Commercial air travel causes an increase in pulmonary artery pressure that can be clinically significant

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I have no financial relationships to disclose

I will not discuss off-label use and/or investigational use in my presentation
Stresses of flight

• Barometric pressure and hypoxia
• Immobility
• Jet lag
• Vibration
• Noise
• Humidity
• Radiation
• Airport tumult
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Haemoglobin Saturation (%) vs. Partial Pressure of Oxygen (mmHg)
Sea level

Haemoglobin Saturation (%) vs. Partial Pressure of Oxygen (mmHg)
Does mild cabin hypoxia matter?
Physiological effects of aviation hypoxia

↑ ventilation (ventilatory acclimatisation to hypoxia)

↑ erythropoietin secretion

Effects on vision and neurocognitive function
   Petrassi FA et al. *Aviat Space Environ Med* 2012 (review)
What about hypoxic pulmonary vasoconstriction?
In animal models, significant vasoconstriction has been shown to begin at a PaO$_2$ of 70 mmHg (9.3 kPa) ... this would correspond to the expected PaO$_2$ (in an aircraft cabin).

Species differences do exist, and it is not known whether significant hypoxic vasoconstriction begins in the human at the same altitude.
Can Patients with Pulmonary Hypertension Travel to High Altitude?

Andrew M. Luks

Avoid travel to > 2000 m if baseline mPAP ≥ 35 mmHg or sPAP ≥ 50
(or use supplementary oxygen)
Case Reports: In-flight cor pulmonale

Hazards of air travel for the obese: Miss Pickwick and the Boeing 747. 
Toff NJ. J R Coll Physicians Lond 1993

Cor pulmonale presenting in a patient with congenital kyphoscoliosis following intercontinental air travel. 
Noble JS, Davidson JA. Anaesthesia 1999
London to Denver
\[ \Delta P_{\text{max}} = RVP - RAP \]

Systolic pulmonary artery pressure (SPAP)

Right atrial pressure (RAP)
London-Denver

Healthy passengers

n = 8

Mean in-flight $\text{SpO}_2$ 95%
London-Denver

![Graph showing altitude and time since takeoff for the London-Denver flight.](image-url)

Smith et al. Aviat Space Environ Med 2012
London to Dubai

Boeing 777

Emirates
London-Denver

Altitude (ft)

Systolic Pulmonary Artery Pressure (mmHg)

Time since takeoff (hours)

Smith et al. Aviat Space Environ Med 2012
London-Denver

London-Dubai

n = 1
Lowest SpO$_2$ 96%
Fall in P$_{ET}$CO$_2$ 34 → 31 mmHg
Conclusions
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Air travel stimulates the pulmonary circulation
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In a susceptible passenger, pulmonary artery pressure can rapidly increase into the pulmonary hypertensive range, even during a medium-haul flight with a relatively low cabin altitude
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A high altitude simulation test with echocardiography (HAST-echo) may be helpful in assessing certain patients
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In a susceptible passenger, pulmonary artery pressure can rapidly increase into the pulmonary hypertensive range, even during a medium-haul flight with a relatively low cabin altitude

A high altitude simulation test with echocardiography (HAST-echo) may be helpful in assessing certain patients

Further research is needed to explore the implications of these findings for patients with cardiopulmonary disease
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