

# Transcutaneous ear probe oxygenation readings are significantly higher than finger probe oxygenation readings in CF adults

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## Introduction

- Accurate assessment of arterial oxygen saturations ( $SaO_2$ ) is vital in the optimal management of people with CF, particularly in those with severe lung disease
- Arterial blood gases (ABGs) accurately measure  $SaO_2$ , pH and partial pressure of oxygen ( $PaO_2$ ) and carbon dioxide ( $PaCO_2$ )<sup>1</sup> but are painful and repeated measurements can result in vascular complications. Earlobe arterialised capillary blood gases (CBGs) have therefore gained popularity as they provide accurate estimates of pH and  $PaCO_2$ , are relatively painless and the procedure requires less training
- CBGs have been shown to have good correlation with ABGs when estimating  $SaO_2$  in patients with chronic lung disease, with increased accuracy in hypoxic patients<sup>1</sup>
- Transcutaneous finger probe pulse oximetry to measure peripheral capillary oxygen saturations ( $SpO_2$ ) is routinely used to estimate  $SaO_2$ , although the results are known to be less accurate than ABGs. 'Hands free' transcutaneous ear probe pulse oximetry can enable more convenient assessment of  $SpO_2$

## Aim

- The aim of this pilot study was to compare simultaneous assessments of  $SaO_2$  by earlobe CBG or radial ABG, finger probe and ear probe  $SpO_2$  in adults with CF and normal controls

## Methods

- In this pilot, prospective, observational study, we recorded patient demographics and spirometry and performed simultaneous earlobe CBG or radial ABG, finger probe and ear probe  $SpO_2$  in adults with CF and normal controls. Finger probe and ear probe  $SpO_2$  were recorded by the same oximeter (PalmSAT(r) 2500 series by Nonin Medical Inc.) using the appropriate ear and finger sensors

## Results

- 21 sets of observations (19/21 CBGs) were recorded in 14 patients (6 male, mean age 29 yrs, mean  $FEV_1$  30% predicted)
- 8/21 observations were taken with patients breathing room air and 13/21 with supplemental oxygen (mean 3.1 L/min)
- 3 sets of observations (3/3 CBGs) were performed in 3 normal controls (1 male, mean age 31 yrs)
- In patients, ear probe  $SpO_2$  was significantly higher than finger probe  $SpO_2$  (\* $p < 0.001$ ) and finger probe  $SpO_2$  was significantly lower than  $SaO_2$  ( $^{\wedge}p = 0.01$ ). See Table and Graph for full results

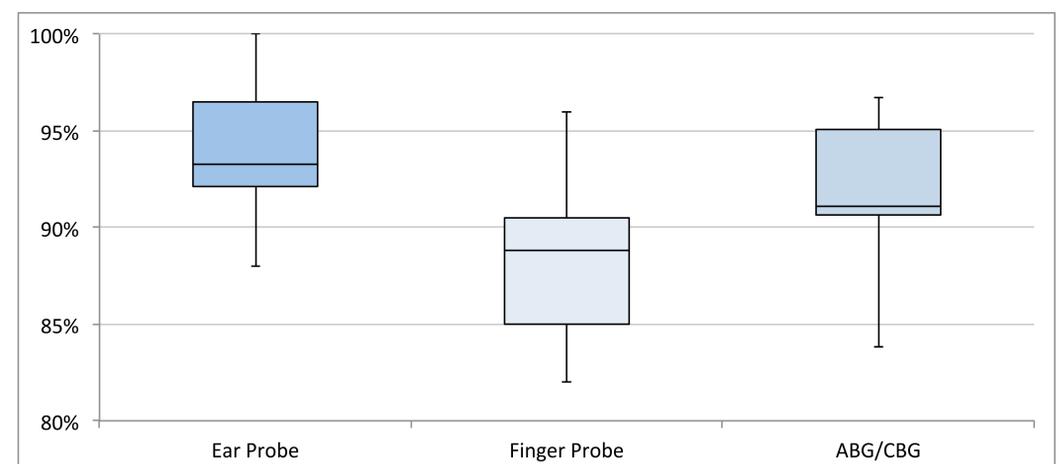
## References

1. British Thoracic Society (2015) BTS Guidelines for home oxygen use in adults. Thorax.70 pp i1- i43

## Table of Results

	Mean Ear Probe	Mean Finger Probe	Mean ABG/CBG				
	$SpO_2$ (%)	$SpO_2$ (%)	$SaO_2$ (%)	$PaO_2$ (kPa)	pH	$PaCO_2$ (kPa)	$HCO_3$ (kPa)
Patients (n=21)	94.0*	89.0 <sup>^</sup>	92	8.14	7.42	7.35	32
Controls (n=3)	100	98	98.1	12.9	7.42	5.4	26.5

## Patient Ear probe and Finger probe $SpO_2$ and ABG/CBG $SaO_2$ (n=21)



- In patients,  $SpO_2$  was  $<88\%$  more frequently on finger probe than on ear probe pulse oximetry (7 patients vs. 0 patients)
- In patients,  $SpO_2$  was  $<88\%$  more frequently on finger probe pulse oximetry than  $SaO_2$  was  $<88\%$  on ABG/CBG (7 patients vs. 2 patients)

## Conclusions

- These results suggest that;
  - Estimates of arterial oxygenation via ear probe pulse oximetry are significantly higher than finger probe
  - Finger probe pulse oximetry significantly under-estimates arterial oxygenation compared to CBG/ABGs. This finding is particularly clinically relevant in patients with or at risk of Type 2 respiratory failure, in whom over- oxygenation is potentially harmful
- These findings demonstrate the potential for inappropriately administering or withholding oxygen when basing clinical decisions on finger probe or ear probe  $SpO_2$  results and highlights the need for further investigation into the best way to achieve safe and accurate assessment of arterial oxygen saturations in CF adults in the future