

Lane Fox Clinical Academic Respiratory Service

Changing Clinical Practice Through Clinical Respiratory Physiology Research

Nicholas Hart

Professor of Respiratory & Critical Care Medicine

Director of Lane Fox Respiratory Service

Director of Research Delivery

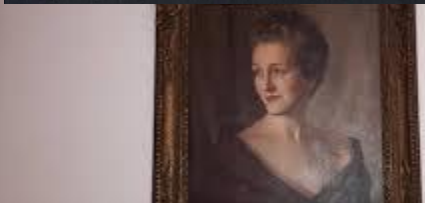
Guys & St Thomas' NHS Foundation Trust

Joint Editor-in-Chief
THORAX

@NickHartThorax

Lane Fox Respiratory Unit   A Specialist Respiratory Service for Complex Home Ventilation, Weaning & Rehabilitation   Est. 1989





Lane Fox Vision of Healthcare

Lane Fox Vision of Healthcare



**Personalised
Effective
Safe**



Lane Fox Vision of Healthcare



**Compassion
Dedication
Passion**



Complex Patients with Chronic Respiratory Failure

34 inpatient beds across 2 sites

Daily outpatient service

Outreach and home assessment clinics

>1600 patients on Lane Fox home mechanical ventilation (HMV) contract

- Local**

- Regional**

- National**

- International**

350 patients started on HMV per year

150 complex NMD patients under active follow up

100 'difficult to wean' patients referred per year

100 community tracheostomy ventilated patients

34 inpatient beds across 2 sites

Daily outpatient service

Outreach and home assessment clinics

**>1600 patients on Lane Fox home medical
ventilation (HMV) contract**

-Local

-Regional

-National

-International

350 patients treated on HMV per year

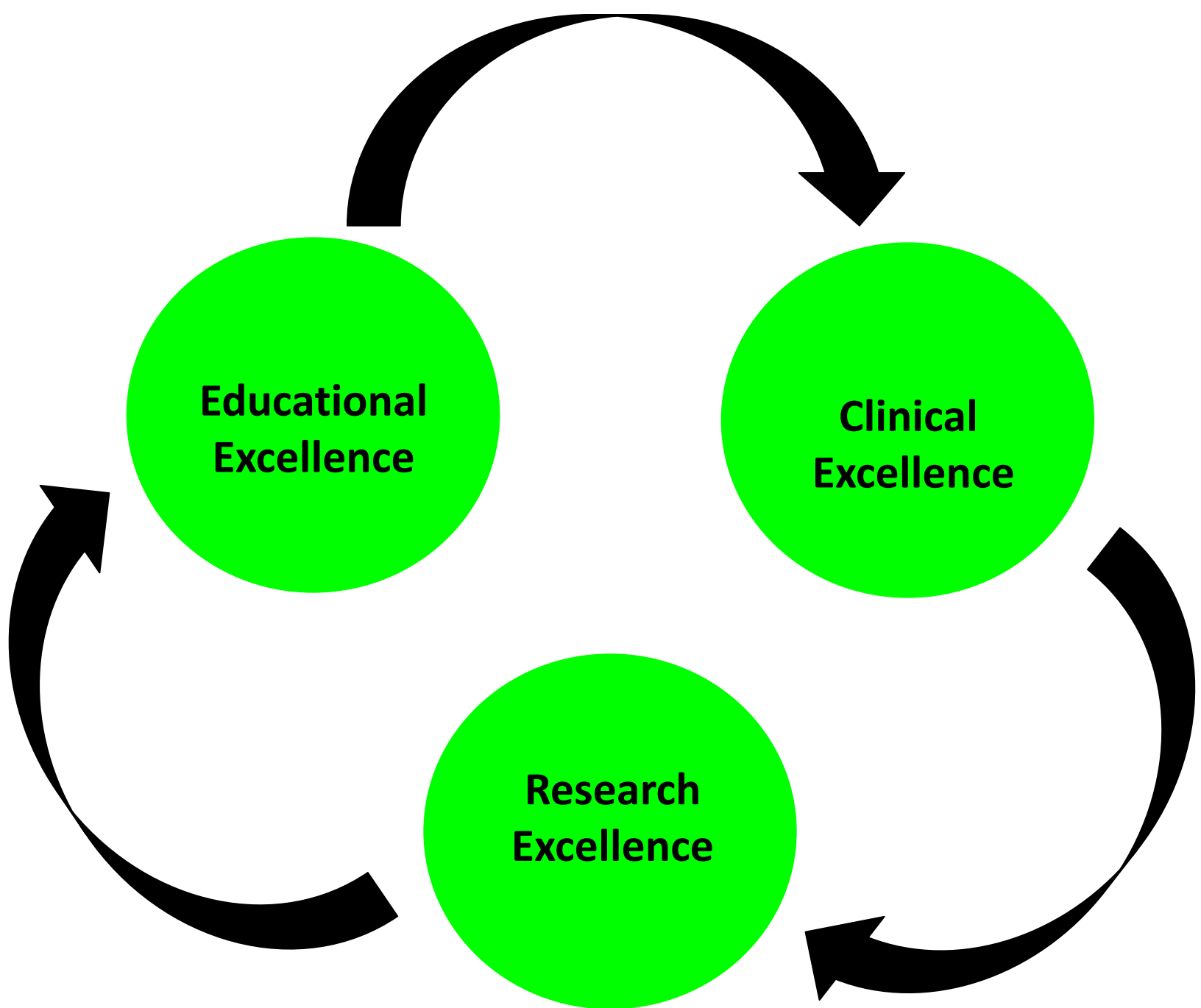
150 community NMD patients under active follow up

10 'difficult to wean' patients referred per year

1 community tracheostomy ventilated patients

24 hour a day medical, nursing and technical support

Integrated Clinical-Academic Research Platform



TECHNICAL

MEDICAL

**Educational
Excellence**

**Clinical
Excellence**

**Research
Excellence**

NURSING

THERAPIES



TECHNICAL

MEDICAL

**Lane Fox
Clinical-Academic
Respiratory
Service**

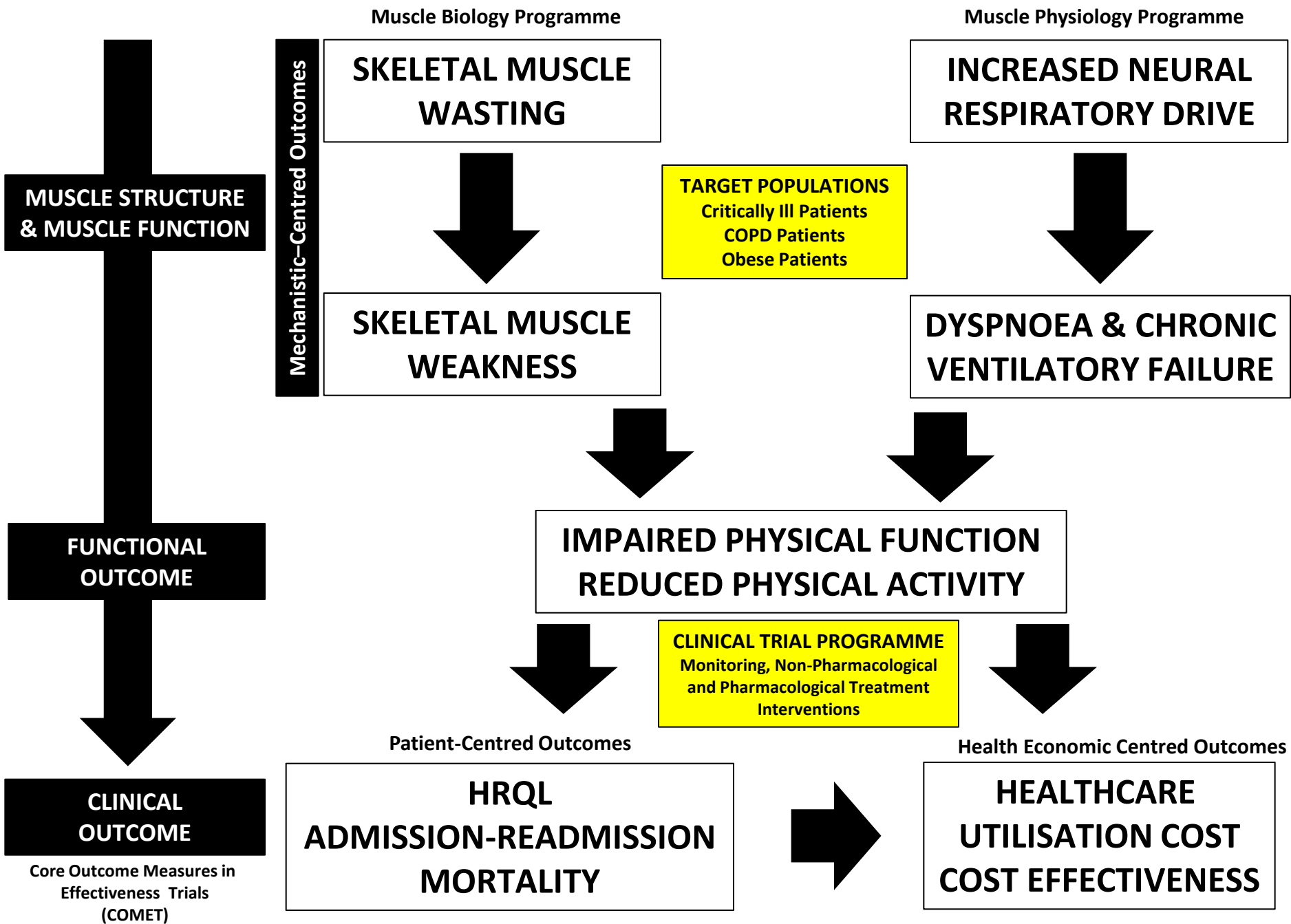
NURSING

THERAPIES

First and Last

- First post ICU weaning and rehabilitation service in the UK in 1996**
- First post polio programme in the UK in 1996**
- First community respiratory and critical care outreach team introduced in the UK in 2007**
- Lane Fox Clinical Respiratory Physiology Research Centre established in 2007**
- Lane Fox Clinical Respiratory Physiology PhD programme started in 2008**
- Trust's Clinical Excellence Award in 2008**
- Complex neuromuscular transition service introduced in 2009**
- First gastrostomy insertion programme for complex neuromuscular patients in 2009**
- Trust's Dignity Award and Trust's Innovation Award in 2009**
- First Weaning, Rehabilitation and HMV unit in the UK to introduce electronic patient records in 2011**
- Paediatric HMV programme started in 2012**
- Lane Fox Tracheostomy Ventilator Nursing Home Network established in 2012**
- First in the UK, Lane Fox Aeromedical Clinic started in 2013**
- First tracheostomy weaning service to introduce comprehensive remote digital delivery of specialist care with the opening of the Lane Fox REMEO Respiratory Centre in Redhill Surrey in 2014**
- First Lane Fox Professor of Respiratory & Critical Care Medicine in 2016**
- Last patient in the UK managed at home in an iron lung ventilation in 2016**

Clinical-Academic Research Programme



MUSCLE-UK CRITICAL CARE PROGRAMME

CLINICIANS

Dr Ronan Astin (University College London)
Danielle Bear (King's College London/St Thomas' Hospital)
Dr Bronwen Connolly (King's College London/Kings College Hospital/ St Thomas' Hospital)*
Dr Nicholas Hart (King's College London/St Thomas' Hospital)
Dr Nicholas Hopkinson (Imperial College/Royal Brompton Hospital)
Dr Mark McPhail (Imperial College/Kings College Hospital)
Prof Hugh Montgomery (University College London/Whittington Hospital)
Prof Mike Polkey (Imperial College/Royal Brompton Hospital)
Dr Zudin Puthuchear (University College London/King's College London)**
Prof John Moxham (King's College London/Kings College Hospital)

SCIENTISTS

Dr Phil Atherton (University of Nottingham)
Dr Lindsay Edwards (King's College London)
Prof Paul Greenhaf (University of Nottingham)
Prof Steve Harridge (King's College London)
Dr Angela McNelly (University College London)
Dr Ged Rafferty (King's College London)
Prof Mike Rennie (University of Nottingham)
Dr Anthea Rowleson (King's College London)
Dr Kenneth Smith (University of Nottingham)
Dr Kenneth Smith (University of Nottingham)
Dr Cristina Velloso (King's College London)

PEER-REVIEWED AWARDS

*ATS Critical Care Assembly Abstract Award 2013; *ATS Critical Care Assembly Abstract Award 2012; **ESICM Young Investigator's Award 2010; **BTS Early Career Investigators Award 2012; **Commendation for ICS Gold Medal 2012; **European Society of Anaesthesiology Anaesthesia and Intensive Care; Award for Publication of Significant Clinical Relevance 2014

Translational Science Programme: From Bench to Bedside

‘Comprehensive study to characterise skeletal muscle wasting and define the pathogenic roles of altered protein synthesis and breakdown’



Musculoskeletal Ultrasound Study in Critical Care: A Longitudinal Evaluation (MUSCLE)

ClinicalTrials.gov NCT01106300

*Z Puthucherry, H Montgomery, S Harridge and N Hart
National Institute of Health Research Funded*

Comprehensive study to characterise skeletal muscle wasting and define the pathogenic roles of altered protein synthesis and breakdown'



Musculoskeletal Ultrasound Study in Critical Care: A Randomised Clinical Evaluation (MUSCLE)

[ClinicalTrials.gov NCT01106300](https://www.clinicaltrials.gov/ct2/show/study?term=NCT01106300)

**Severity of critical illness determines degree of muscle wasting
Chronic Health determines the trajectory of recovery**

*Z Puthucherry, H Montgomery, S Harridge and N Hart
National Institute of Health Research Funded*

Target Molecules

Exercise

Feeding

LANE FOX CLINICAL RESPIRATORY PHYSIOLOGY RESEARCH CENTRE

ADVANCED PHYSIOLOGICAL MONITORING PROGRAMME

LANE FOX CLINICAL RESPIRATORY PHYSIOLOGY GROUP

- Dr Joerg Steier
- Dr Bronwen Connolly
- Dr Patrick Murphy***
- Dr Phil Marino
- Dr Eui-Sik Suh*
- Dr Swapna Mandal
- Dr Michelle Ramsay**
- Dr Maxine Patour
- Miss Gill Arbane

KINGS COLLEGE LONDON

- Prof John Moxham
- Dr Gerrard Rafferty
- Dr Caroline Jolley
- Dr Victoria MacBean
- Dr Abdel Douri
- Dr Fiammetta Fidele

ROYAL BROMTON HOSPITAL

- Prof Michael Polkey
- Dr Nicholas Hopkinson
- Dr William Man

PHILIPS & PHILIPS RESEARCH

- Prof David White
- Bill Gausa
- Sharon Baer
- Dr Pete Hill
- Dr Sandrine Devot

PEER-REVIEWED AWARDS

European Respiratory Society GSK Award 2014;
European Respiratory Society British Lung Foundation Award 2014**;
European Respiratory Society Intensive Care Assembly Non-Invasive Ventilation Group 2013**,
American Thoracic Society Critical Care Assembly 2011***,
European Respiratory Society Intensive Care Assembly Non-Invasive Ventilation Group 2010****

- **UK data has shown that AECOPD**
  - **account for 1 in 8 hospital admissions**
  - **median length of hospital stay of 5 days**
  - **20% hospital readmission rate within 28 days**
  - **up to a third of patients readmitted within 3 months**
- **NHS has incentivised performance by the introduction of financial penalties for patients who are readmitted to acute hospitals within 28 days**

National COPD Resources and Outcomes Project (NCROP) <http://www.brit-thoracic.org.uk/Portals/0/Clinical%20Information/COPD/NCROP/NCROPClinicalAuditpdf>

Report of the 2003 National COPD Audit. The Royal College of Physicians and the British Thoracic Society
2004

Westert GP et al: An international study of hospital readmissions and related utilization in Europe and the USA. Health Policy 2002, 61(3):269-278

Human Cost of Acute Exacerbations of COPD

- **An acute exacerbation of COPD has detrimental effects on lung function, HRQL and exercise capacity**
- **Patients with >3 exacerbations per year have a 5-year survival rate of only 30%**
- **Exacerbation-free patients have a 5-year survival rate of 80%**

Connors A et al. Am J Respir Crit Care Med 1996, 154:959-967

Seemungal TA et al. AJRCCM 1998, 157(5 Pt 1):1418-1422

Donaldson GC et al. Thorax 2002, 57(10):847-852

Almagro P et al. Chest 2002, 121(5):1441-1448

Groenewegen KH et al. Chest 2003, 124(2):459-467

Soler-Cataluna JJ et al. Thorax 2005, 60(11):925-931

Donaldson GC et al. Chest 2005, 128(4):1995-2004

Cote CG et al. Chest 2007, 131(3):696-704

Celli BR et al. AJRCCM 2008, 178(4):332-338

Esteban C et al. Resp Med 2009, 103(8):1201-1208

Vestbo J et al. NEJM 2011, 365(13):1184-1192

Halpin DM et al Int J Chron Obstruct Pulmon Dis 2012, 7:653-661

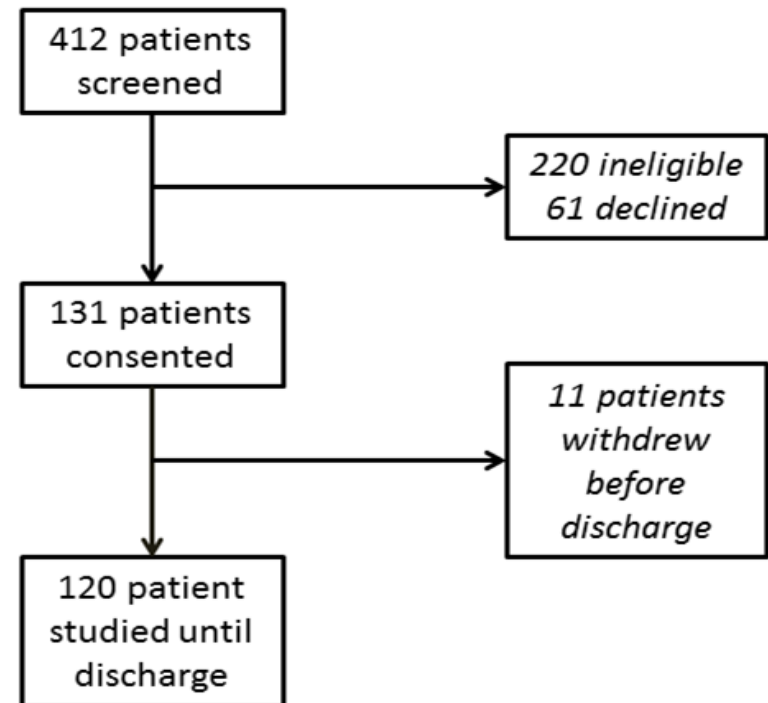
Steer J et al. Thorax 2012, 67(2):117-121

Neural respiratory drive predicts clinical deterioration and safe discharge in exacerbations of COPD

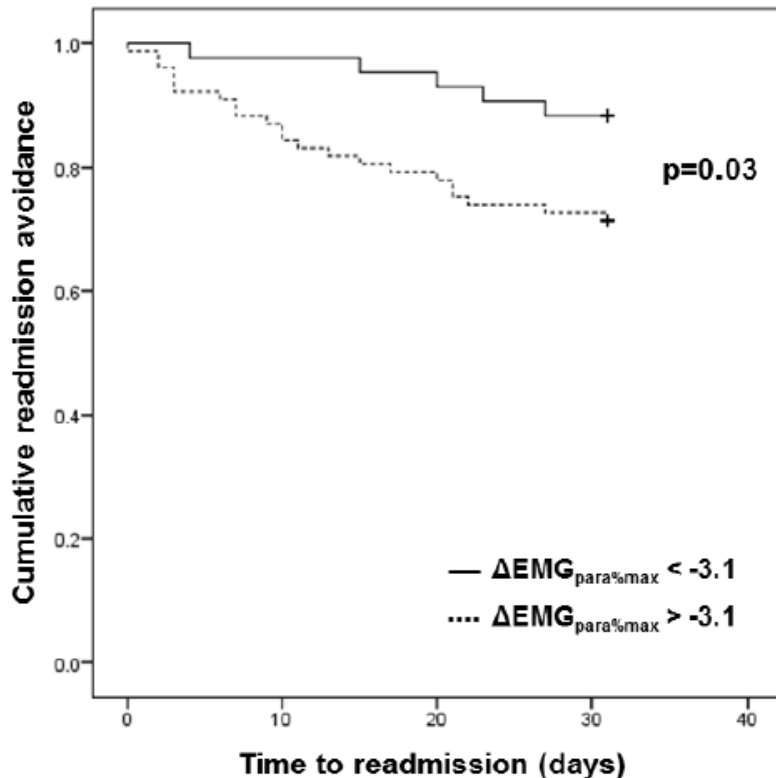
Eui-Sik Suh,^{1,2} Swapna Mandal,^{1,2} Rachel Harding,¹ Michelle Ramsay,^{1,2}
Meera Kamalanathan,¹ Katherine Henderson,³ Kevin O’Kane,⁴ Abdel Douiri,⁵
Nicholas S Hopkinson,⁶ Michael I Polkey,⁶ Gerrard Rafferty,² Patrick B Murphy,^{1,2}
John Moxham,² Nicholas Hart^{1,2}

Thorax. 2015 Dec;70(12):1123-30

- **120 patients completed admission-to-discharge EMG studies, daily IC, spirometry**
- **>600 individual studies in 122 patients**



14-Day Readmission



$\Delta EMG_{para\%max}$
OR 1.127, 95% CI 1.034 to 1.228, $p=0.007$

'The failure of $\Delta EMG_{para\%max}$ to fall by more than 3.1% between admission and discharge had a sensitivity of 93.8% and a specificity of 41.3% to detect 14-day readmission or death. The positive predictive value (PPV) was 19.7% with a negative predictive value (NPV) of 97.7%'

PREDICTING SAFE DISCHARGE

Time-to-readmission Kaplan-Meier plots for patients whose $EMG_{para\%max}$ fell by more than 3.1% between admission and discharge (solid line), and those whose $EMG_{para\%max}$ fell by less than 3.1% (dotted line).

Abbreviations: $EMG_{para\%max}$ = 1-minute mean magnitude of rectified inspiratory parasternal EMG activity normalised to a maximal manoeuvre

LANE FOX CLINICAL RESPIRATORY PHYSIOLOGY RESEARCH CENTRE

NON-INVASIVE VENTILATION CLINICAL TRIALS PROGRAMME

- **Lane Fox Clinical Respiratory Physiology Group**
  - Dr. Joerg Steier
  - Dr. Patrick Murphy
  - Dr. Phil Marino
  - Dr. Swapna Mandal
  - Dr. Michelle Ramsay
  - Miss Gill Arbane
- **King's College London**
  - Prof. John Moxham
  - Dr. Gerrard Rafferty
  - Dr. Caroline Jolley
  - Dr. Victoria MacBean
  - Dr. Abdel Douri
- **Royal Brompton Hospital, London,**
  - Prof. Michael Polkey
  - Dr. Nicholas Hopkinson
  - Dr. William Man
- **Guy's and St. Thomas' Charity**
- **Philips-Respironics**
  - Prof. David White
  - Bill Gausa
  - Sharon Baer
  - Dr. Pete Hill
- **Resmed**
  - Dr Holger Wohrle
  - Dr Glenn Richards
- **Fisher-Paykel**
  - Dr Jo Lorimer
- **B&D Electromedical**
  - Noel Davis
  - Peter Bachelor

UNRESTRICTED RESEARCH GRANTS

LESSONS LEARNT FROM THE HOT-HMV TRIAL



A CATALYST
FOR INNOVATION
IN HEALTH

PHILIPS

KING'S
College
LONDON
University of London

Guy's and St Thomas'
NHS Foundation Trust



How is all started

Draft

**UK Global Medical Excellence Cluster Initiative
ORGANISATION**

29 January, 2007

Professors Tak Lee, Peter Barnes and Wisia Wedzicha

1st Meeting 15th May 2007 hosted at KCL

RANDOMISED CONTROLLED TRIAL OF HOME MECHANICAL VENTILATION IN HYPERCAPNIC CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS POST ACUTE HYPERCAPNIC EXACERBATION

Trial Steering Committee

Chairman: Professor John Gibson

Independent members: Dr Steve Banham; Dr Martin Allen

Investigators

Dr Nicholas Hart (Guys & St Thomas' Foundation Trust/Kings College London)

Dr Patrick Murphy (Guys & St Thomas' Foundation Trust/Kings College London)

Professor Michael Polkey (Royal Brompton Hospital/Imperial College)

Dr John Hurst (University College London/Royal Free Hospital)

Professor Wisia Wedzicha (University College London/Royal Free Hospital)

Professor John Moxham (Kings College London/Kings College Hospital Foundation Trust)

Dr Rebecca Lyall (Kings College London/Kings College Hospital Foundation Trust)

Dr Ian Smith (Papworth Hospital/Cambridge University)

Dr Nick Oscroft (Papworth Hospital/Cambridge University)

Dr Rob Angus (Aintree University Hospital/University of Liverpool)

Dr Nick Duffy (Aintree University Hospital/University of Liverpool)

Professor Rob Davies (Churchill Hospital/Oxford University)

Dr Annabel Nickol (Oxford University/Churchill Hospital)

Dr Mark Elliot (St James' Hospital/Leeds University)

Mr Craig Armstrong (St James' Hospital/Leeds University)

Dr Dev Banerjee (Birmingham Heartlands Hospital)

Dr Stephen Bourke (North Tyneside Hospital)

Professor John Weinman (Kings College London)

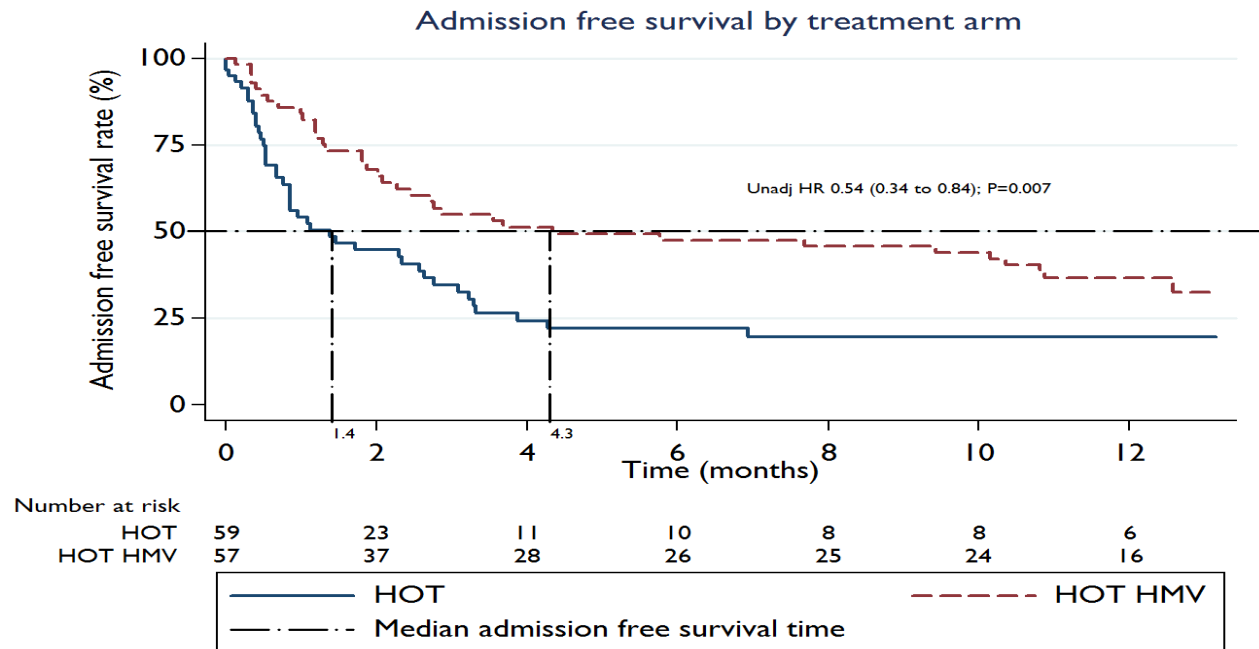
Professor Andrew Nunn (London MRC Clinical Trials Unit)

BASELINE CHARACTERISTICS

Baseline characteristics	HOT HMV (N=57)	HOT (N=59)	Total (N=116)
*Age (years)	66.4 (10.2)	67.1 (9.0)	66.7 (9.6)
*Median BMI (kg/m ²) (25 th to 75 th percentile)	21.5 (18.8 to 24.5)	22.2 (17.9 to 26.9)	21.6 (18.2 to 26.1)
*Prior use of LTOT (n (%))	40 (70%)	40 (68%)	80
*≥3 COPD related admissions in last year	30 (53%)	31 (53%)	61
Gender (female) (n (%))	29 (51%)	32 (54%)	61
Median smoking pack year history (25 th to 75 th percentile)	42.0 (30.5 to 60.0)	45.0 (31.0 to 55.0)	44.0 (31.0 to 60.0)
FEV ₁	0.6 (0.2)	0.6 (0.2)	0.6 (0.2)
FEV ₁ (%)	24.0 (8.6)	22.9 (8.6)	23.4 (8.6)
FVC	1.8 (0.8)	1.5 (0.6)	1.7 (0.7)
FVC (%)	57.4 (19.7)	49.3 (20.4)	53.2 (20.4)
FEV ₁ /FVC	0.3 (0.1)	0.4 (0.1)	0.4 (0.1)

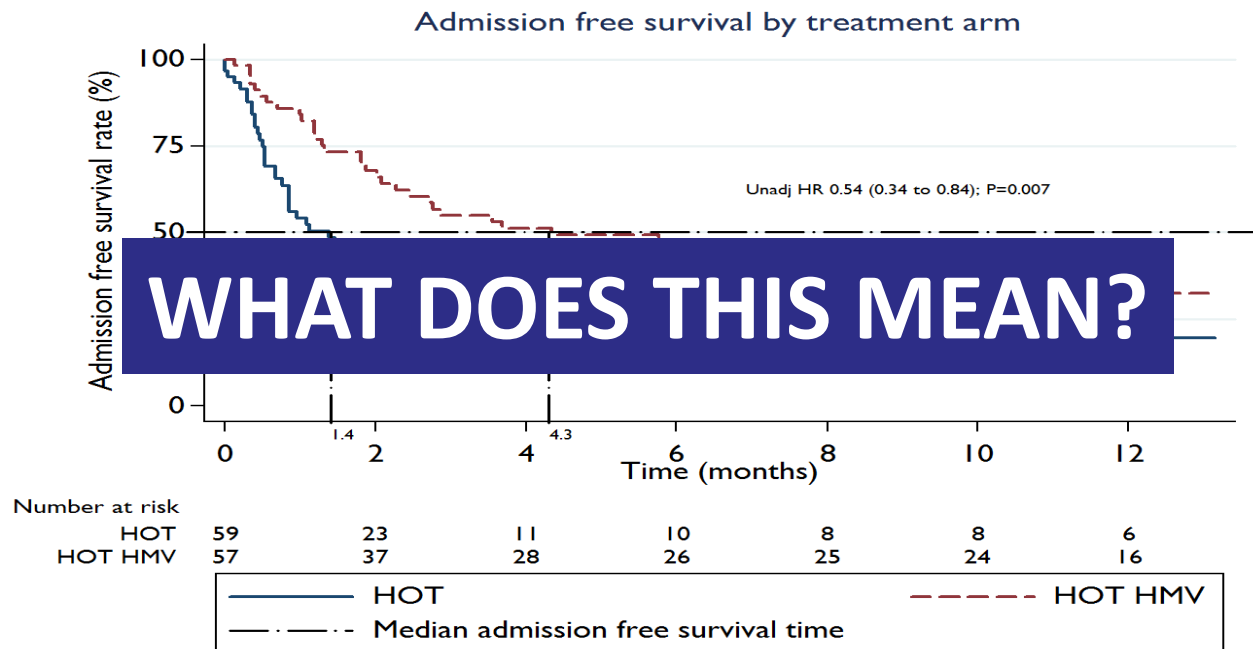
These are sick COPD patients with very limited treatment options

PRIMARY OUTCOME

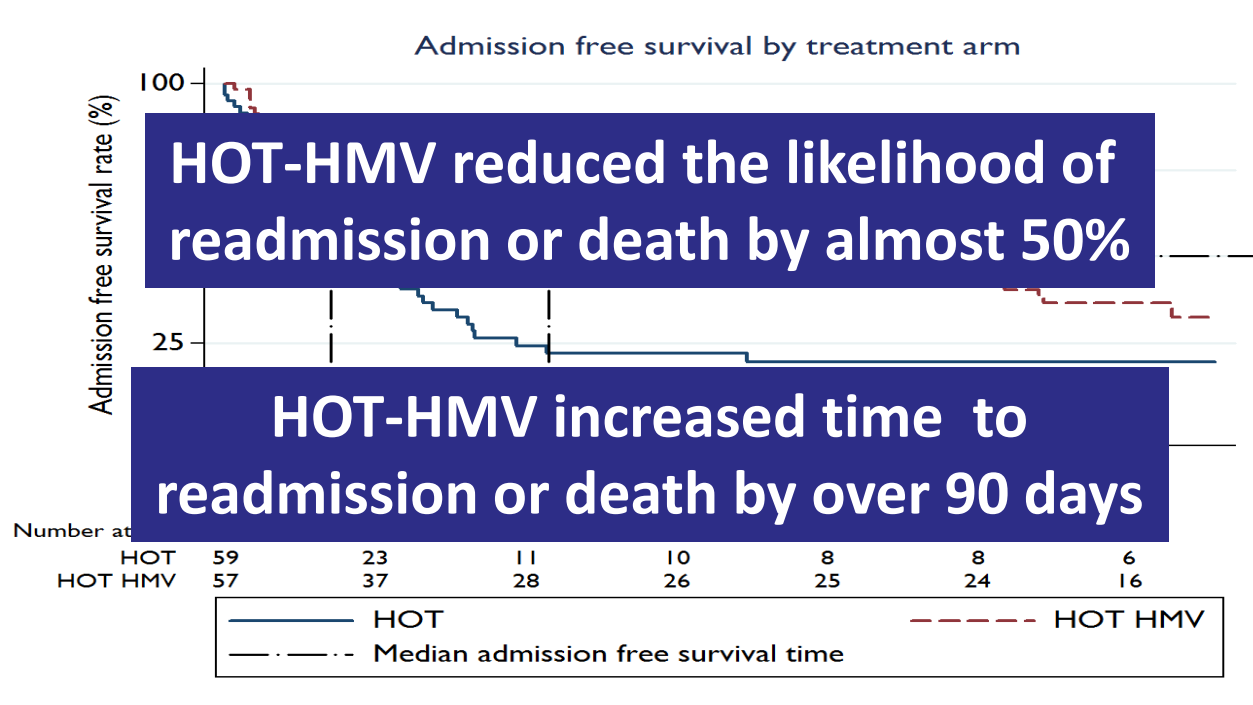


12 month admission free survival

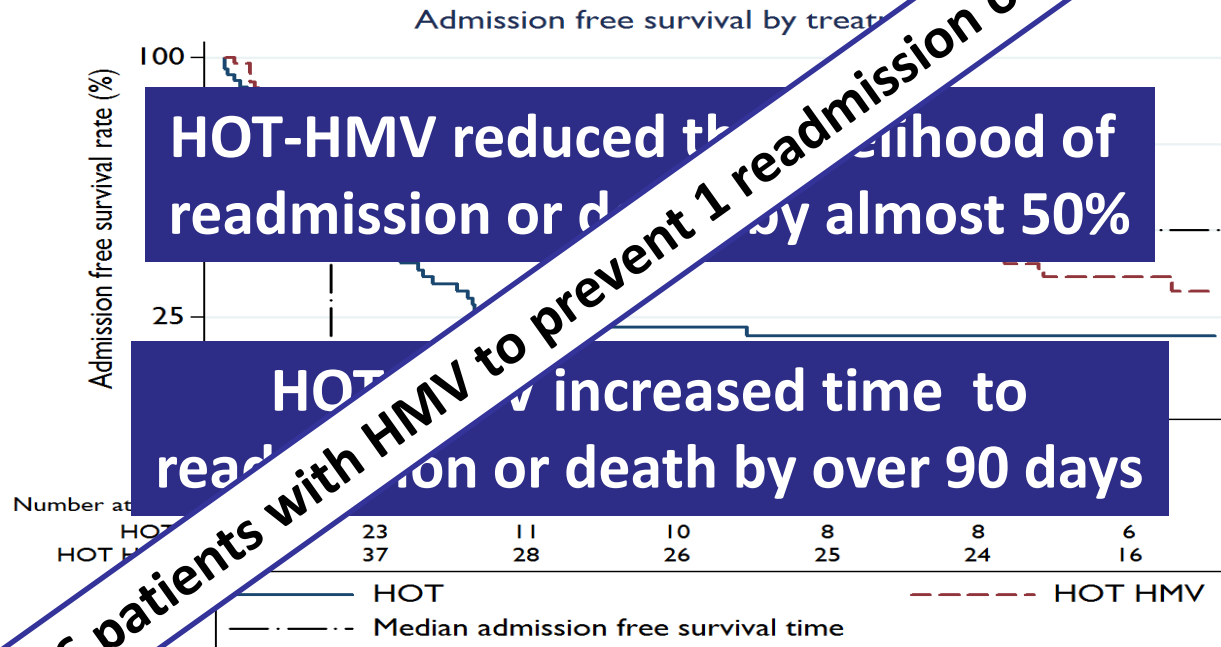
PRIMARY OUTCOME



PRIMARY OUTCOME



PRIMARY OUTCOME



CONCLUSION

- **Guy's & St Thomas' Lane Fox Clinical-Academic Respiratory Service is an international leader in the field in the management of complex patients with chronic respiratory failure**
- **Through the muscle biology and muscle physiology programmes we will make significant advances that will enhance patient outcome and change clinical practice**