

# The clinical impact of observer variability in lung nodule classification in children with Wilms Tumour

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## Abstract

**Objectives** To investigate the extent to which observer variability of CT lung nodule assessment may affect clinical treatment stratification in Wilms Tumor (WT) patients, according to the recent SIOP-RTSG UMBRELLA protocol. **Methods** I: CT thoraces of children with WT submitted for central review, were used to estimate size distribution of lung metastases. II: Scans were selected for blinded review by five radiologists to determine intra and inter-observer variability. They assessed identical scans on two occasions six months apart. III: Monte Carlo simulation (MCMC) was used to predict the clinical impact of observer variation when applying the UMBRELLA protocol size criteria. **Results** Lung nodules were found in 84 out of 360 (23%) children with WT. For 21 identified lung nodules, inter-observer limits of agreement (LOA) for the five readers were  $\pm 2.4\text{mm}$  and  $\pm 1.4\text{mm}$  (AP diameter),  $\pm 1.9\text{mm}$  and  $\pm 1.8\text{mm}$  (TS diameter) and  $\pm 2.0\text{mm}$  and  $\pm 2.4\text{mm}$  (LS diameter) at assessments 1 and 2. Intra-observer LOA across the three dimensions were  $\pm 1.5\text{mm}$ ,  $\pm 2.2\text{mm}$ ,  $\pm 3.5\text{mm}$ ,  $\pm 3.1\text{mm}$  and  $\pm 2.6\text{mm}$  (readers 1-5). MCMC demonstrated that 17% of the patients with a 'true' nodule size of  $\geq 3\text{mm}$  will be scored as  $< 3\text{mm}$ , and 21% of the patients with a 'true' nodule size of  $< 3\text{mm}$  will be scored as being  $\geq 3\text{mm}$ . **Conclusion** A significant intra-inter observer-variation was found when measuring lung nodules on CT for patients with WT. This may have significant implications on treatment stratification, and thereby outcome, when applying a threshold of  $\geq 3\text{mm}$  for a lung nodule to dictate metastatic status.

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