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Title: Bronchodilator treatment response mapping in COPD using hyperpolarised gas ventilation MRI

Mr. Felix 30162 Horn f.c.horn@sheffield.ac.uk [1], Dr. Helen 30163 Marshall h.marshall@sheffield.ac.uk [1], Prof. David 30164 Barber d.barber@sheffield.ac.uk [1], Dr. Juan 30165 Parra-Robles j.parra-robles@sheffield.ac.uk [1], Dr. David 30166 Lipson david.a.lipson@gsk.com MD [2], Dr. Rod 30172 Lawson Rod.Lawson@sth.nhs.uk MD [3] and Prof. Jim 30185 Wild j.m.wild@sheffield.ac.uk [1]. [1] Department of Academic Radiology, University of Sheffield, Sheffield, South Yorkshire, United Kingdom, S10 2JF ; [2] GlaxoSmithKline, GlaxoSmithKline, King of Prussia, PA, United States, PA 19406 and [3] Department of Respiratory Medicine, Sheffield Teaching Hospitals NHS Trust, Sheffield, South Yorkshire, United Kingdom, S102JF .

Body: Lung imaging using hyperpolarised ^{3}He gas MRI (HP-MRI) [Wild J., et al., Mag. Reson. in Medicine 2002; 47:687-95] is able to regionally resolve changes in lung ventilation in response to therapy in obstructive airways diseases such as COPD. A novel way to quantitatively map regional treatment response with ventilation difference mapping of the lungs of patients pre- and post-therapy using HP-MRI was designed and evaluated. The method was tested with COPD patient datasets. Ventilation images were acquired using HP-MRI; A baseline scan before application of standard prescription bronchodilator and one after. The post treatment datasets were registered [Barber D.C. et al., Medical image analysis 2007; 11:648-62] to the baseline image and segmented. All datasets were normalised and smoothed. The treatment response map was generated as the difference between baseline and post treatment image.

Figure 1(G) shows the treatment response map of a COPD patient. Green represents increased ventilation post bronchodilator, red areas show a decrease in ventilation. This method enables a direct mapping of ventilation changes pre and post-treatment. Treatment response mapping provides a novel way to quantify and visualise regional differences in lung ventilation pre- and post-treatment as shown here in a COPD patient dataset. Funding by EU FP7 Airprom & PInet GSK Study RES111175 is also acknowledged as a co-sponsor of this research.