



How to do Calculations

ARTP – Practitioner Examination

Example

Based upon the information interpret the results based upon guidelines

Number 12

Height 1.75 m

Weight 45 kg

Age 35 yrs

Sex Male

	Units	Measure	Normal range						Post Bronchodilator	
			Low	Mean	High	SR	% Mean	Value	% Improv	

Spirometry

FEV1	L	2.20	3.18	4.02	4.86	-3.6	55	2.25	2
FVC	L	2.40	3.83	4.83	5.83	-4.0	50	2.76	15
FEV1/FVC	%	91.7	69.2	80.9	92.7	1.5	113	81.5	-11
PEF	L/s	8.91	7.41	9.39	11.37	-0.4	95	8.85	-1

Lung Volumes

FRC	L	1.67	2.34	3.32	4.30	-2.8	50
RV	L	1.11	1.16	1.83	2.50	-1.8	61
TLC	L	3.56	5.75	6.90	8.05	-4.8	52
RV/TLC	%	31.2	18.7	27.6	36.6	0.7	113
VC	L	2.45	3.83	4.83	5.83	-3.9	51

Transfer Factor

Tlco	mmol/min	5.76	8.79	11.10	13.41	-3.8	52
Kco	mmol/min	1.69		1.61			105
VA	L	3.41					

Interpretation

ECCS regression Equation

VARIABLE	UNITS	REGRESSION EQUATION	RSD
MALE			
FVC	L	5.76H - 0.026A - 4.34	0.61
FEV1	L	4.30H - 0.029A - 2.49	0.51
FEV1/FVC	%	- 0.180A + 87.21	7.17
PEF	L/S	6.14H - 0.043A + 0.15	1.21
FRC	L	2.34H + 0.009A - 1.09	0.60
RV	L	1.31H + 0.022A - 1.23	0.41
TLC	L	7.99H - 7.08	0.70
RV/TLC	%	0.39A + 13.96	5.46
Tlco	mmol/min/kPa	11.11H - 0.066A - 6.03	1.41
Kco	mmol/min/kPa/L	pred Tlco/pred TLC	
FEMALE			
FVC	L	4.43H - 0.026A - 2.89	0.43
FEV1	L	3.95H - 0.025A - 2.60	0.38
FEV1/FVC	%	- 0.19A + 89.10	6.51
PEF	L/S	5.50H - 0.030A - 1.11	0.90
FRC	L	2.24H + 0.001A - 1.00	0.50
RV	L	1.81H + 0.016A - 2.00	0.35
TLC	L	6.60H - 5.79	0.60
RV/TLC	%	0.34A + 18.96	5.83
Tlco	mmol/min/kPa	8.18H - 0.049A - 2.74	1.17
Kco	mmol/min/kPa/L	pred Tlco/pred TLC	

Transfer Factor

BTPS	1.091l			
V _{in}	2.3l			
t	10.5s			
CO _{in}	0.300%	Co _{ex}	0.099%	
He _{in}	14.10%	He _{ex}	9.97%	
V _D	0.2l			

$$Tlco = 53.6 * \frac{(V_A)}{(t)} * \log_{10} \frac{(CO_{in} * He_{ex})}{(CO_{ex} * He_{in})}$$

$$V_A(eff) = (V_{in} - V_D) * [He_{in} / (He_{ex} * 0.95)] * BTPS$$

% (e.g. FEV₁/FVC)

- FEV₁ = 2.20 l
- FVC = 2.40 l
- FEV₁/FVC = (2.2/2.4) * 100
- = 0.917 * 100
- = 91.7%

% Mean (e.g. PEF)

- Mean = 9.39
- PEF = 8.91
- % Mean = $(\text{PEF}/\text{Mean}) * 100$
- = $(8.91/9.39) * 100$
- = $0.949 * 100$
- = 94.9 %

% Improvement (e.g. FVC)

- % Imp = $100 * ((\text{post-pre})/\text{pre})$
- = $100 * ((2.76-2.40)/2.40)$
- = $100 * (0.36/2.40)$
- = $100 * 0.15$
- % Imp = 15 %

Mean (predicted) e.g. TLC

- Mean = $(7.99 * \text{Ht(m)}) - 7.08$
- = $(7.99 * 1.75) - 7.08$
- = $13.98 - 7.08$
- Mean = 6.90 L

Range (LLN & ULN) e.g. FRC

$$\begin{aligned}\text{Range} &= \text{Mean} \pm 1.64 * \text{RSD} \\ &= 3.32 \pm (1.64 * 0.60) \\ &= 3.32 \pm 0.984 \\ &= (3.32-0.984) - (3.32+0.984)\end{aligned}$$

$$\text{Range} = \underline{2.34 - 4.30 \text{ L}}$$

SR (z-score) e.g. VC

- $SR = (VC - \text{Mean}) / RSD$
- $= (2.45 - 4.83) / 0.61$
- $= -2.38 / 0.61$
- $SR = \underline{-3.90}$

$$V_A$$

- $V_A = (V_{in} - V_D) * (H_{e_{in}} / (H_{e_{ex}} * .95)) * BTPS$
- $= (2.3 - 0.2) * (14.1 / (9.97 * .95)) * 1.091$
- $= 2.1 * (14.1 / 9.47) * 1.091$
- $= 2.1 * 1.49 * 1.091$
- $V_A = \underline{3.41 \text{ L}}$

T_{Lco}

- $T_{lco} = 53.6 * (V_A/t) * \log((CO_{in} * He_{ex}) / (CO_{ex} * He_{in}))$
- $= 53.6 * (3.41/10.5) * \log((0.300 * 9.97) / (.099 * 14.10))$
- $= 53.6 * (0.325) * \log(2.99/1.396)$
- $= 53.6 * 0.325 * \log(2.14)$
- $= 53.6 * 0.325 * 0.33$
- $T_{lco} = \underline{5.75 \text{ mmol/min/kPa}}$

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Kco

- $K_{co} = Tl_{co} / V_A$
- $= 5.75 / 3.41$
- $K_{co} = \underline{1.69 \text{ mmol/min/kPa/L}}$