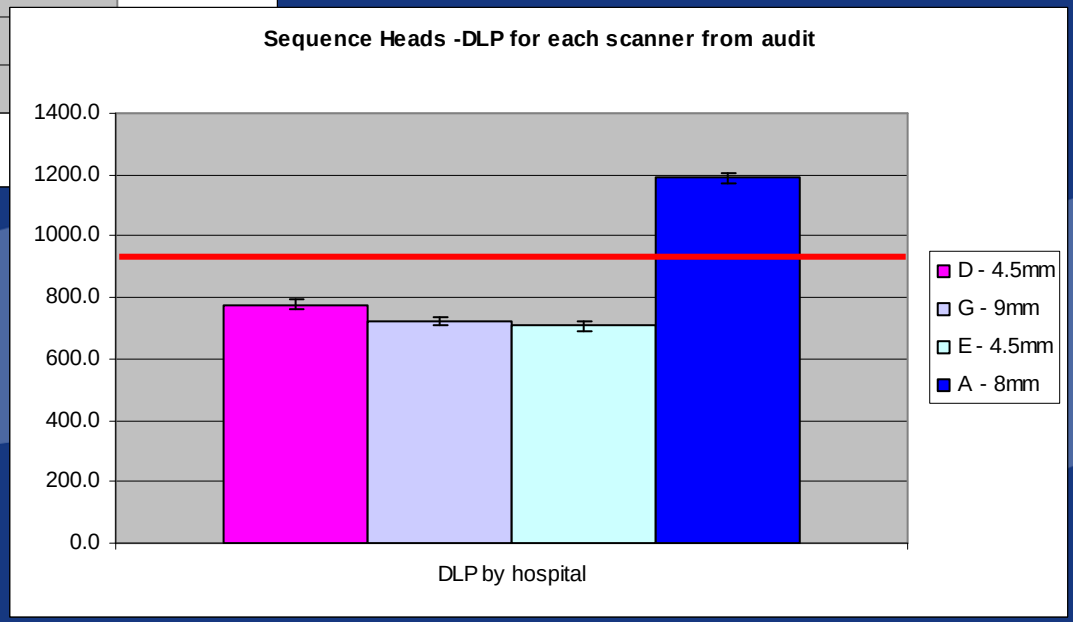
Head scans



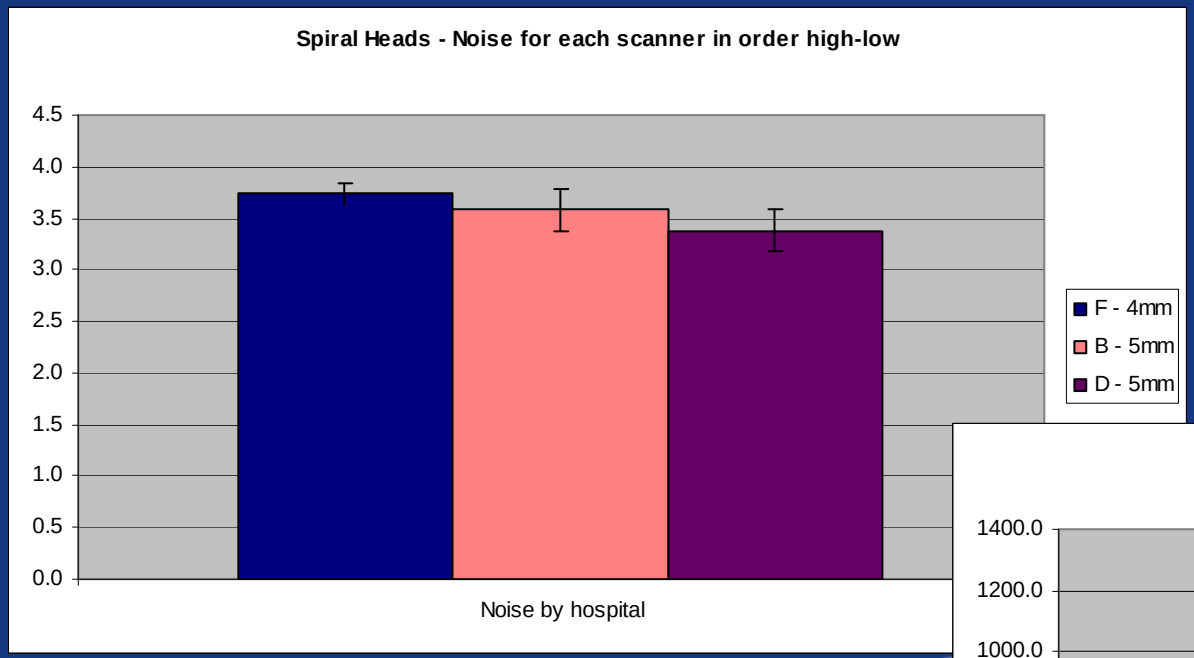
Results – Routine Head (sequence)

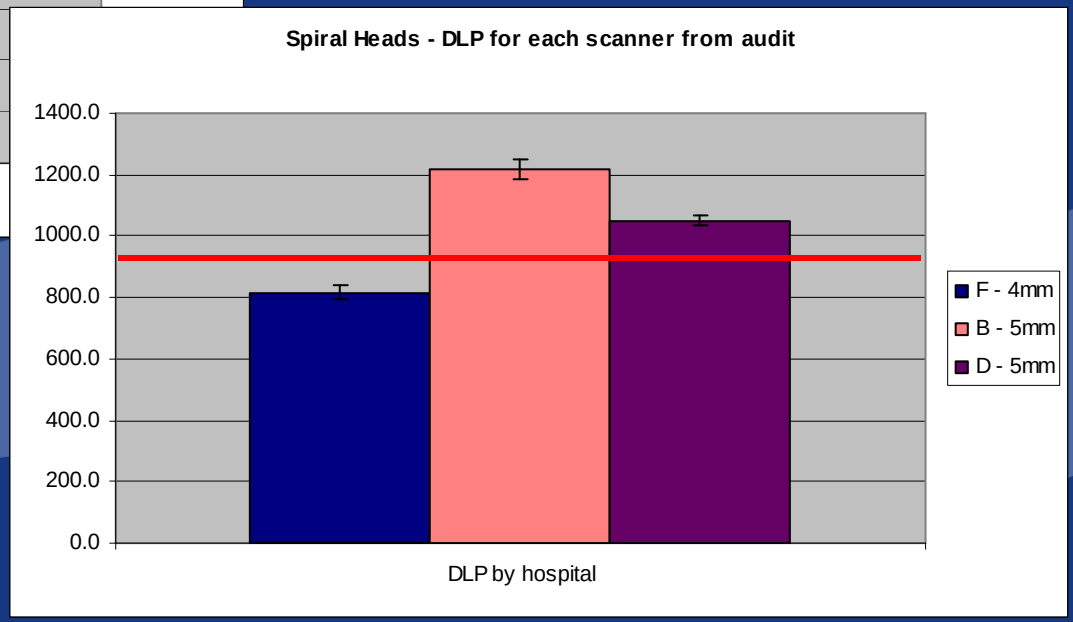


Scanner	Av. mAs
D	274
G	260
E	310
A	358

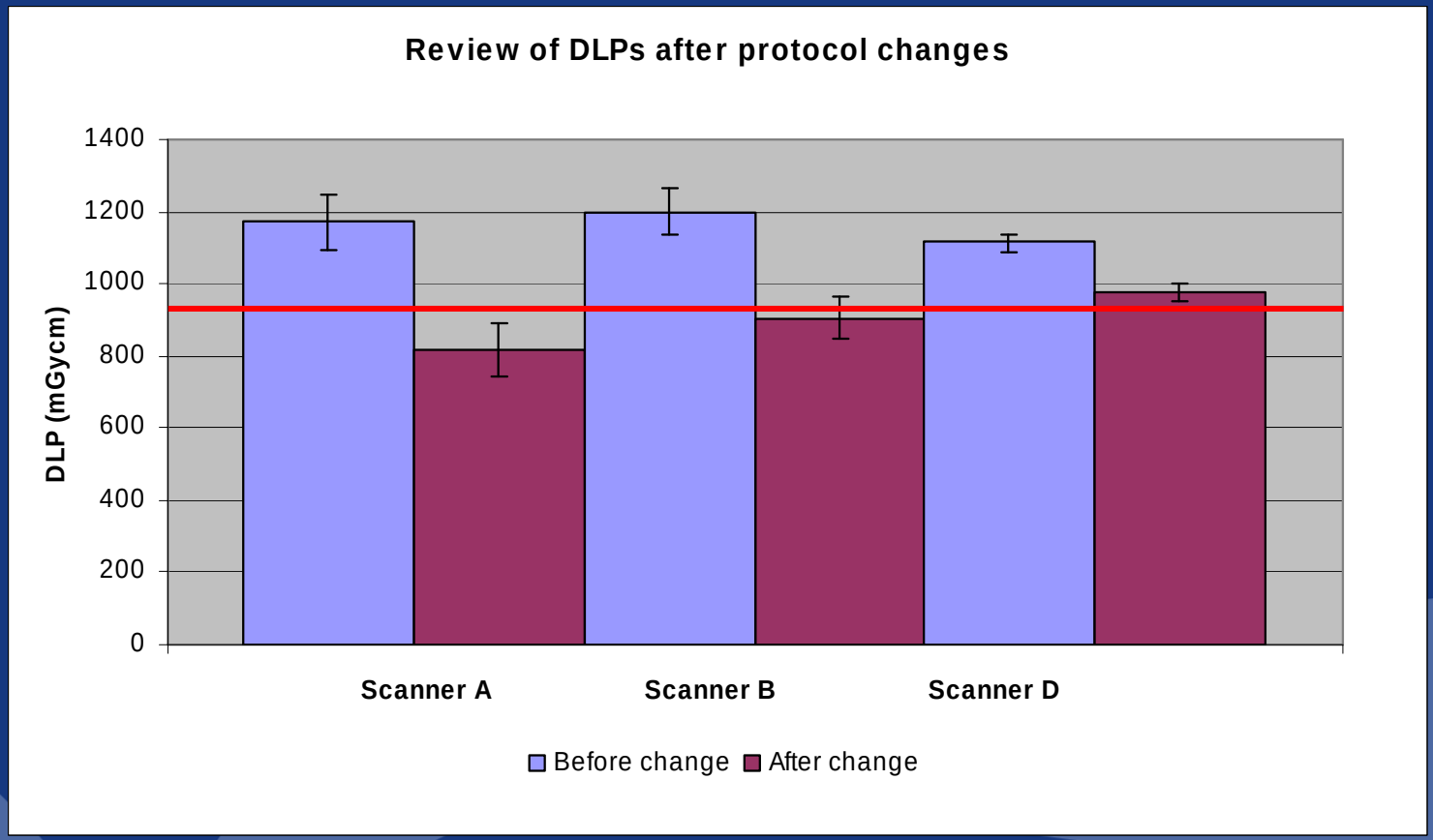


Results – Routine Head (spiral)

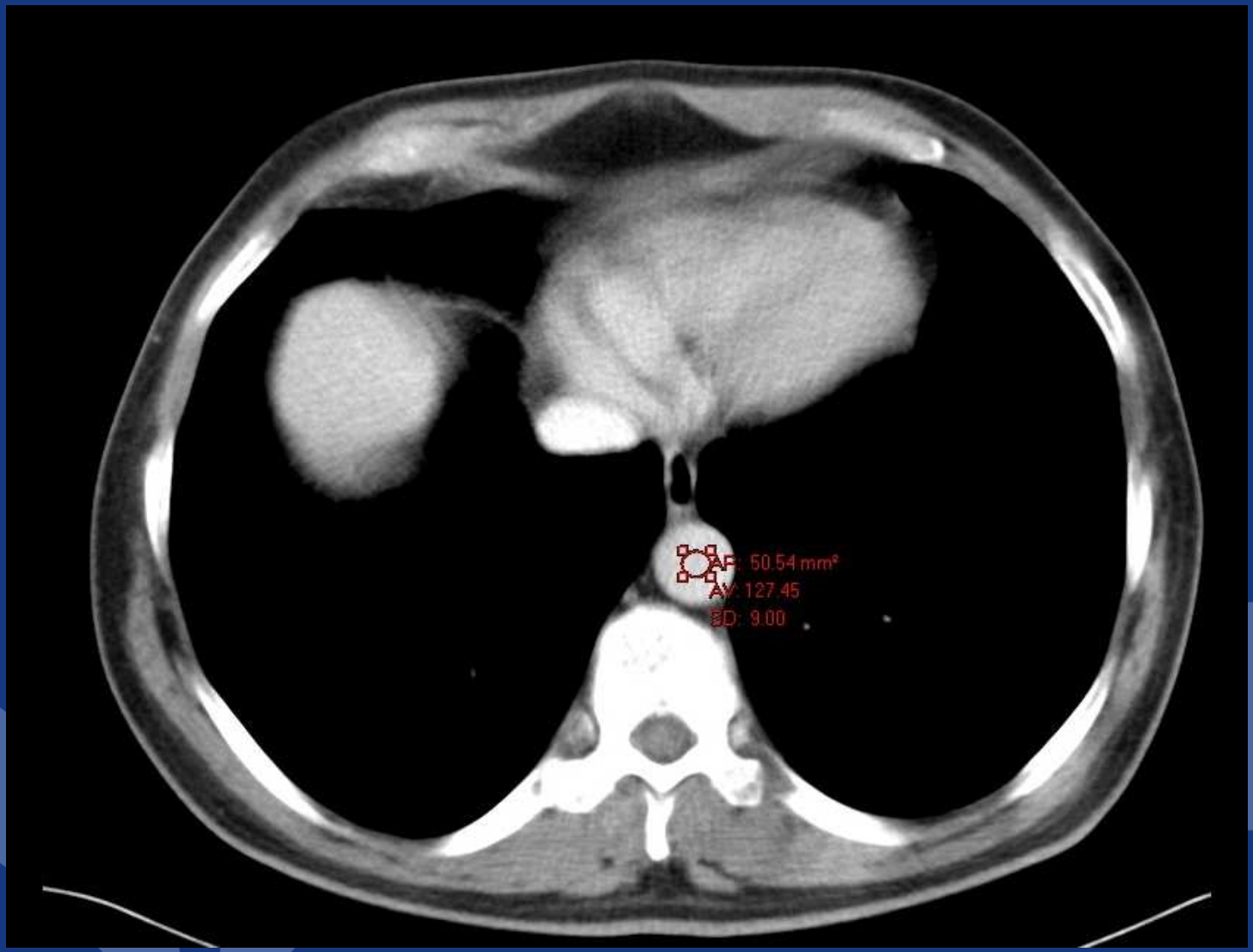




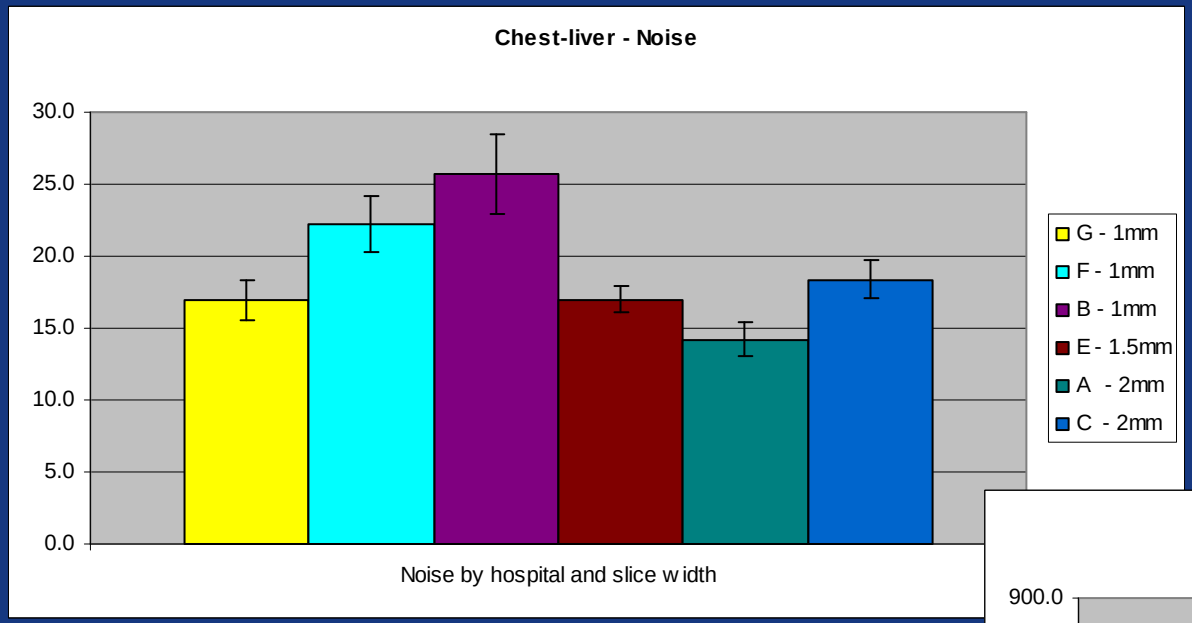
Follow up – Routine Head

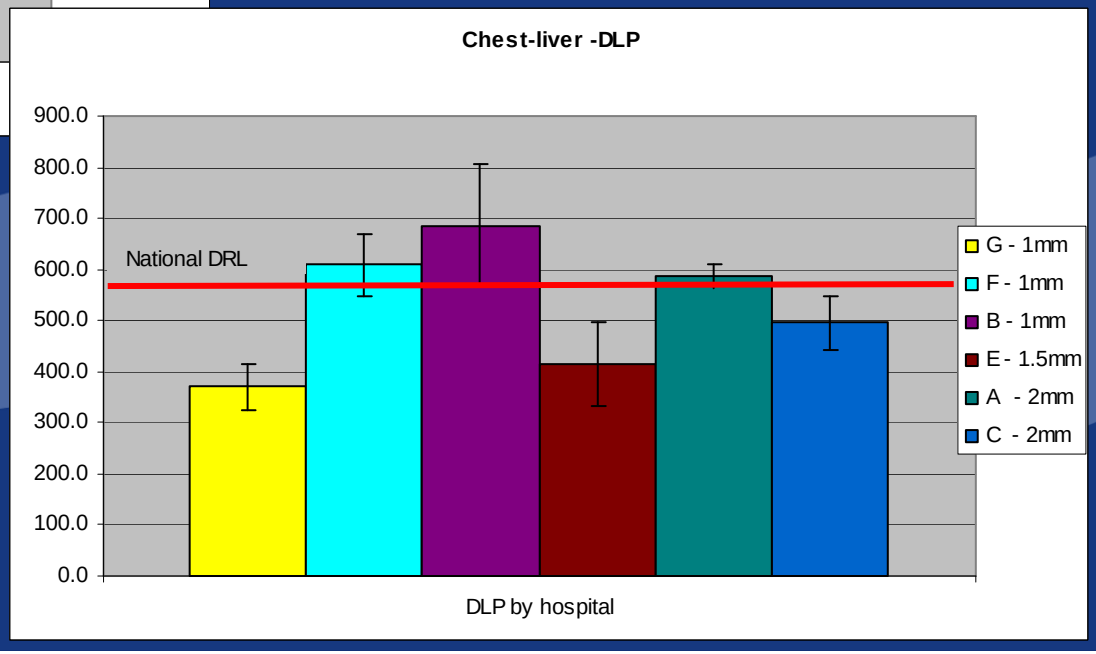


Chest-liver scans

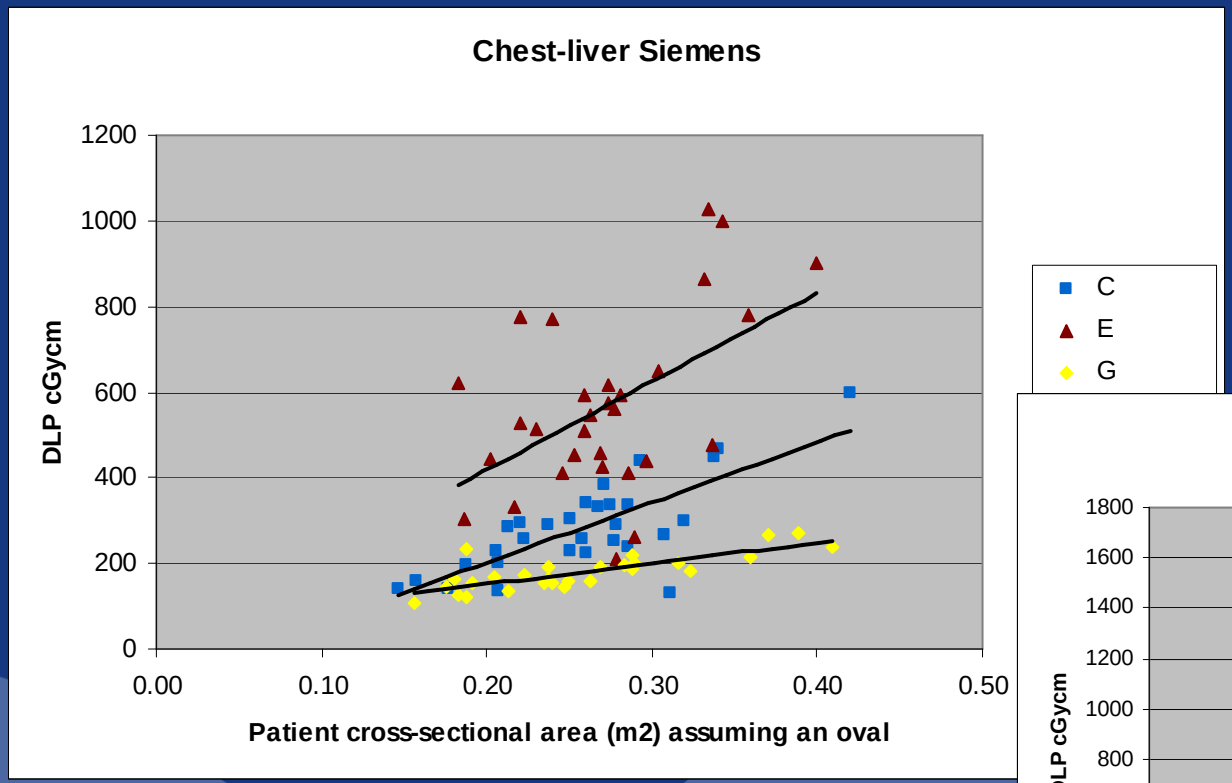


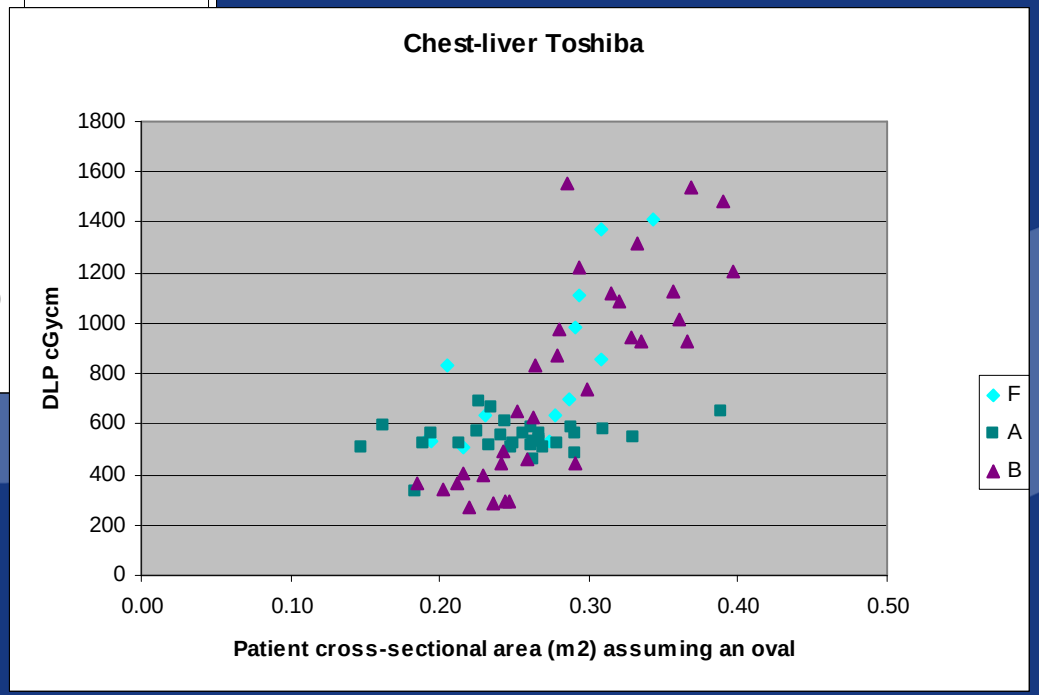
Results – Chest/Liver



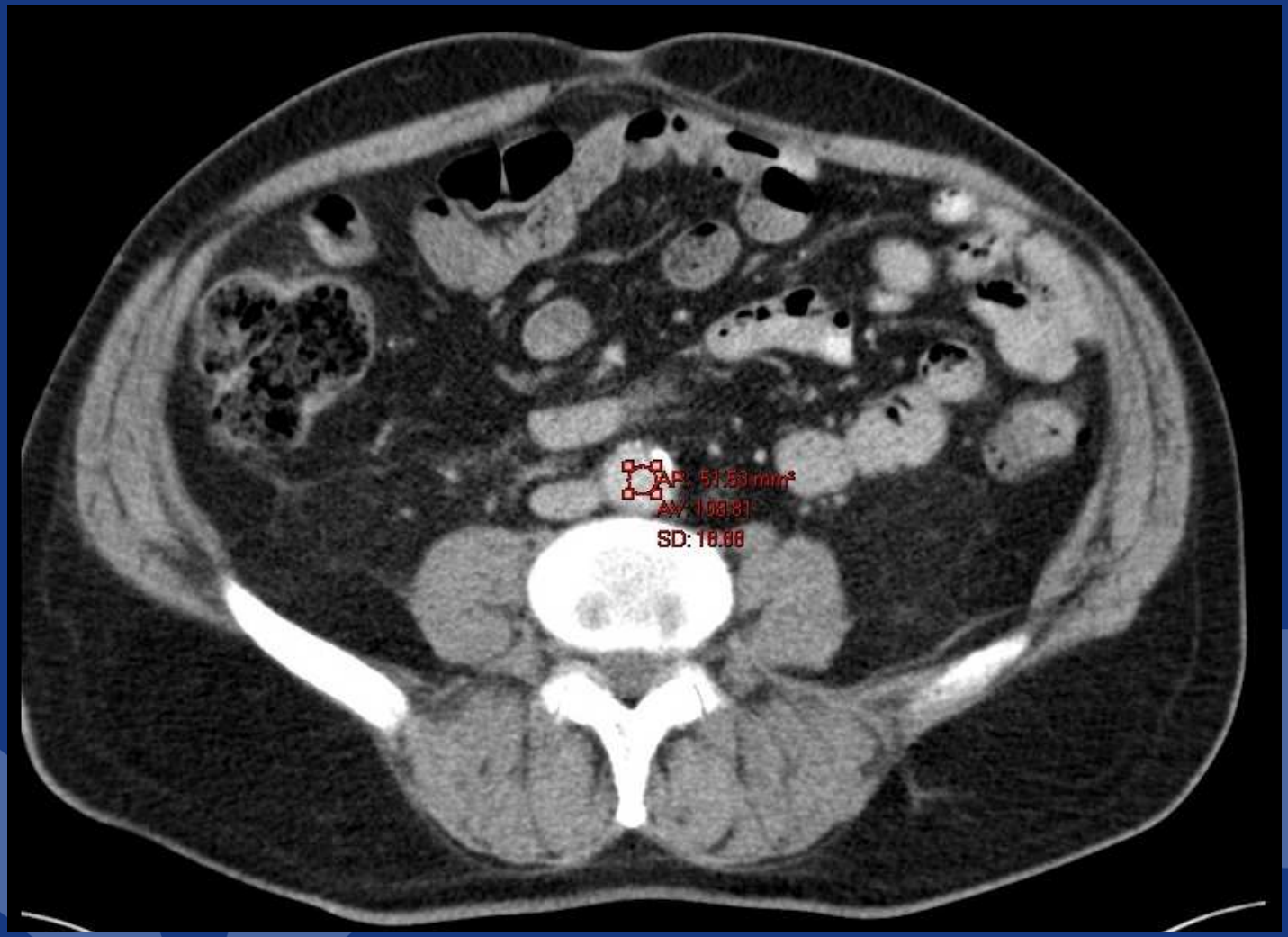


Results – Chest/Liver

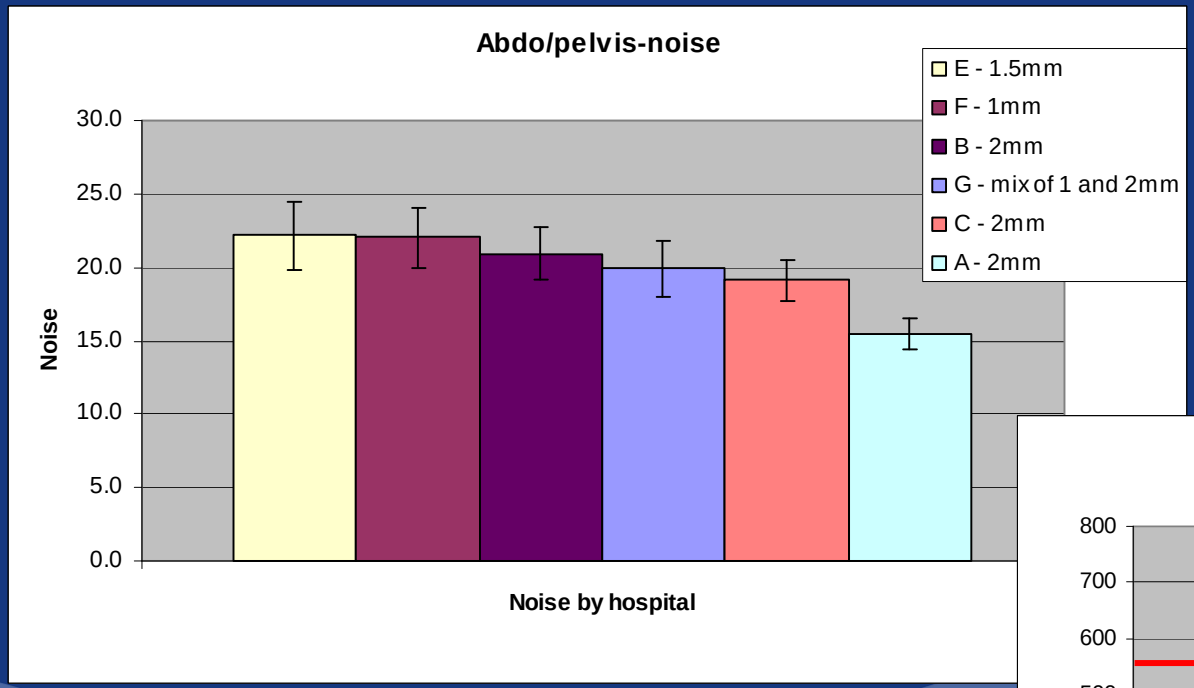


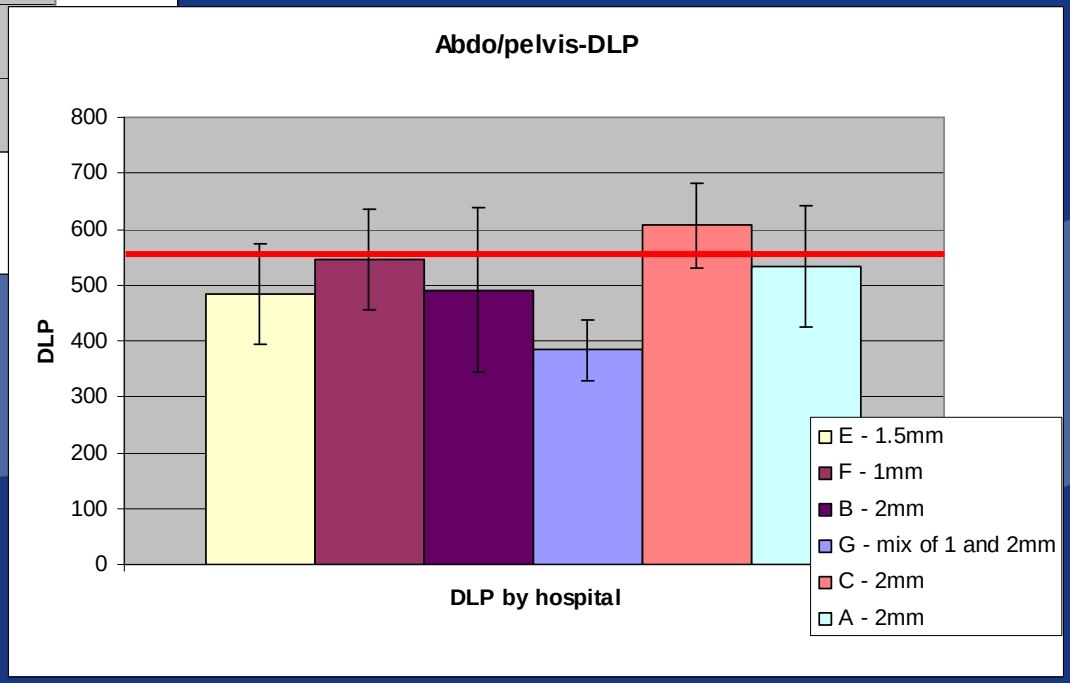


Abdo-pelvis scans

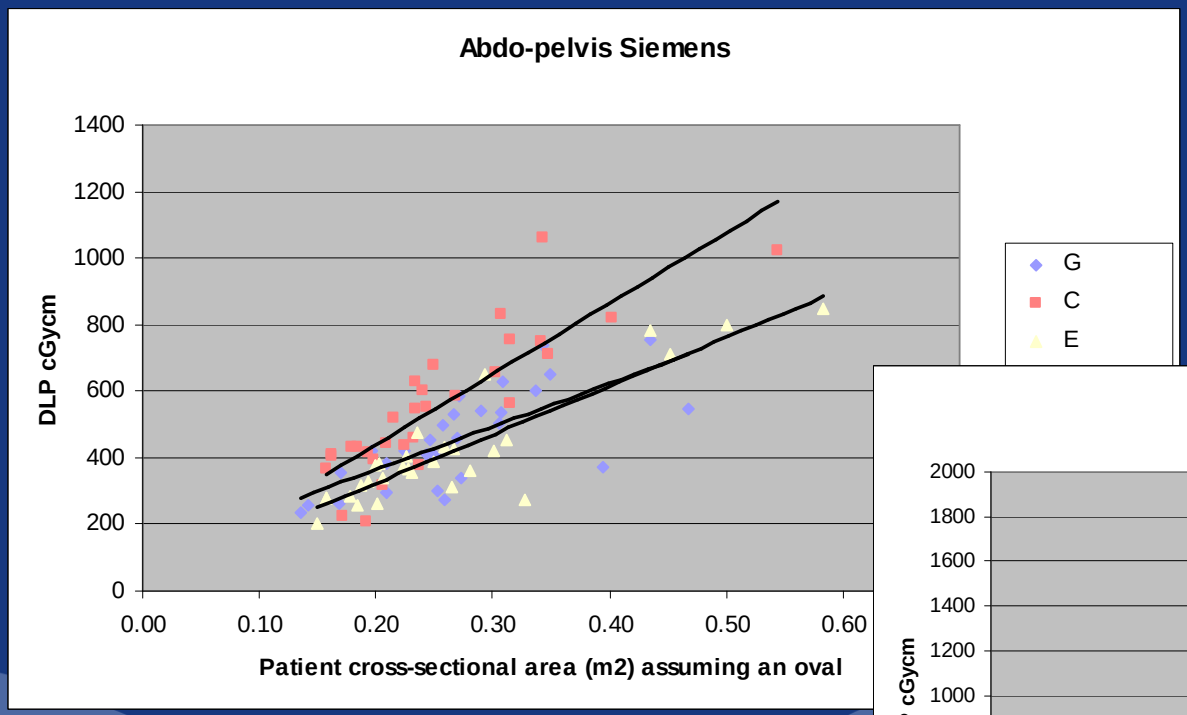


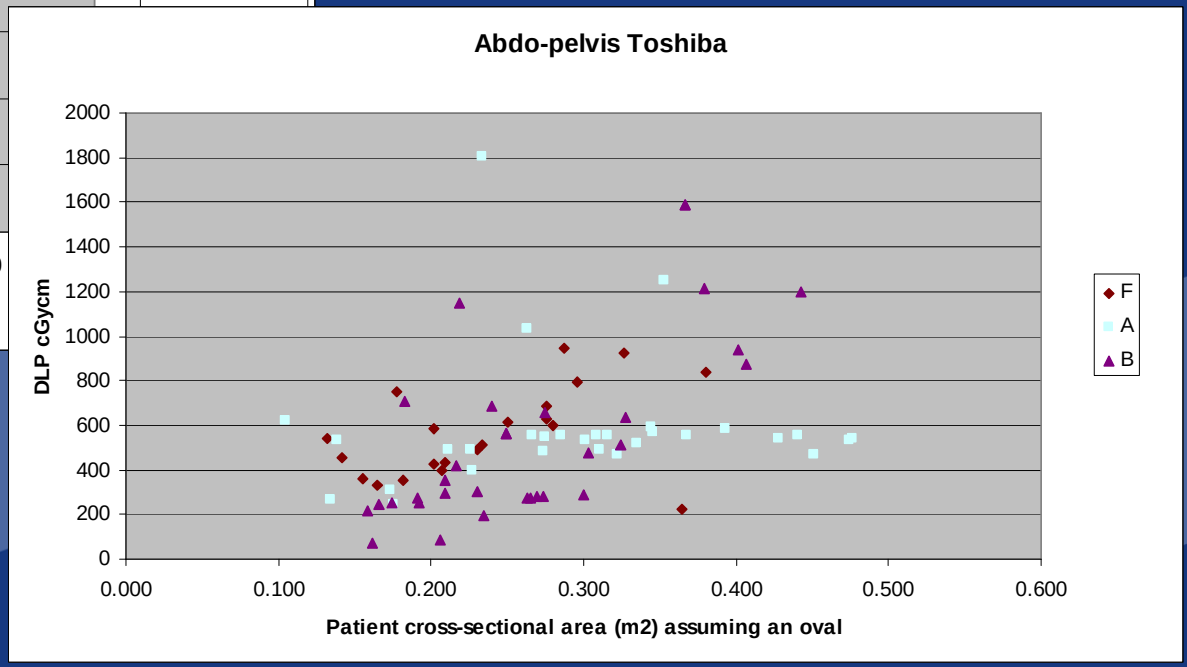
Results – Abdo/pelvis





Results - Abdo-pelvis





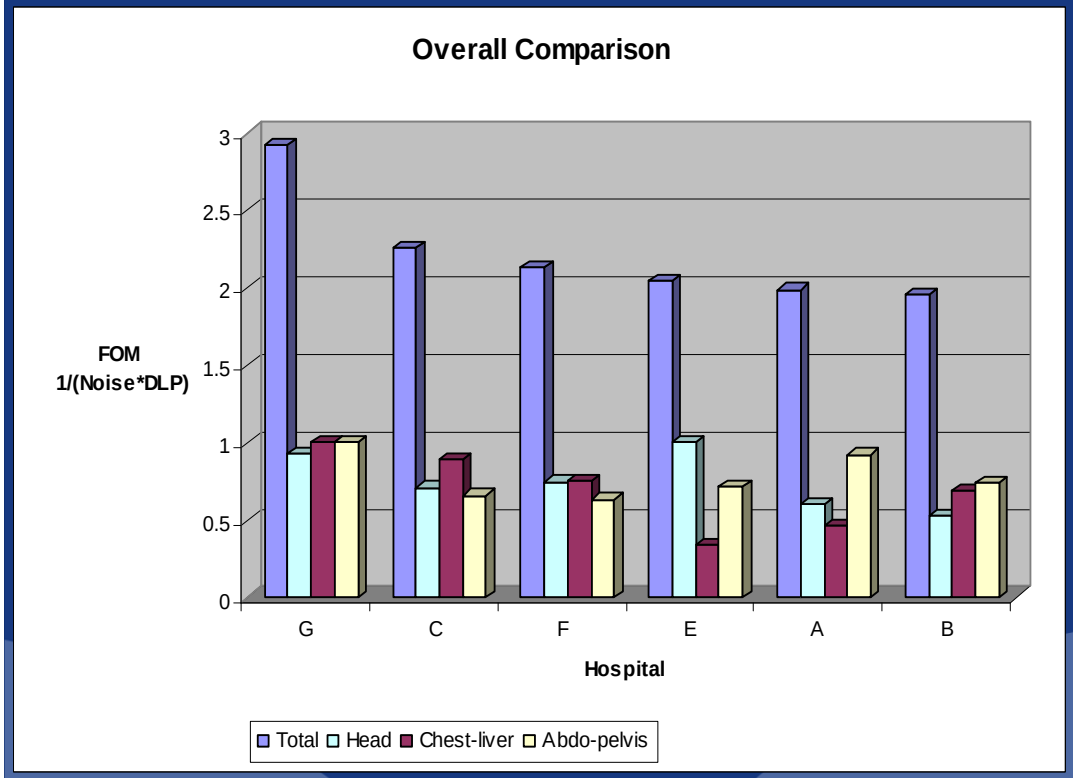
Next steps - Chest/Liver, Abdo/Pelvis

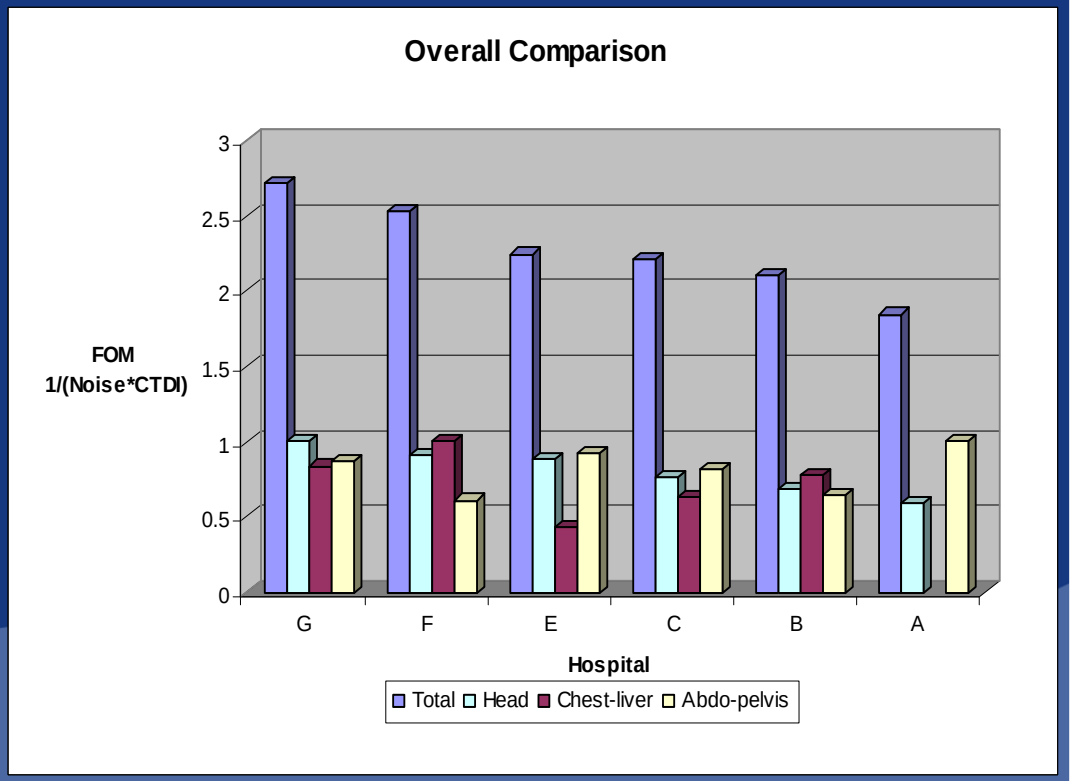
- Reduce overlap
- Can adequate MPRs be made with 2mm slices? - reduce dose and noise
- Why difference technique, same hospital?

Comparing hospitals across all three exams

- Image optimisation aims to achieve both low noise and low DLP/CTDI
- Can use a Figure of Merit
- FOM = 1/(Noise*DLP/CTDI)
- Normalising to maximum then summing gives overall rank of each scanner of those tested
- Max. value of 3

Overall Comparison





Conclusions

- Dose audit only gives half the picture
- Scan length is an important factor
- It is possible to achieve the same noise outcome with very different settings
- Less variation in noise than might have been expected
- More work to be done to optimise those scanners with high DLP and high noise