Optimising neonatal x-ray quality: results of an audit

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INTRODUCTION

- Babies who require specialist neonatal care present diagnostic and therapeutic dilemmas to the treating clinicians[1,2]
- X-ray imaging is a tool frequently used to assist clinical management[1,2]
- The effects of ionizing radiation on this vulnerable population are well documented[1]
- Quality assurance (QA) programs are an established method to maximise diagnostic quality while keeping radiation exposure to a minimum[2]

AIMS

- To examine the film quality of x-rays produced at a tertiary referral neonatal unit in the United Kingdom
- To establish inter- and intra-observer variation when applying a film quality checklist

METHODS

- 174 x-rays were randomly selected from a large, tertiary neonatal service over a 3 month period (10% workload)
- Film grading system developed by Cook *et al.*[3] was used
- Two radiographers, after bespoke training, independently rated each x-ray for quality using pre-defined criteria
- Observer agreement was determined using Kappa (*K*) statistic

RESULTS

- 100 of 172(59%) of x-rays were rated high quality (average score≥27) [Image 1 – 3]. 2 cases not rated by both Observers.
- Nearly all x-rays had appropriate density (165 of 174 x-rays)
- Rotation was the most common cause of reduced image quality [Image 4]
- Correct use of lead protection produced most discrepancies between observers [Image 5]
- Observer agreement was fair[4] for overall x-ray quality; $K = 0.23$ $(p<0.01)$ [Table 1]
- Observer agreement was variable for individual film quality criteria (Weighted $K = 0.12 – 0.92$, all $p<0.05$) [Figure 1]

Observer 1 \ Observer 2	Low	High
Low	28	66
High	4	74

Table 1. Proportion of images rated high & low quality by each observer

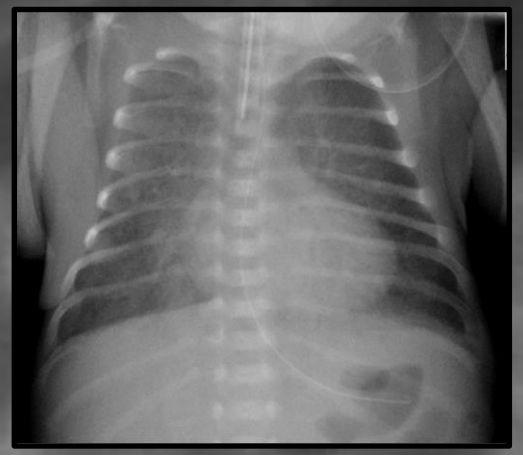

Image 1. CXR rated high quality by both observers

Image 2. High quality AXR

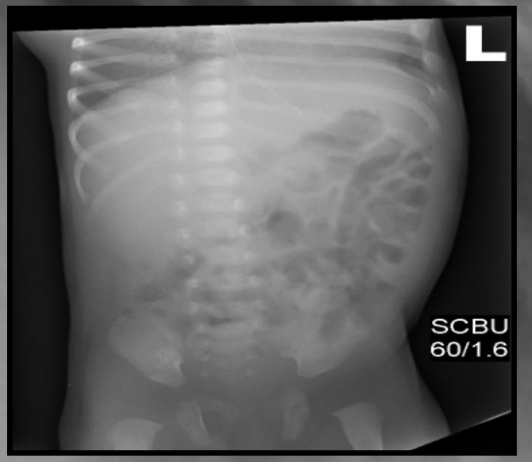

Image 3. Poor quality AXR

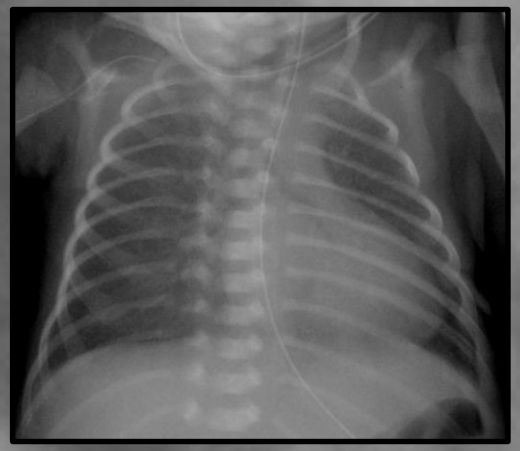

Image 4. CXR with marked rotation

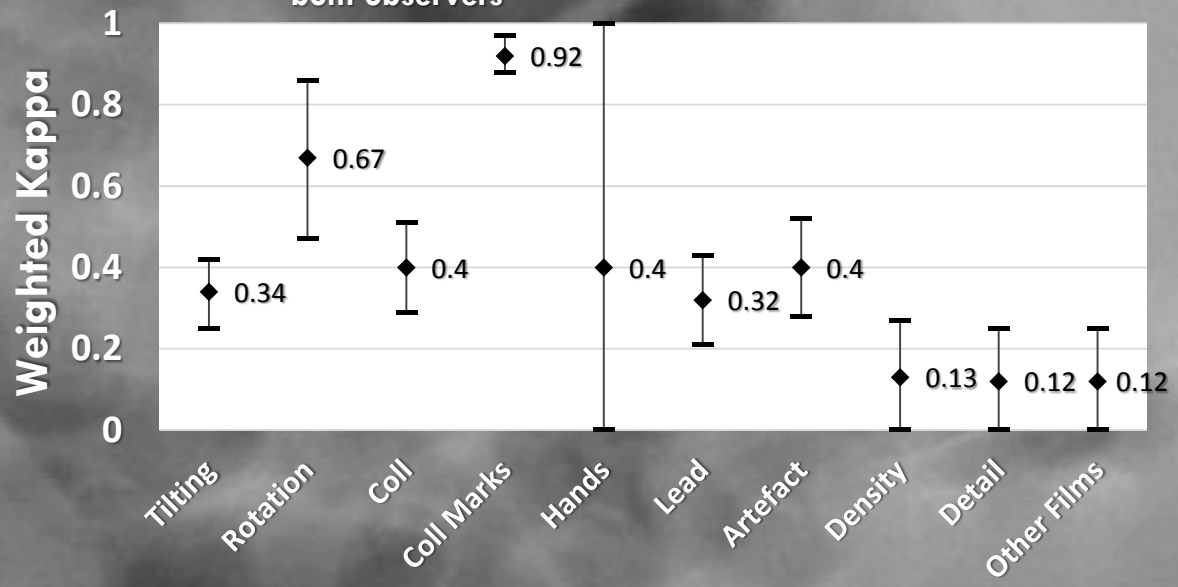

Figure 1. Observer Agreement (Kappa statistic) for each element of image quality

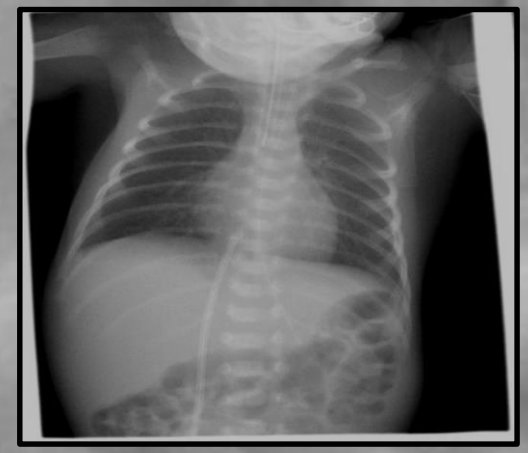

Image 5. CXR without appropriate lead protection

CONCLUSIONS

- Identifying of common patterns assists in maintaining high standards and minimizes radiation exposure
- Targeted training allows radiographers to accurately assess image quality with a moderate degree of reliability

REFERENCES

1 – DeMauro *et al* 2011 Imaging of the Newborn Cambridge University Press.
2 – Dougeni *et al* 2007 Br J Radiol **80**(958): 807-815.
3 – Cook *et al* 2001Br J Radiol **74**(887): 1032-1040.
4 – Landis & Koch 1977 Biometrics **33**(1): 159-174.