

Predicting the
Safety of **A**ir **T**ravel: a **S**tudy in
recent neonatal nursery graduates.
The SATS Study.

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Air travel

- Commercial aircraft cruise at 9,000-13,000m
- As altitude increases, barometric pressure decreases exponentially.
- Without pressurisation of aircraft, insufficient O_2 to support life at high altitudes.
- Aircraft pressurised to 2,400m.
 - Equivalent to FiO_2 14-15%.
 - SPO_2 likely to fall to 85-91%.

Effects of altitude

- Low-O₂ environment not thought to be detrimental to healthy adults & children.
- Ex-preterm infants are at increased risk of hypoxia:
 - Apnoeic/ hypoventilation response to hypoxia
 - Labile pulmonary vasculature
 - Increased airway reactivity
 - Foetal Hb

Infants and air travel

- BTS guidelines¹ recommend:
 - Term infants: not fly <1 week of age
 - Ex-preterm infants with history of nLD: undergo 20-minute pre-flight Hypoxia Challenge Test (HCT.)
- Assumes that breathing hypoxic gas mixture (14% O₂) at sea level (normobaric hypoxia) equates to hypobaric hypoxia of altitude.
- Failed test: SPO₂ falls below 85% (or 90%); considered to need in-flight O₂.

• ¹British Thoracic Society recommendations. Thorax 2002;57:0-15

Western Australia

0 100 200 300 400 500 km



AIMS

- Prospective observational study
 - Describe effects of air travel on ex-preterm infants at near term corrected age.
 - Determine accuracy of HCT in predicting in-flight hypoxia.

METHODS

- Inclusion criteria:
 - ex-preterm (<35 completed weeks)
 - requiring air transfer to regional hospital at or near term corrected age.
- Exclusion criteria:
 - Cyanotic CHD
 - Down Syndrome

METHODS

- HCT performed prior to transfer.
- $\text{SPO}_2 < 85\%$: “*fly with O₂.*”
- Remainder: “*safe to fly.*”

- Nurse escort blinded to test result.
- During flight, if $\text{sats} < 85\%$ - commenced O₂.

RESULTS

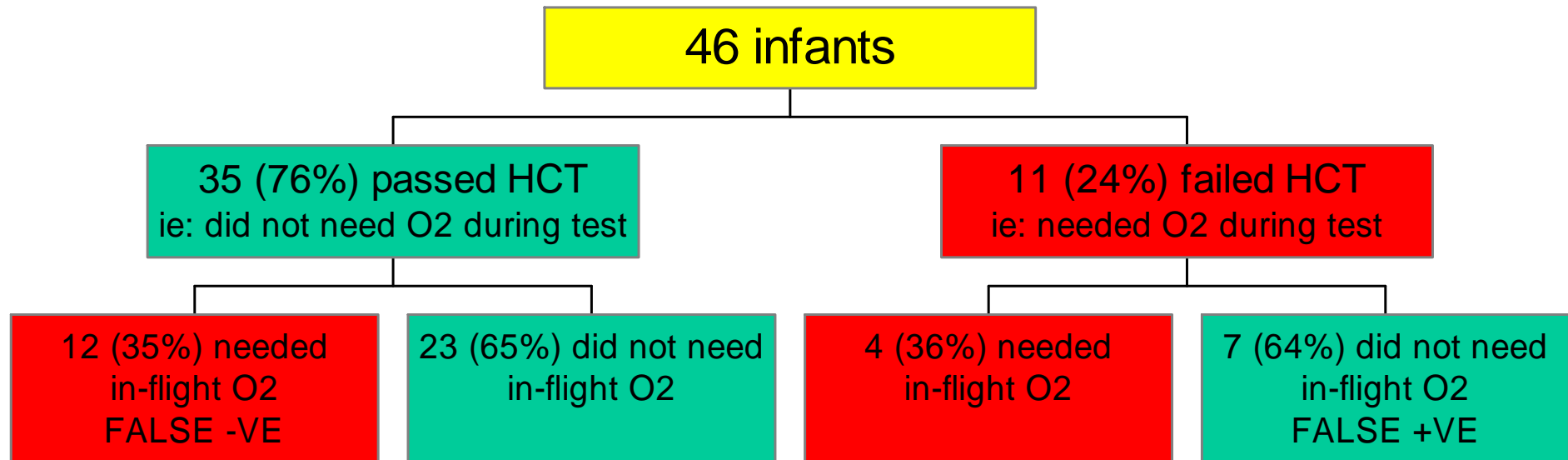
- 46 infants
 - 14 male, 32 female
 - GA: 32.2 weeks (range 24-35.6)
 - BW: 1667g (range 655-2815g)
- 19 (31%) had no respiratory disease
- 27 (59%) with history lung disease

RESULTS

- HCT at CGA 35.8 (33.1 - 43) weeks
- Flight distance: 593 (417-2174) km
- Flight duration: 62.5 (45-150) minutes
- 46 infants
 - 30 flew safely, without O₂
 - 16 (34.7%) needed O₂ in-flight; 5: no nLD.
 - 9 clinically distressed
 - O₂ administered at 20 (9-60) minutes
 - O₂ flow rate: 125 (32.5-500) ml/min

HCT RESULT

(SPO₂<85% =fail)



Accuracy: 58.6%

Sensitivity: 25%

Specificity: 76.6%

PPV: 36.4%

NPV: 65.7%

Comparative demographics

	<i>No in-flight O2</i> <i>n=30</i> <i>Median (range)</i>	<i>In-flight O2</i> <i>n=16</i> <i>Median (range)</i>	<i>p value</i>
<i>GA (weeks)</i>	33.2 (26.4-35.6)	31.3 (24-34.6)	0.066
<i>BW (grams)</i>	1647 (945-2815)	1695 (655-2500)	0.747
<i>Sex (M:F)</i>	10:20	10:6	0.057
<i>CGA at time of HCT (weeks)</i>	36.5 (33.4-38.4)	35.2 (33.1-43)	0.116
<i>Flight Distance (km)</i>	511 (417-2174)	593 (417-2174)	0.131
<i>Flight duration (minutes)</i>	65 (45-150)	60 (45-150)	0.264

Comparative demographics

	<i>No in-flight O2</i> <i>n=30</i> <i>Median (range)</i>	<i>In-flight O2</i> <i>n=16</i> <i>Median (range)</i>	<i>p value</i>
<i>Duration CPAP (hours)</i>	0 (0-686)	70.5 (0-747)	0.04
<i>Duration IPPV (hours)</i>	0 (0-68)	13.3 (0-1234)	0.004
<i>Duration O2 (hours)</i>	0 (0-308)	8 (0-2362)	0.028
<i>Room-air SPO2</i>	98.5 (1.3)	97.9 (1.14)	0.07
<i>Time off O2 (days)</i>	33 (6-61)	19 (7-33)	0.047
<i>Time off resp support (days)</i>	24 (6-57)	21 (7-52)	0.815

DISCUSSION

- Ex-preterm infants with history of nLD more likely to be susceptible to effects of in-flight hypoxia.
- More than 1/3 who needed in-flight O₂ had no nLD, no O₂ therapy, no resp support.
- HCT did not accurately predict need for in-flight O₂.

DISCUSSION

- Limitations with HCT:
 - Not true simulation of flight
 - Not pressurised
 - Only expected FiO_2 simulated
 - Graded fall in FiO_2 doesn't occur during HCT
- HCT could be improved:
 - ? Longer duration
 - ? Graded fall in FiO_2
 - ? hypobaric chamber
 - ? Change cutoff to $<90\%$ as a failed test

CONCLUSIONS

- 1. Ex-preterm infants at risk of in-flight hypoxia despite appearing healthy, with no ongoing O₂ requirement.
- 2. The HCT is not accurate in predicting those at risk of hypoxia.
- 3. Demographic data are of limited clinical significance in predicting who is safe to fly.

CONCLUSIONS

- Implications for air transfer:
 - COST vs SAFETY
- Safest practice might be to transfer all ex-preterms with available O₂.

Thank You

- Parents & infants
- Nursing staff, NCCU, King Edward Memorial Hospital
- Sandy Anderson
- Dr Mary Sharp
- Women's & Infant's Research Foundation