



# Some DECAF and a few PEARLS

Northumbria Healthcare   
NHS Foundation Trust



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# Northumbria Healthcare COPD Research Programme

Lead: Prof Bourke

DECAF and PEARL Fellows:

- **Derivation** of the DECAF prognostic score
  - Survival, health resource utilisation, quality of life and functional status following hospitalisation for AECOPD
- **Validation** of the DECAF prognostic score & PEARL
- **Implementation:** RCT of hospital at home v standard care in patients at low risk of death (DECAF 0-1)

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Carlos Echevarria

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Tom Hartley &  
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# DECAF: prediction of in-hospital mortality in ECOPD

Derivation (n=920) Thorax 2012;67:970-6

Validation (n=1,725) Thorax 2016;71:133-140

## The DECAF Score

Variable	Score
<b>D</b> yspnoea	
eMRCd            1-4	0
eMRCd            5a	1
eMRCd            5b	2
<b>E</b> osinopenia (<0.05 x 10 <sup>9</sup> /L)	1
<b>C</b> onsolidation	1
<b>A</b> cidosis (pH <7.3)	1
Atrial <b>F</b> ibrillation	1
<b>Total DECAF Score</b>	<b>/6</b>

Clinical tool	AUROC
<b>DECAF derivation</b>	<b>0.86</b>
<b>DECAF validation</b>	<b>0.82 – 0.83</b>
CURB-65	0.717
APACHE II	0.727

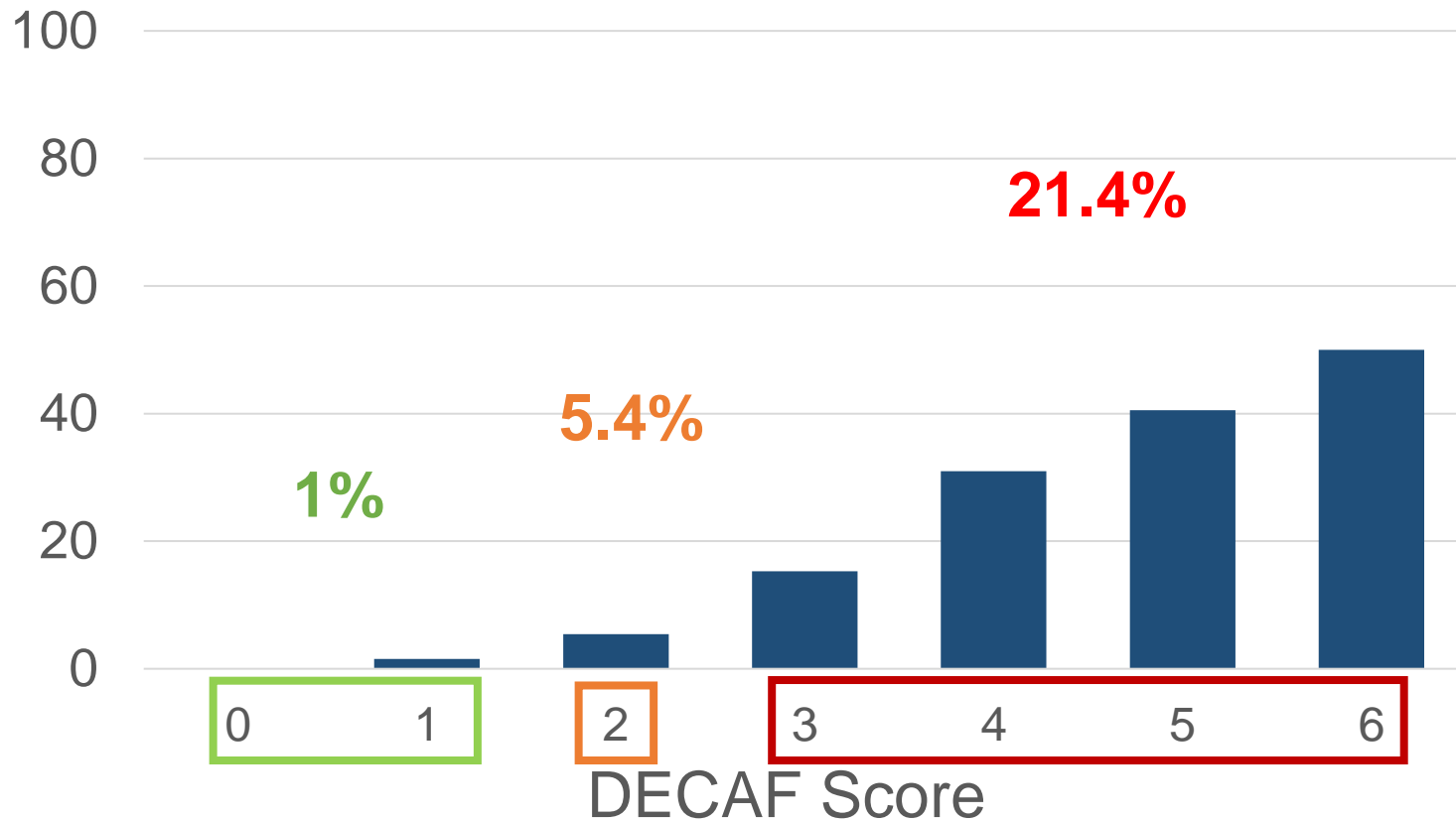
# Extended MRC Dyspnoea Scale

Thorax 2012;67:117-21

- Breathlessness
  - Transition between levels defined
  - eMRC D 5x “...leave the house unassisted,...
- Frailty
  - 5a: ..independent in washing and/or dressing”
  - 5b: ..and requires help with washing and dressing”

# In-hospital mortality by DECAF risk group

Validation study (Thorax, 2016)



# Pneumonic ECOPD (n = 788)

Derivation and validation cohorts pooled (n = 2,645)

	DECAF	CURB-65	p
30-day mortality (AUROC)	0.75 (0.71-0.79)	0.66 (0.62-0.71)	<0.001
30-day mortality low risk group,%*	<b>3.3</b> (4/122)	<b>10.1</b> (24/237)	0.022
In-hospital mortality low risk group,%*	<b>1.6</b> (2/122)	<b>7.2</b> (17/237)	0.026

\*DECAF 0-1 and CURB 0-1 groups

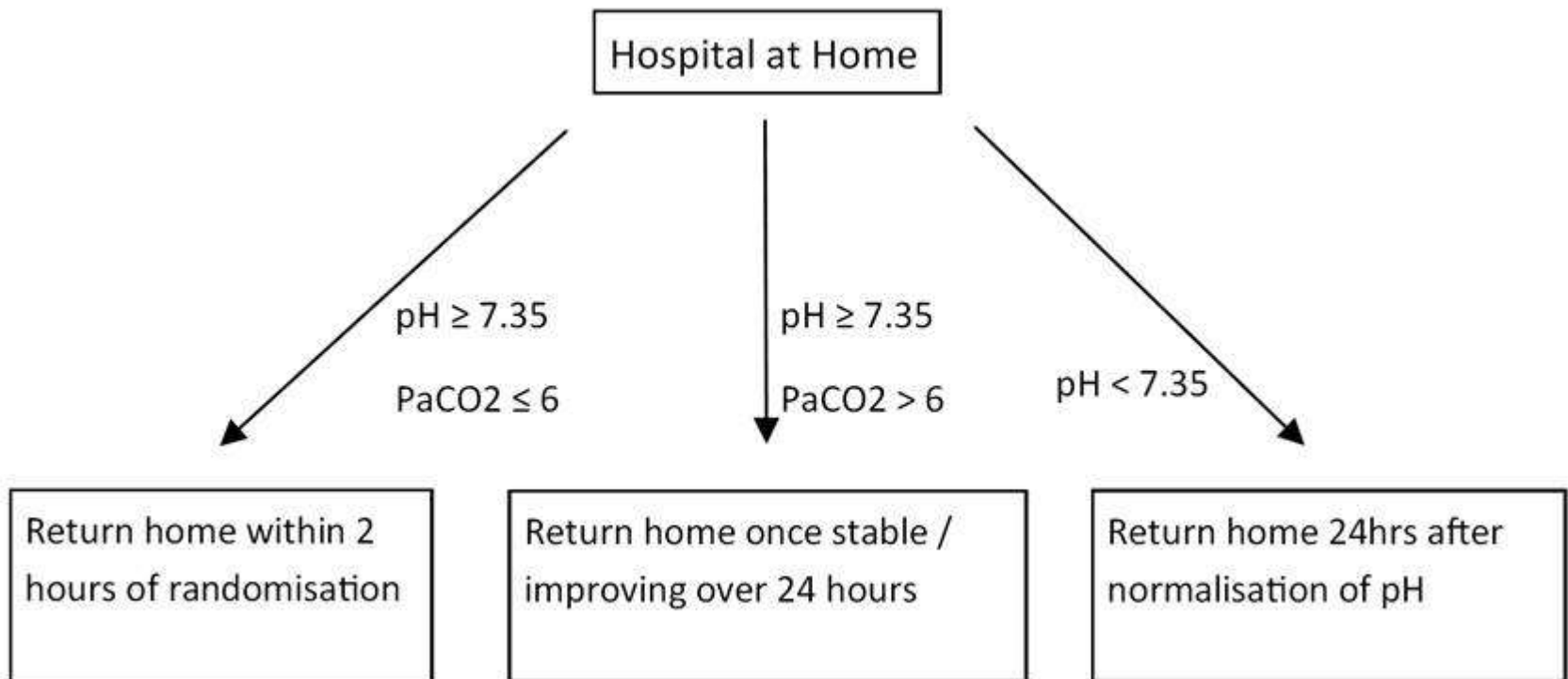
# RCT of Hospital at Home in ECOPD selected by low risk DECAF

Thorax 2018;73:713-722

<i>Inclusion criteria</i>	<i>Exclusion criteria</i>
Age $\geq 35$ years	Other illness likely to limit survival to $< 1$ year
Smoking history $\geq 10$ pack years	Long term ventilation
Obstructive spirometry	Co-existent secondary diagnosis which necessitates admission
Primary diagnosis of AECOPD	Acute confusion precluding discharge / Lack of ability to give informed consent
DECAF score 0 or 1	Assessment more than one overnight stay after admission

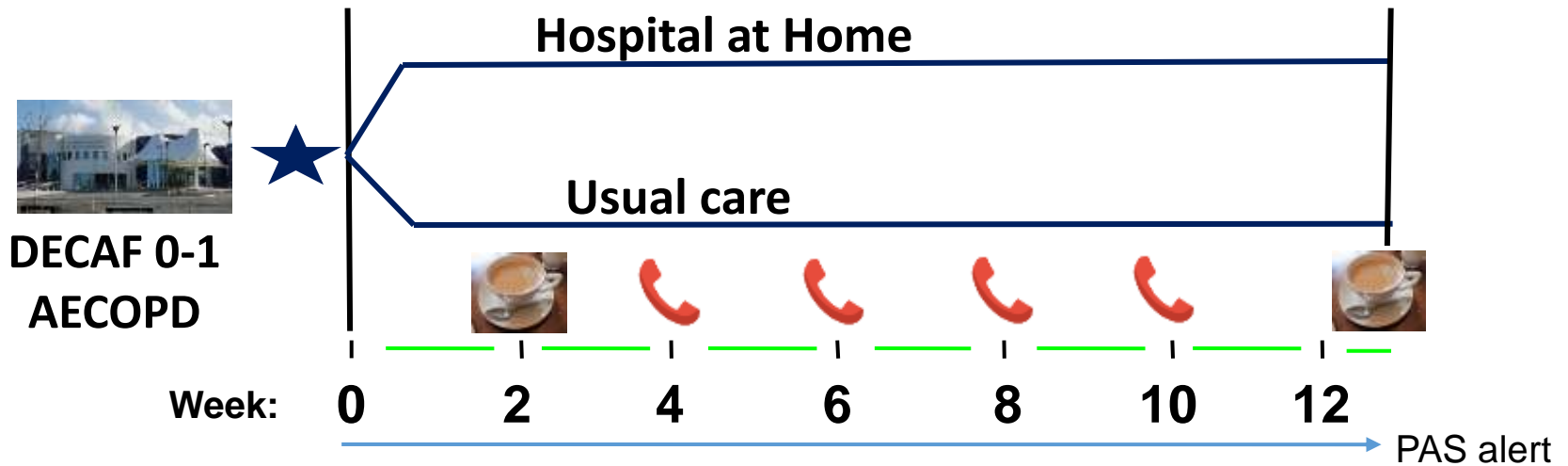
**“HoT DECAF”**: Primary Outcome: Total health and social care costs over 90 days

# Hospital at home arm management pathway





# HoT DECAF: study outline



= Baseline assessment, patient preference, EQ-5D-5L, HADS, CAT



= Home visit; resource use (health + social), EQ-5D-5L, HADS, CAT



= Resource use

# HoT DECAF: results

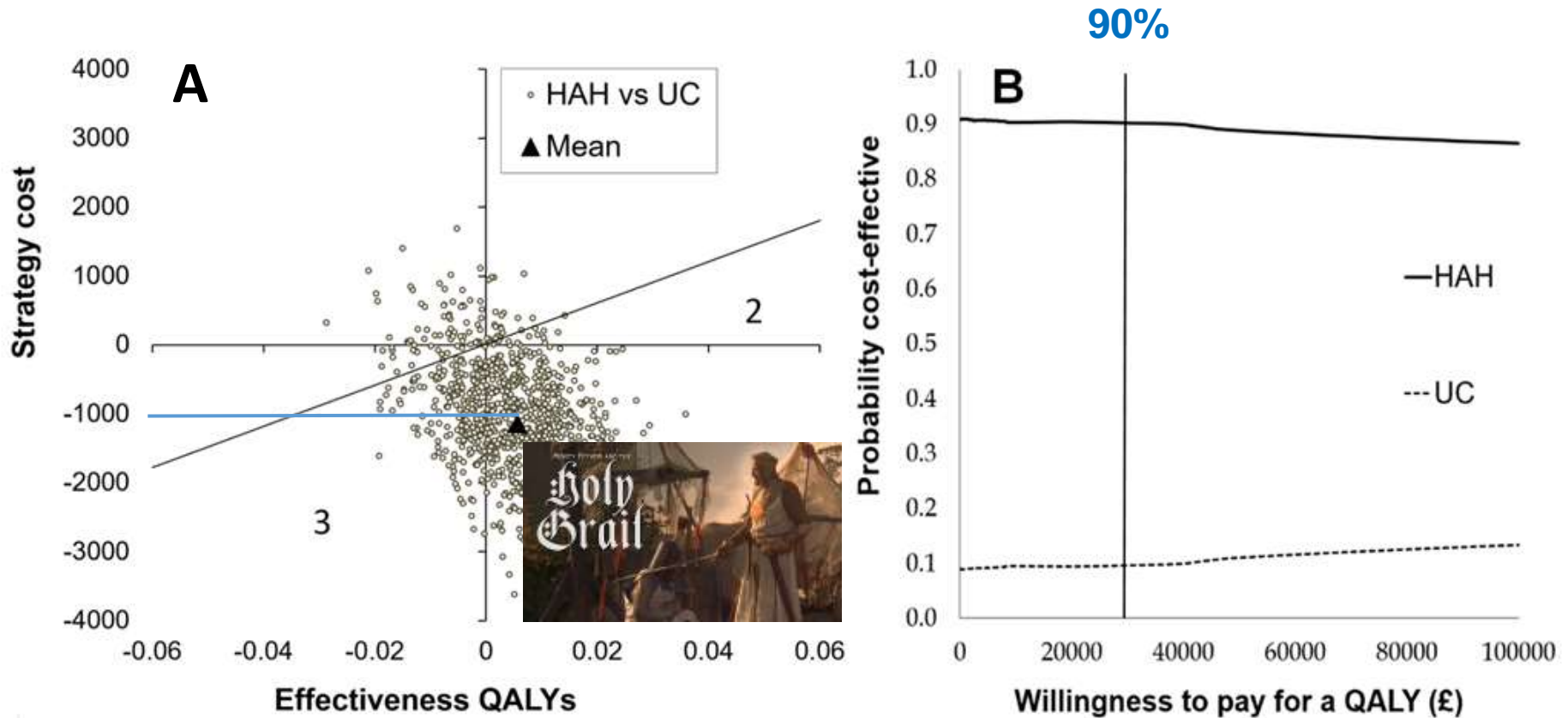
<b>Outcome</b>	<b>HAH</b> n= 60	<b>UC</b> n= 58
Bed days, 90 days n (IQR)	1 (1-7)*	5 (2-12)
Readmission	22 (36.7%)	23 (39.7%)
14 day mortality	0	0
90 day mortality	1 (1.6%)	1 (1.7%)
Preference <b>for HAH</b>	54/60	51/57

\*P=0.001, Mann-Whitney

**Echevarria Thorax 2018;73:713-722**

# HoT DECAF: cost effectiveness

Total health and social care costs over 90 days £1,016 lower per patient in H@H



# The best laid schemes o' mice an' men...

Robert Burns

- Delay in return home under hospital at home
  - DECAF 0-1 is safe
    - Derivation and validation studies (n=2,645)
    - Within hospital at home: no acute deaths
  - Human factors – new service
- Standard care arm – median LOS 3 days
  - Expected LOS ~ 5 days
  - Bias? Bed pressures and knowledge the patient is in the trial influencing “usual care” discharge?

# HoT DECAF: embedded qualitative study

Dismore BMJ Open 2019 doi:10.1136/ bmjopen-2018-026609

- **Positive drivers**

- Greater independence and freedom
- Maintain usual activities: perceived faster recovery
- Contact with family (esp grandchildren) and friends
- Better sleep “no bed like your own bed” and nutrition
- Specialist nurse: clear explanation, privacy, confidence, approachable
- Counter-intuitively, carers reported greater convenience, not greater burden

- **Potential barriers**

- Fear of being alone at night
- Dislike of “strangers” visiting their home

- **Negative influences**

- Less likely to smoke in hospital
- Formed new friendships in hospital

# Implementation

- Robust identification of eligible patients
- Education:
  - Clinicians: H@H selected by DECAF is safe
  - Patients and carers: reassurance, particularly those living alone
- Commissioners
  - Local tariff agreed (RightCare)
- Resource
  - The commissioned clinical service can support upto 4 patients within H@H

# NIHR Signal: top 2% research expected to change clinical practice



## **NIHR Signal** People with COPD exacerbations prefer early discharge then treatment at home



Published on 11 December 2018

doi: [10.3310/signal-000691](https://doi.org/10.3310/signal-000691)

People with flare-ups of COPD (chronic obstructive pulmonary disease) prefer to be managed at home rather than in hospital. Hospital stay was on average four days shorter when people were discharged early to the hospital at home scheme, and there was no noticeable increase in readmissions in this group.

This NIHR-funded trial aimed to establish the costs and outcomes of hospital at home compared with staying in hospital for treatment.

The findings support current guidance that hospital at home is suitable for selected patients and this study shows that the DECAF score is an effective way of selecting people, with a low risk of serious

### Expert commentary

“People who have an exacerbation or worsening of their chronic obstructive pulmonary disease (COPD) can be safely cared for in 'hospital at home' schemes or discharged from hospital more quickly if they are rated as low risk on a clinical scoring system called DECAF. Patients preferred to be cared for at home rather than being admitted to hospital and care was as safe as hospital and probably cheaper.

This means people with COPD who are assessed in emergency departments or admission units as being low risk can safely be discharged if a suitable home care service is available. There is a growing body of evidence in this area, and this trial adds weight to an integrated care approach that encourages care in the community wherever possible.

**Professor Sarah Purdy, Head of School, Bristol Medical School, University of Bristol**

The commentator declares no conflicting interests

# High risk DECAF 3+

**Table 5** Time to death in patients who died during the index admission and median length of stay in those who survived to discharge, by DECAF score

DECAF score	Median time to death, days (IQR)	Median length of stay, days (IQR)
0	N/A	3 (1–5)
1	4.5 (4–12.5)	4 (2–7)
2	9 (5–16)	5 (3–10)
3	10 (3.75–23.25)	7 (3–13)
4	5 (1–11)	7.5 (5–18)
5	2 (1–9)	10 (6–19.5)
6	2 (2–2)	22 (22–22)



- Place of care: specialist respiratory ward or higher level of care
  - Do not board!
  - Close monitoring
- Early optimisation and escalation of care
  - Empirical antibiotic choice – short time to death – broad spectrum with pseudomonal cover
- Consider if palliation more appropriate?



# Admission Avoidance

- DECAF 0-1 and no additional acute care need
- Proportion of admitted patients DECAF 0-1:
  - DECAF Derivation **53%**
  - DECAF Validation **45%**
  - Northumbria NACAP **37%**
  - National average NACAP **54%**
- Low hanging fruit
- Note not all require supported discharge - PEARL

# In every patient admitted with ECOPD:

DECAF Score		Circle
D	eMRCDD 5a (Too breathless to leave the house unassisted but independent in washing and/ or dressing)	1
	eMRCDD 5b (Too breathless to leave the house unassisted and requires help with washing and dressing)	2
E	Eosinopenia (eosinophils $< 0.05 \times 10^9/L$ )	1
C	Consolidation	1
A	Moderate or severe Acidaemia (pH $< 7.3$ )	1
F	Atrial Fibrillation (including history of paroxysmal AF)	1
Total:		

# ECOPD: selection for readmission avoidance services

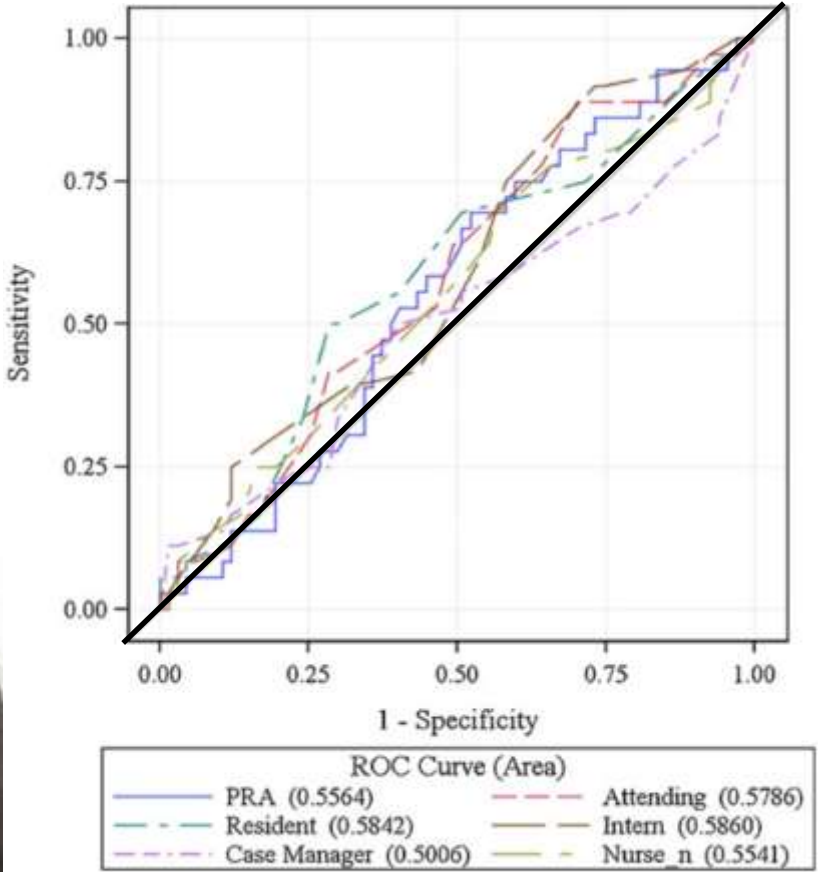
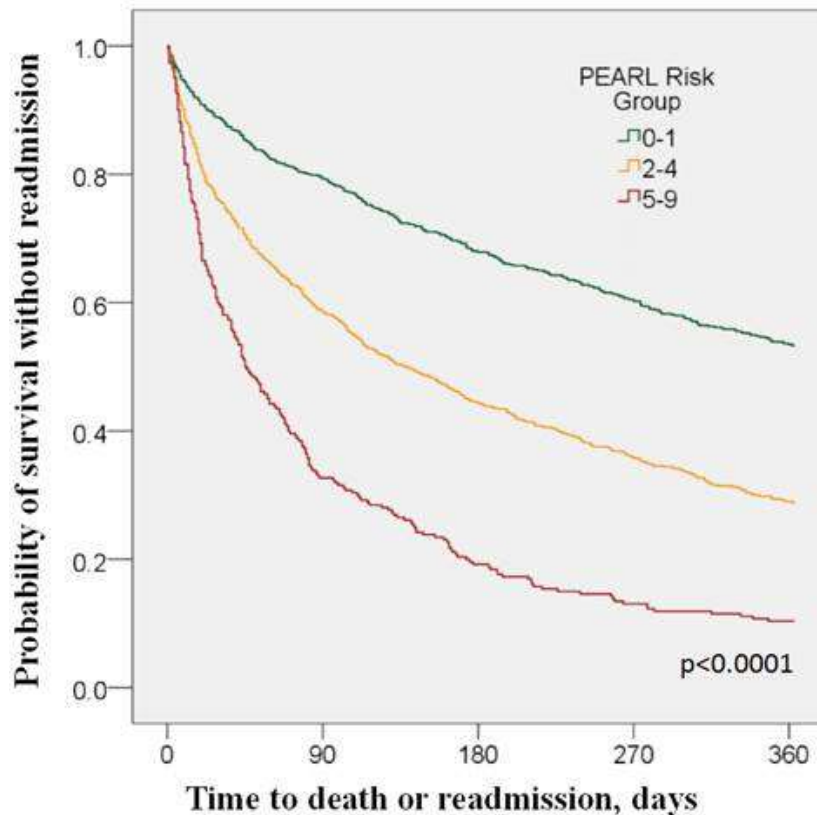


Figure. 2. ROC curves for readmission predictions.

# Risk of readmission or death post discharge

Thorax 2017;72:686-93

Previous admissions; EMRCd; Age; Right heart failure; Left heart failure.



# In every patient discharged with ECOPD:

PEARL Score		Circle
<i>Prediction of 90-day readmission or death risk</i>		
<b>P</b>	<b>Previous admissions (<math>\geq 2</math>)</b> <i>Admission to inpatient hospital ward. Do not count attendance at A&amp;E, Ambulatory Care or day-case units.</i>	<b>3</b>
<b>E</b>	<b>eMRCD 4</b> (Stops for breath after about 100m or after a few minutes on the level)	<b>1</b>
	<b>eMRCD 5a</b> (Too breathless to heave the house unassisted but independent in washing and/or dressing)	<b>2</b>
	<b>aMRCD 5b</b> (Too breathless to leave the house but requires help with washing AND dressing)	<b>3</b>
<b>A</b>	<b>Age (<math>\geq 80</math>)</b>	<b>1</b>
<b>R</b>	<b>Right sided heart failure</b> <i>Clinical diagnosis of <u>Cor Pulmonale</u> (with or without imaging)</i>	<b>1</b>
<b>L</b>	<b>Left sided heart failure</b> <i>Confirmed by cardiac imaging</i>	<b>1</b>
<b>Total PEARL Score</b>		
<b>90-day risk of readmission or death:</b> <b>PEARL 0-1 (low risk) = 20.7%; PEARL 2-4 (intermediate risk) = 42.1%; PEARL <math>\geq 5</math> (high risk) = 66.4%</b>		

We do have an awful lot of  
data.....

# National COPD Audits: oxygen provision and mortality

	2003	2008	2014
Mortality	7.7%	7.8%	4.3%
NIV	8.5%	11.4%	12%
PaO2	9.2	8.9	8.3
PaO2 > 13 kPa	19%	16%	8%

BTS Oxygen Guidelines

## Clinical practice (2014 National COPD Audit):

- Target sats **88-92% = 84%**; **94-98%= 8%**
- NEWS2 Scale 2 only if ABG shows hypercapnia:
  - If linked to target **88-92% = 34%** (4,541) **94-98% = 66%** (8.873)

# BTS Oxygen Guideline 2017 & NEWS 2

## **BTS Oxygen Guidelines**

- Set target sats 88-92% in most patients with COPD (or other condition at risk)
- Can revise target sats if ABG confirms normocapnia, no prior exacerbations requiring NIV or IMV and ABG repeated within 30-60 min

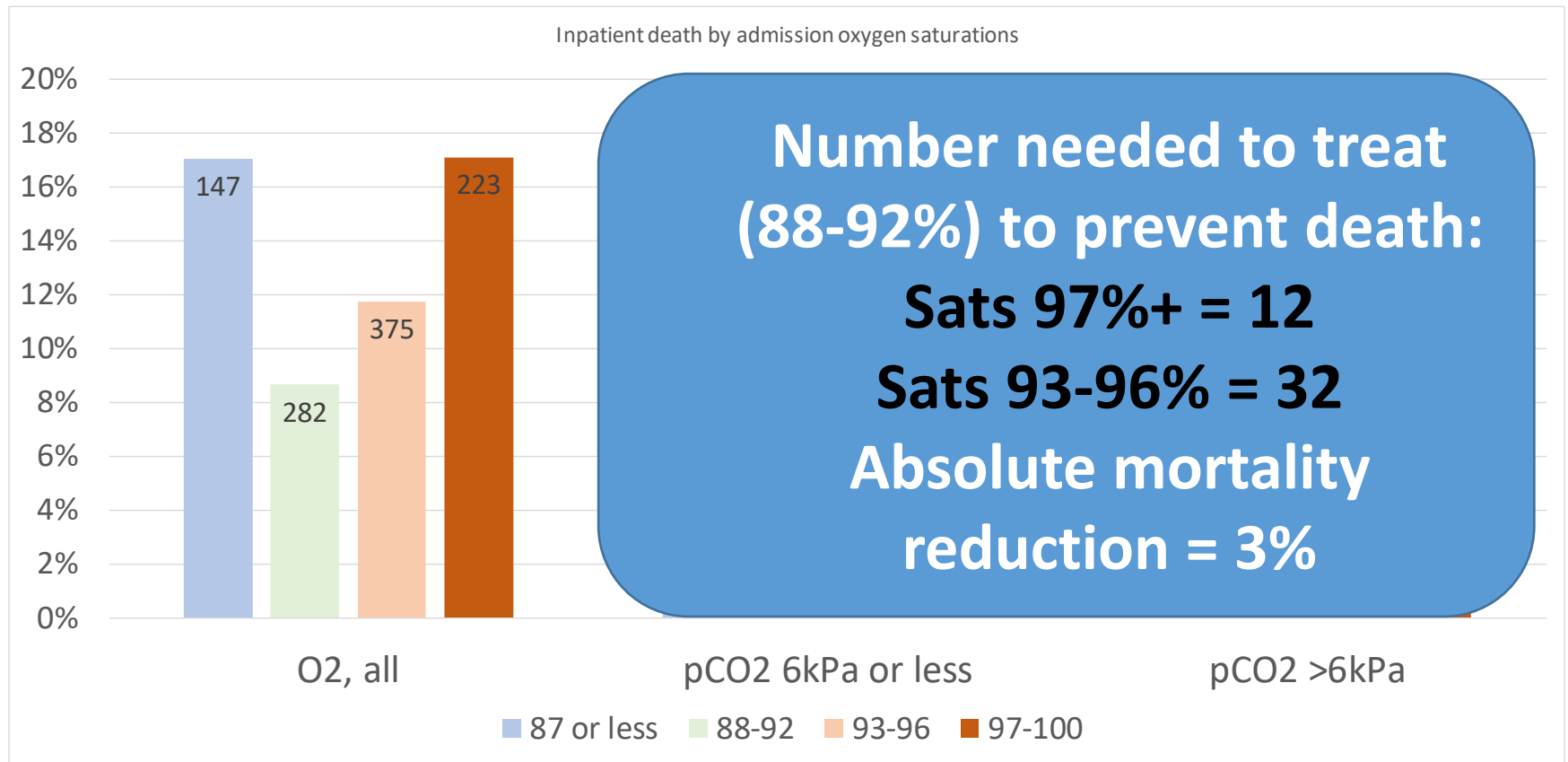
## **NEWS 2**

- Scale 2: do not score if sats 88-92% on oxygen
- Use scale 2 if:
  1. Hypercapnia confirmed by ABG (34% admissions ECOPD)
  2. Senior clinician approval



# Mortality risk by admission oxygen sats in patients with ECOPD receiving O2

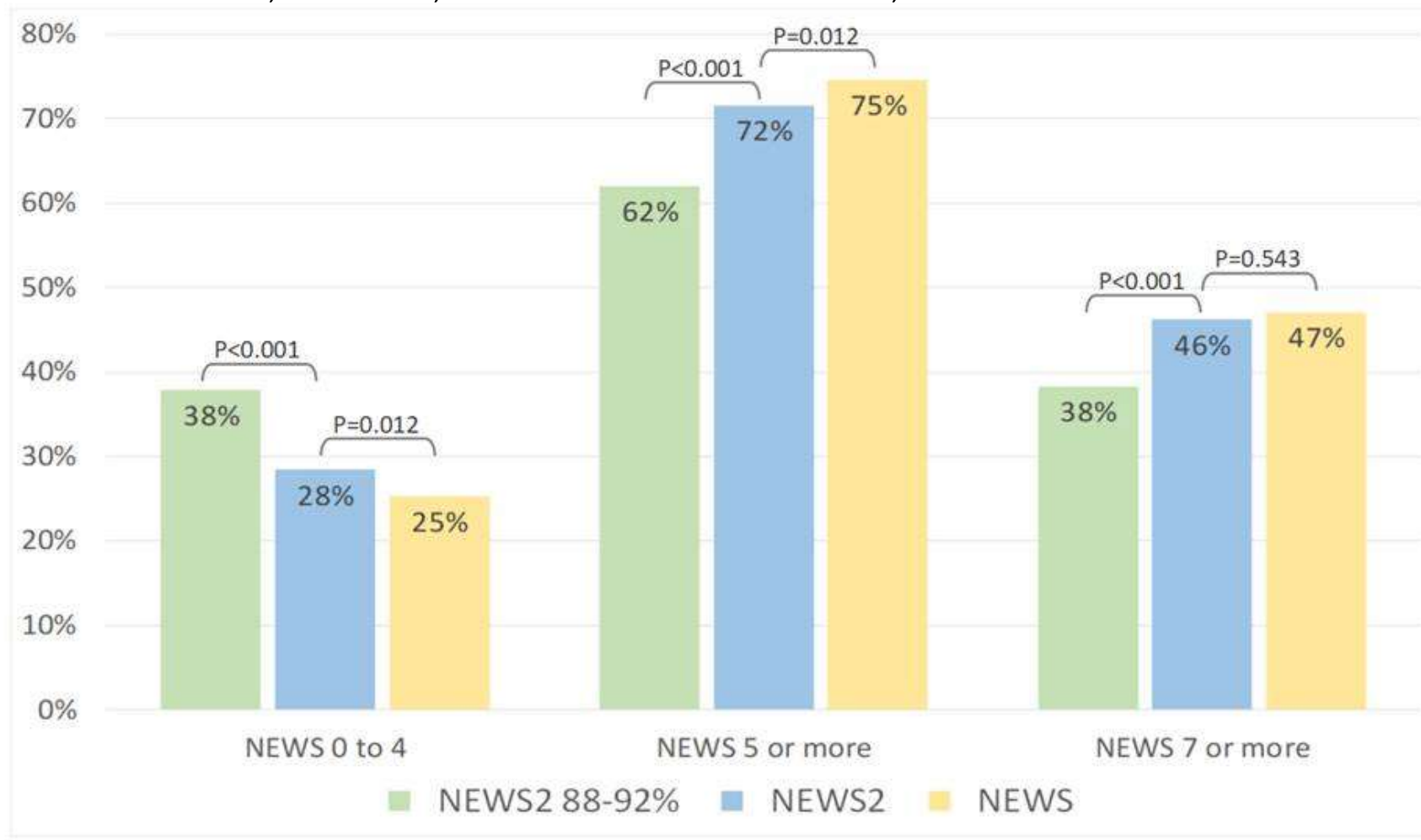
Echevarria Emerg Med J 2020



Physician and spirometry confirmed COPD. N = 1,027 across 6 UK hospitals.

# ~~Breaking NEWS~~: Comparison of early warning scores in patients with COPD exacerbation: DECAF and NEWS score

Echevarria CE, Steer AJ, Bourke SC. Thorax 2019;74:941-46



*Rest in peace*

**OXYGEN ALERT CARD**

Name: \_\_\_\_\_

I have a chronic respiratory condition and I am at risk of having a raised carbon dioxide level in my blood during flare-ups of my condition (exacerbations)

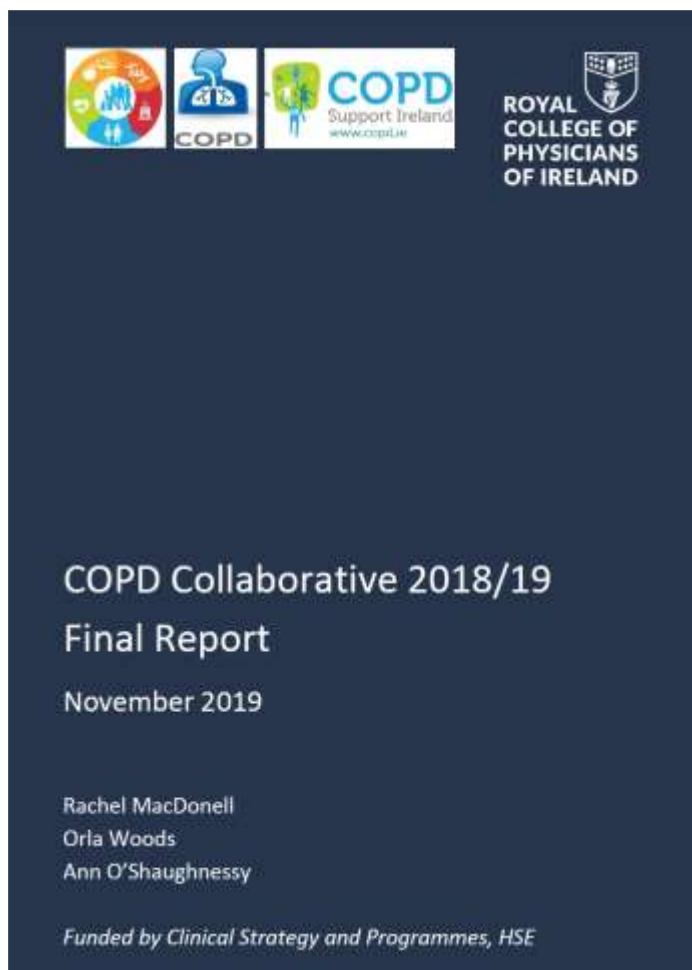
Please use my \_\_\_\_\_% Venturi mask to achieve an oxygen saturation of  
\_\_\_\_\_ % to \_\_\_\_\_ % during exacerbations of my condition

Use compressed air to drive nebulisers (with nasal oxygen a 2 l/min)  
If compressed air is not available, limit oxygen-driven nebulisers to 6 minutes

*2001 - 2018*

# Ireland: COPD QI

## 18 clinical teams across 19 hospitals



1. Access to respiratory specialist review
2. Compliance with admission clinical bundle
3. Use of standardised, evidence-based assessment (DECAF\*)
4. Compliance with discharge processes.

• Reduction in Length of Stay (6.75 days to 5.0 days)

↓ 1.75  
days



# Clinical risk stratification in ECOPD

- DECAF low risk:
  - Admission avoidance A/E – no additional care need
  - Hospital @ Home
  - Early discharge
- DECAF high risk:
  - Empirical antibiotic choice
  - Specialist respiratory ward +
  - Close monitoring
  - Palliative care
- PEARL
  - Selection for readmission avoidance schemes





# Next steps?

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