**University of Leicester**

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| **Project Reference** | BRC Studentships |

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**Section 2 – *Project Information***

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| **Project Title** | Extra-pulmonary characteristics of people with COPD and lung hyperinflation and the effects of lung volume reduction​ | |
| **Project Highlights:** | 1. | Work in a diverse multidisciplinary team in a clinical environment |
| 2. | Study the characteristics of people with advanced lung disease and lung hyperinflation and the response to intervention |
| 3. | Detailed physiological assessments of body composition, skeletal muscle & cardiac function using pragmatic clinical measures through to high-tech imaging |
| **Project Summary** | | |
| **Background:** For some people with chronic lung disease high lung volumes (hyperinflation) contribute to extreme breathlessness, severely curtailed exercise capacity, and fatigue. For suitable individuals, lung volume reduction (LVR) via endobronchial or surgical intervention can reduce lung volumes, increase exercise capacity, improve quality of life and reduce mortality (NETT Trial, AJRCCM, 2011).  There is relatively little known about the impact of LVR beyond the lungs. Nutritional status, body composition and skeletal muscle function are likely to be important factors (Kim, AJRCCM, 2012; Greening et al, AJRCCM, 2015; Swallow et al, Thorax, 2007). We do not fully understand the mechanisms driving an individuals’ recovery (or failure to recover) exercise capacity after LVR: nutritional status; muscle function; exercise performance; muscle mass; and importantly muscle quality have not been carefully characterised. There is also a paucity of data on the impact of LVR on cardiac function; both the direct influence via reduction in intrathoracic pressure and the indirect effects that may occur through changes in exercise behaviors are worthy of investigation.  **Aim:** To study the extra-pulmonary characteristics of people with lung hyperinflation and relate these to recovery of physical function after lung volume reduction (LVR) treatment. This project will produce detailed extra-pulmonary phenotyping in people with hyperinflation accessing the COPD clinical service.  Glenfield Hospital represents one of the largest regional centers for LVR in the UK. This PhD project will recruit patients accessing the complex COPD service and those referred through the LVR clinical pathway to address the following questions: 1) How does hyperinflation influence systemic features of COPD including skeletal muscle, nutritional status, and cardiac function? 2) What are the changes in skeletal muscle function, mass and quality following LVR and removal of ventilatory limitation? 3) Does the reduction of hyperinflation following LVR improve cardiac muscle remodeling and diastolic filling?  Drawing on the experience of supervisors and collaborators within the University of Leicester the successful candidate will collect and analyse data using techniques such as systematic literature review; clinical measures (e.g. nutritional status, regional muscle mass by multi-frequency bioelectrical impedance); and research methods (e.g. MRI for muscle quality and cardiac function, DEXA body composition, cardiopulmonary exercise testing, isokinetic dynamometry for muscle strength and fatigue, tri-axial accelerometry for assessing habitual physical activity). | | |
| **References**  Criner GJ, Cordova F, Sternberg AL, Martinez FJ. The National Emphysema Treatment Trial (NETT) Part II: Lessons learned about lung volume reduction surgery. Am J Respir Crit Care Med. 2011 Oct 15;184(8):881-93. doi: 10.1164/rccm.201103-0455CI. PMID: 21719757; PMCID: PMC3208657.  Kim V, Kretschman DM, Sternberg AL, DeCamp Jr MM, Criner GJ. Weight gain after lung reduction surgery is related to improved lung function and ventilatory efficiency. American journal of respiratory and critical care medicine. 2012 Dec 1;186(11):1109-16.  Greening NJ, Harvey-Dunstan TC, Chaplin EJ, Vincent EE, Morgan MD, Singh SJ, Steiner MC. Bedside assessment of quadriceps muscle by ultrasound after admission for acute exacerbations of chronic respiratory disease. Am J Respir Crit Care Med. 2015 Oct 1;192(7):810-6. doi: 10.1164/rccm.201503-0535OC. PMID: 26068143; PMCID: PMC4613897.  Swallow EB, Reyes D, Hopkinson NS, Man WD, Porcher R, Cetti EJ, Moore AJ, Moxham J, Polkey MI. Quadriceps strength predicts mortality in patients with moderate to severe chronic obstructive pulmonary disease. Thorax. 2007 Feb;62(2):115-20. doi: 10.1136/thx.2006.062026. Epub 2006 Nov 7. PMID: 17090575; PMCID: PMC2111256. | | |