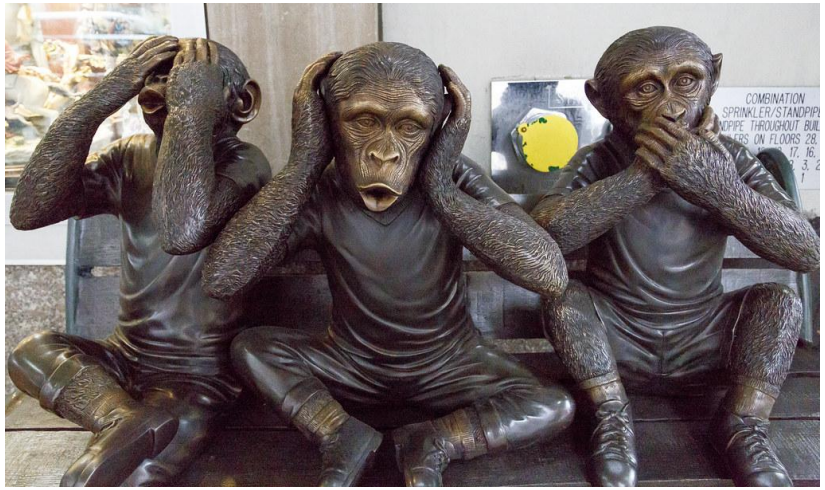
ATS/ERS Updates

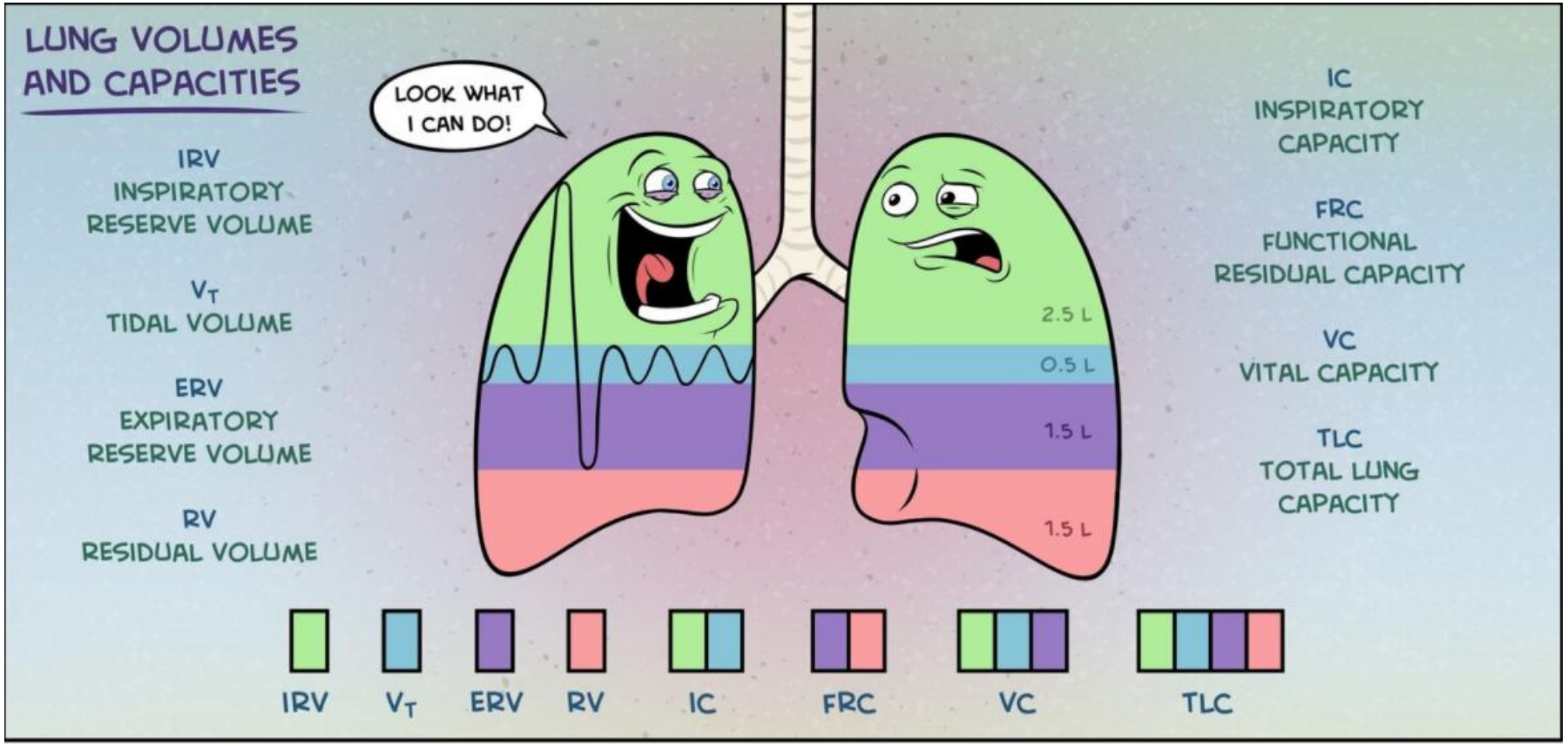
JOSÉ RAMOS, ME-D, RRT, RPFT

Disclosures

I have no financial relationships to disclose



Volumes and Capacities



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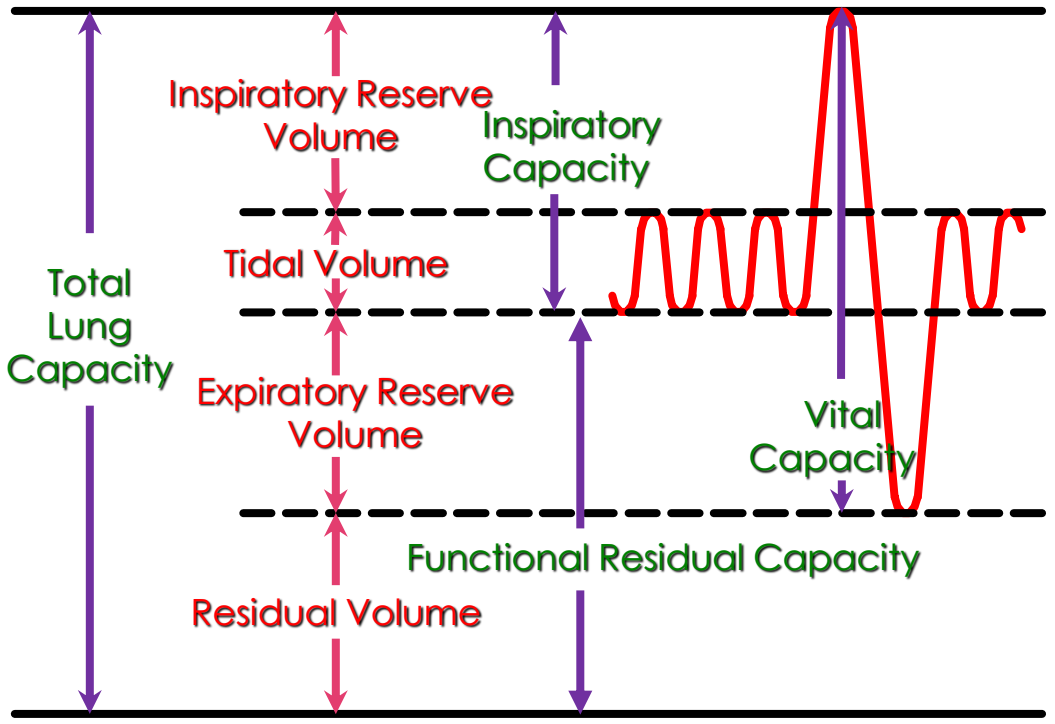

Spirometry Guideline Updates

- Equipment and Calibration
  - ISO 26782 Compliance (since 2009)
  - Daily Calibration Requirements
  - Allow for Inspiratory and Expiratory
- Testing Procedure
  - FET
  - EOFE
  - Inspiratory Maneuver Inclusion

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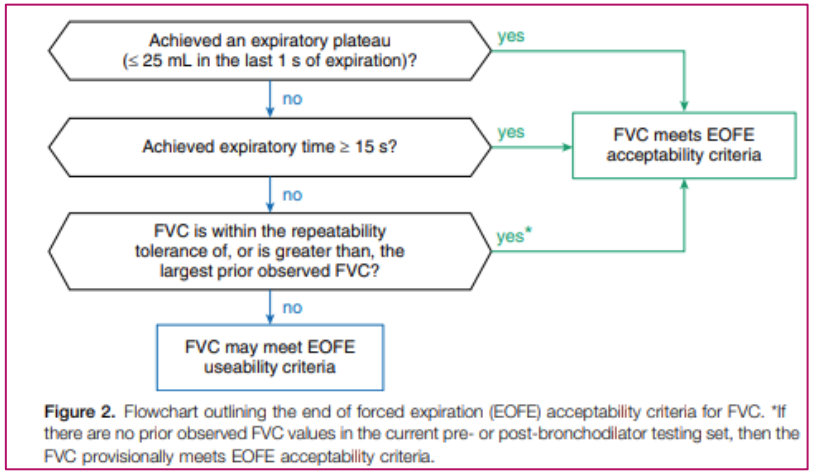

Figure 2. Flowchart outlining the end of forced expiration (EOFE) acceptability criteria for FVC. *If there are no prior observed FVC values in the current pre- or post-bronchodilator testing set, then the FVC provisionally meets EOFE acceptability criteria.

Graham BL, Steenbruggen I, Miller MR, Barjaktarevic IZ, Cooper BG, Hall GL, Hallstrand TS, Kaminsky DA, McCarthy K, McCormack MC, Oropez CE, Rosenfeld M, Stanojevic S, Swanney MP, Thompson BR. Standardization of Spirometry – 2019 Update: An Official American Thoracic Society and European Respiratory Society Technical Statement. Am J Respir Crit Care Med

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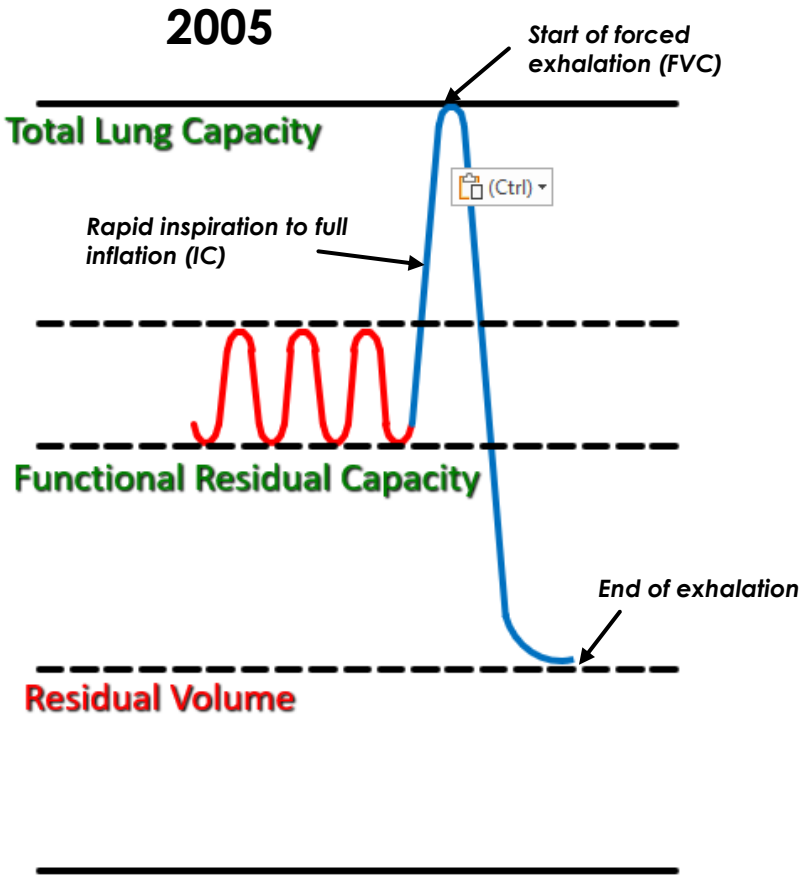

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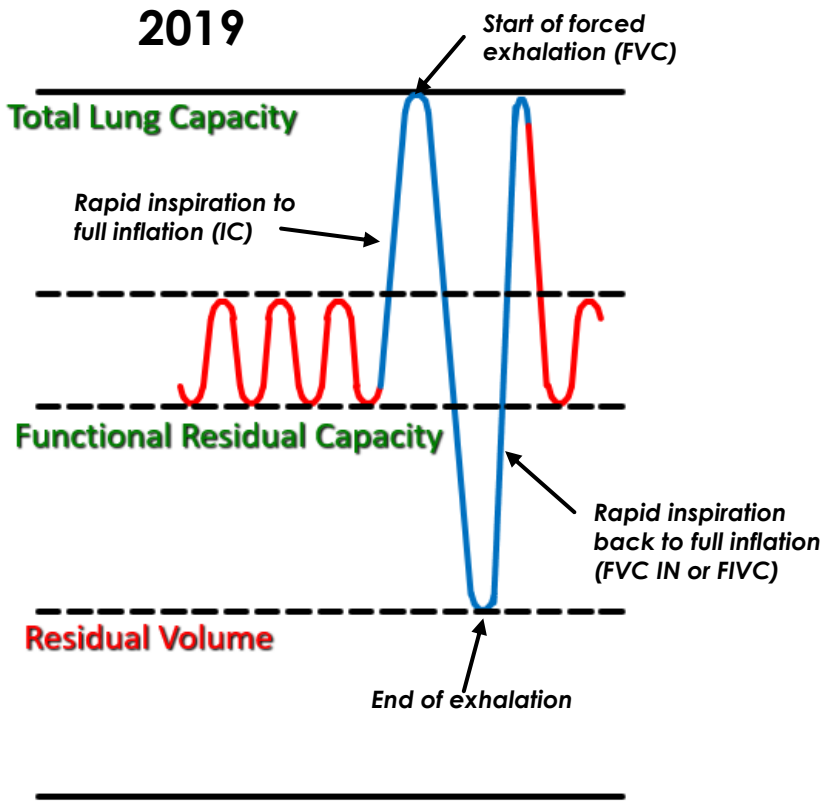

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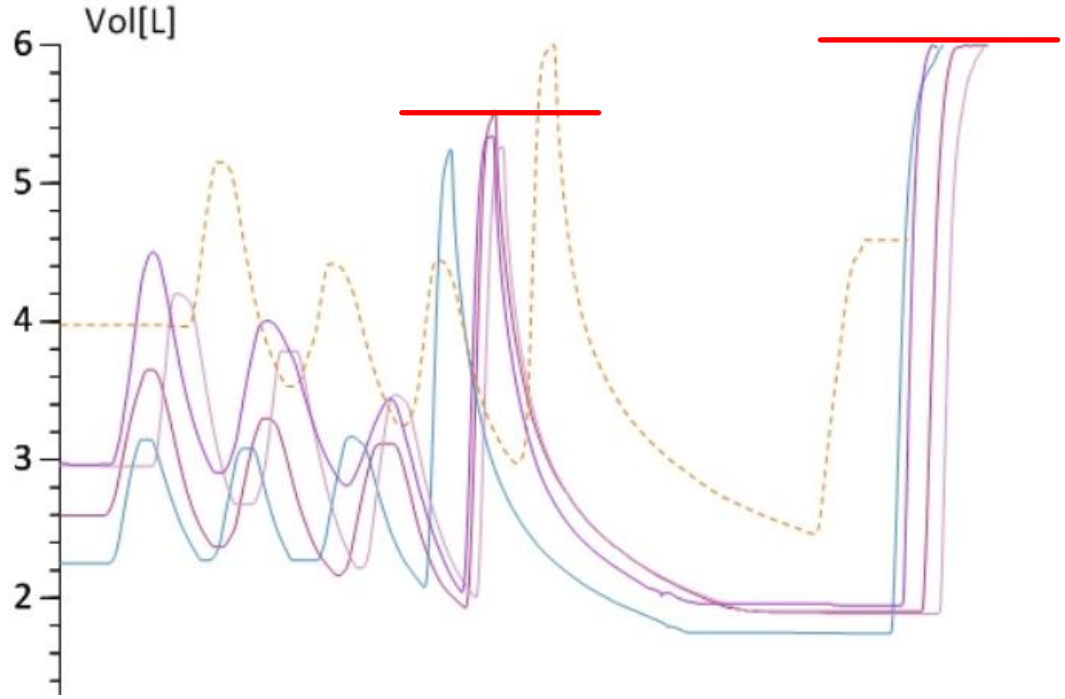

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  - **Grading System**
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  - Contraindications
  - Pre-test restrictions
  - Sex at Birth

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Table 10. Grading System for FEV_1 and FVC (Graded Separately)

Grade	Number of Measurements	Repeatability: Age >6 yr	Repeatability: Age ≤6 yr*
A	≥3 acceptable	Within 0.150 L	Within 0.100 L*
B	2 acceptable	Within 0.150 L	Within 0.100 L*
C	≥2 acceptable	Within 0.200 L	Within 0.150 L*
D	≥2 acceptable	Within 0.250 L	Within 0.200 L*
E	≥2 acceptable	>0.250 L	>0.200 L*
	OR 1 acceptable	N/A	N/A
U	0 acceptable AND ≥1 usable	N/A	N/A
F	0 acceptable and 0 usable	N/A	N/A

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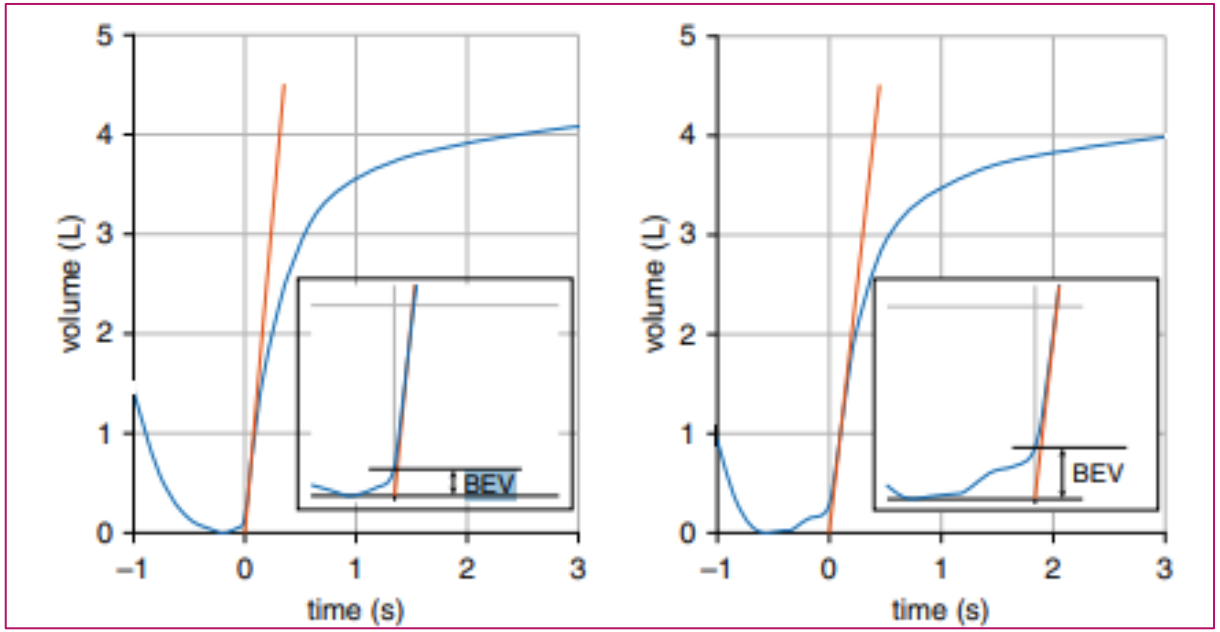

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Table 7. Summary of Acceptability, Usability, and Repeatability Criteria for FEV_1 and FVC

Acceptability and Usability Criterion	Required for Acceptability		Required for Usability	
	FEV_1	FVC	FEV_1	FVC
Must have BEV ≤5% of FVC or 0.100 L, whichever is greater	Yes	Yes	Yes	Yes
Must have no evidence of a faulty zero-flow setting	Yes	Yes	Yes	Yes
Must have no cough in the first second of expiration*	Yes	No	Yes	No
Must have no glottic closure in the first second of expiration*	Yes	Yes	Yes	Yes
Must have no glottic closure after 1 s of expiration	No	Yes	No	No
Must achieve one of these three EOFE indicators:	No	Yes	No	No
1. Expiratory plateau (≤0.025 L in the last 1 s of expiration)				
2. Expiratory time ≥15 s				
3. FVC is within the repeatability tolerance of or is greater than the largest prior observed FVC†				
Must have no evidence of obstructed mouthpiece or spirometer	Yes	Yes	No	No
Must have no evidence of a leak	Yes	Yes	No	No
If the maximal inspiration after EOFE is greater than FVC, then FIVC − FVC must be ≤0.100 L or 5% of FVC, whichever is greater‡	Yes	Yes	No	No

Repeatability criteria (applied to acceptable FVC and FEV_1 values)

Age >6 yr: The difference between the two largest FVC values must be ≤0.150 L, and the difference between the two largest FEV_1 values must be ≤0.150 L

Age ≤6 yr: The difference between the two largest FVC values must be ≤0.100 L or 10% of the highest value, whichever is greater, and the difference between the two largest FEV_1 values must be ≤0.100 L or 10% of the highest value, whichever is greater

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Prior to BDR

(Post value – Pre value/Pre value)x100

(2.76 – 2.50)/2.50

0.26/2.50

10%

Spirometry Guideline Updates

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With BDR

(Post value – Pre value x 100/pred value)

2.76 – 2.50 x 100/2.34

0.26 x 100/2.4

26/2.34

11%

Spirometry Guideline Updates

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<u>Prior to BDR</u>

(Post value – Pre value/Pre value)x100

(2.76 – 2.50)/2.50

0.26/2.50

10%

(not significant)

<u>With BDR</u>

(Post value – Pre value x 100/pred value)

2.76 – 2.50 x 100/2.34

0.26 x 100/2.4

26/2.34

11%

(significant)

Spirometry Guideline Updates

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Table 2. Relative Contraindications for Spirometry

Due to increases in myocardial demand or changes in blood pressure
Acute myocardial infarction within 1 wk
Systemic hypotension or severe hypertension
Significant atrial/ventricular arrhythmia
Noncompensated heart failure
Uncontrolled pulmonary hypertension
Acute cor pulmonale
Clinically unstable pulmonary embolism
History of syncope related to forced expiration/cough
Due to increases in intracranial/intraocular pressure
Cerebral aneurysm
Brain surgery within 4 wk
Recent concussion with continuing symptoms
Eye surgery within 1 wk
Due to increases in sinus and middle ear pressures
Sinus surgery or middle ear surgery or infection within 1 wk
Due to increases in intrathoracic and intraabdominal pressure
Presence of pneumothorax
Thoracic surgery within 4 wk
Abdominal surgery within 4 wk
Late-term pregnancy
Infection control issues
Active or suspected transmissible respiratory or systemic infection, including tuberculosis
Physical conditions predisposing to transmission of infections, such as hemoptysis, significant secretions, or oral lesions or oral bleeding

Spirometry should be discontinued if the patient experiences pain during the maneuver. Relative contraindications do not preclude spirometry but should be considered when ordering spirometry. The decision to conduct spirometry is determined by the ordering healthcare professional on the basis of their evaluation of the risks and benefits of spirometry for the particular patient. Potential contraindications should be included in the request form for spirometry.

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Table 5. Activities That Should Be Avoided before Lung Function Testing

- Smoking and/or vaping and/or water pipe use within 1 h before testing (to avoid acute bronchoconstriction due to smoke inhalation)
- Consuming intoxicants within 8 h before testing (to avoid problems in coordination, comprehension, and physical ability)
- Performing vigorous exercise within 1 h before testing (to avoid potential exercise-induced bronchoconstriction)
- Wearing clothing that substantially restricts full chest and abdominal expansion (to avoid external restrictions on lung function)

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Parameter	Male	Female	Difference
FVC	5.71	4.99	12.6%
FEV1	4.51	3.96	12.2%
FEV1/FVC	0.79	0.79	-

DLCO

- Equipment and Calibration
  - Rapid Response Gas Analyzers (RGA)
  - Calibration
  - Linearity Check
- Testing Procedure
  - Breath-Hold Time (BHT)
  - Collection Time & Volume
  - Acceptable and Repeatable

DLCO

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  - Collection Time & Volume
  - **Grading System**
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Table 3. Quality Grading for D_{LCO} Maneuvers

Grade	VI/VC	Breathhold Time	Sample Collection
A	⩾90%*	8–12 s	⩽4 s
B	⩾85%	8–12 s	⩽4 s
C	⩾80%	8–12 s	⩽5 s
D	⩾80%	<8 or >12 s	⩽5 s
F	Any test not meeting Grade A, B, C, or D.		

Graham BL, Brusasco V, Burgos F, et al. 2017 ERS/ATS standards for single-breath carbon monoxide uptake in the lung. Eur Respir J 2017; 49: 1600016 [https://doi.org/10.1183/ 13993003.00016-2016].

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Trial	DLCO	VI/VC	VA	2 grade A within 2 ml/min/mmHg
1	15.2	91%	6.71	
2	14.4	93%	6.59	
1	15.2	91%	6.71	
2	14.4	88%	6.59	
1	15.2	91%	6.71	Perform another
2	14.4	88%	6.35	
1	15.2	88%	6.71	Perform another
2	14.4	87%	6.59	
1	15.2	91%	6.71	Perform another
2	17.4	93%	6.89	

Graham BL. [Vyaire Medical]. (2023, Sept. 8). *Understanding 2017 ATS/ERS DLCO Quality Grading Making Sense Out of Alphabet Soup*. https://www.youtube.com/watch?v=K8-8wpt9J4g (Graham BL, 35:38)

DLCO

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  - Volume-based Sampling
  - Biological Controls
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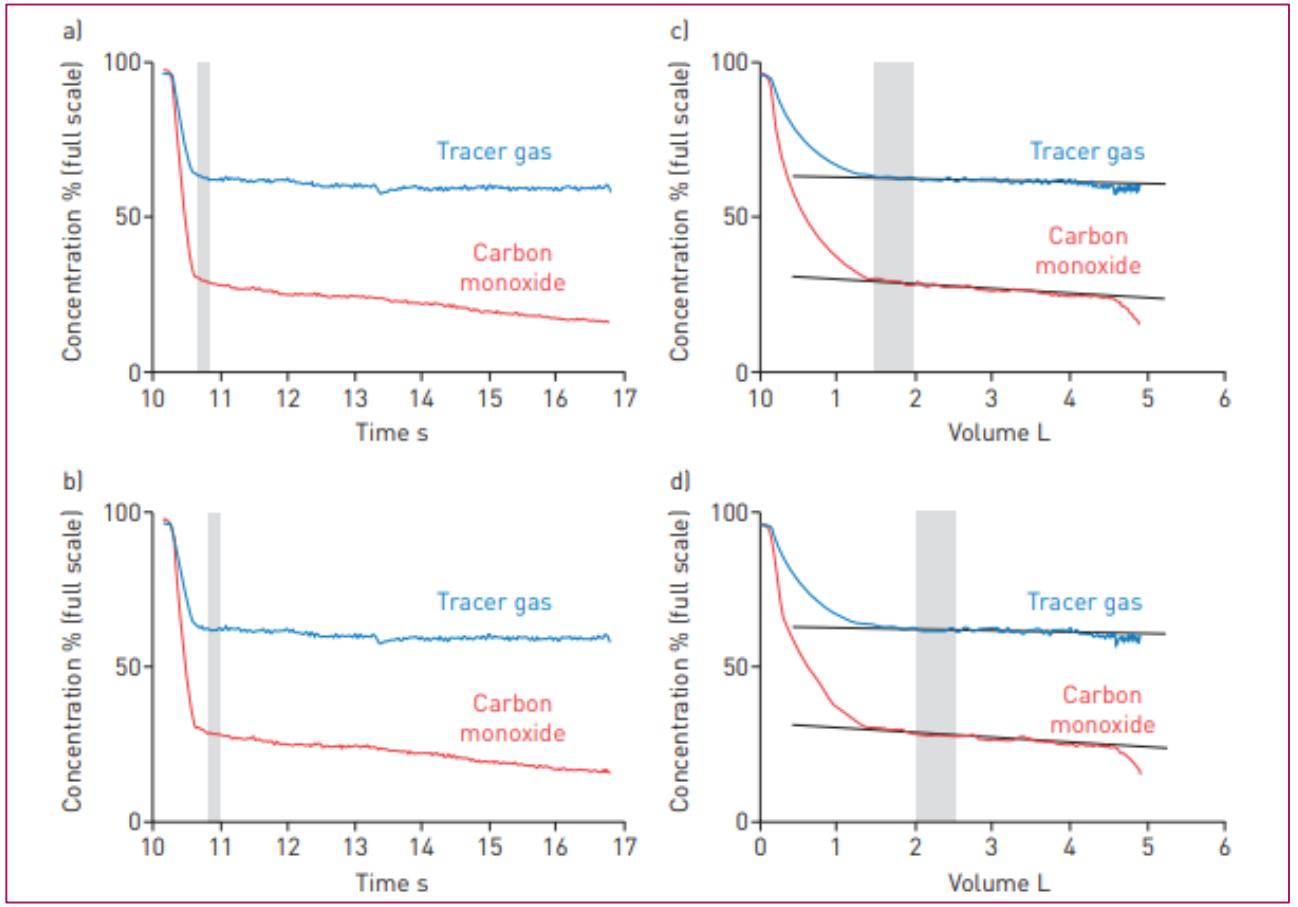

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Lung Volumes

- Equipment
  - Isothermal Lung Model
- Testing Procedure
  - Linked Maneuver
  - Airways Resistance
  - Panting Frequency
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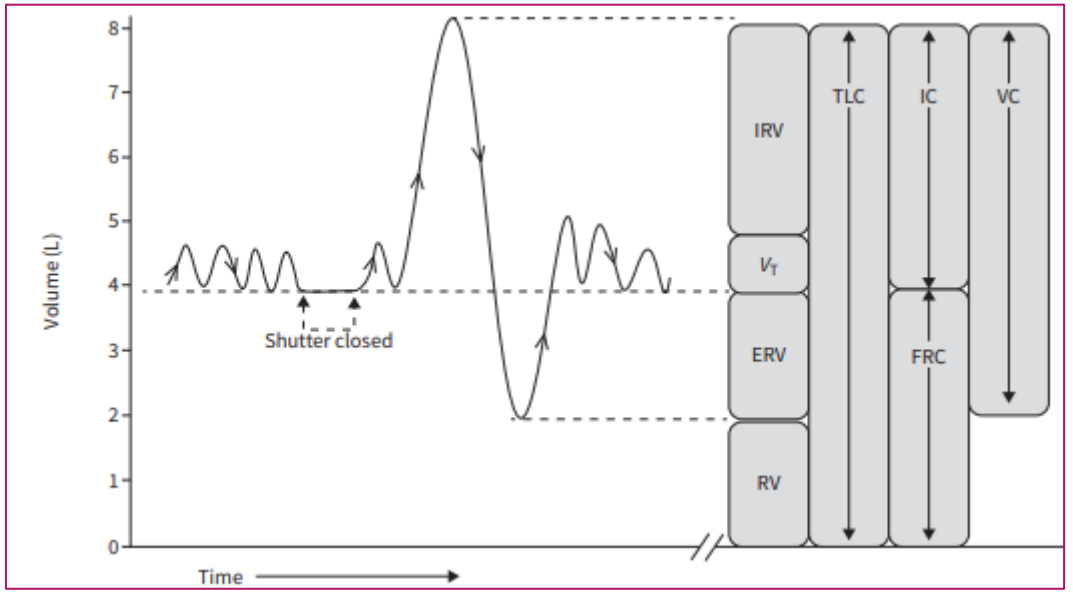

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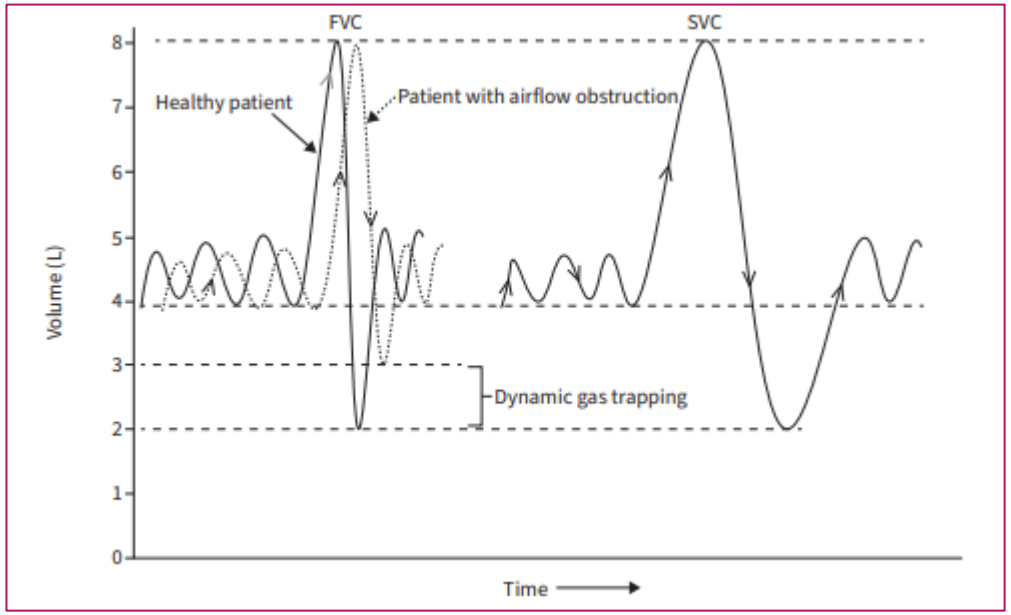

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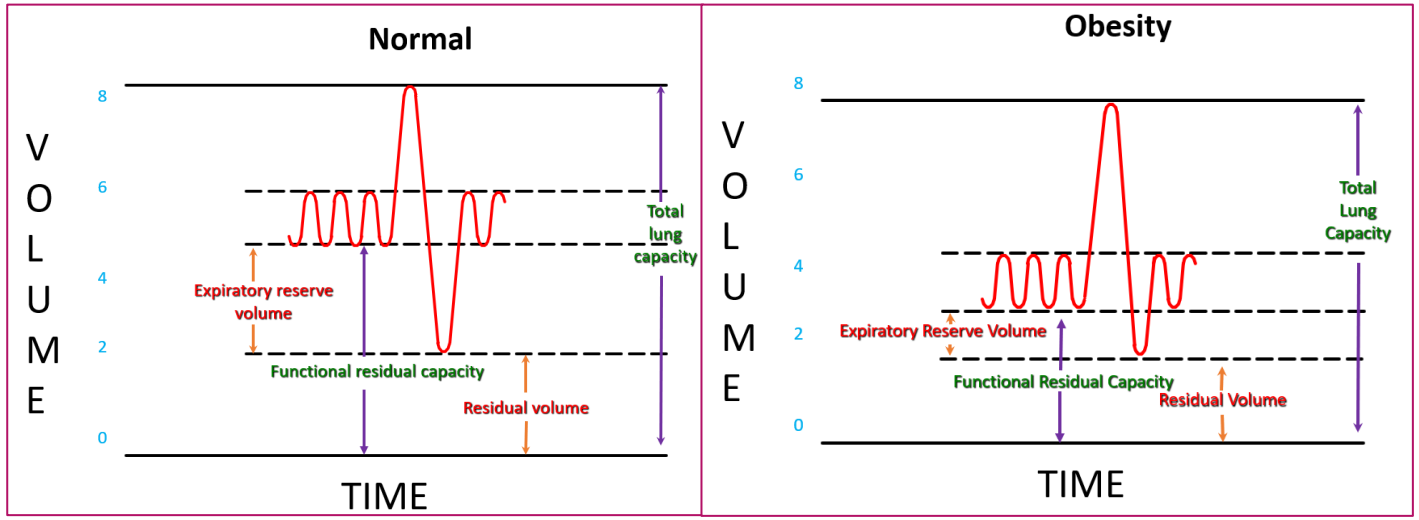

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FRCp	3.76	2.30	4.35	115.6		4.45	4.61	4.42	4.23	4.03
ERV			1.66			2.30	0.00«	2.19	1.89	1.92
RV	2.07	1.31	2.69	130.2		2.15	4.61	2.22	2.34	2.12
TLC	7.36	5.75	9.15	124.3		8.20	8.48	8.47	8.70	8.58
RV%TLC	28.27	19.47	29.36	103.9		26.27	54.32	26.22	26.94	24.66

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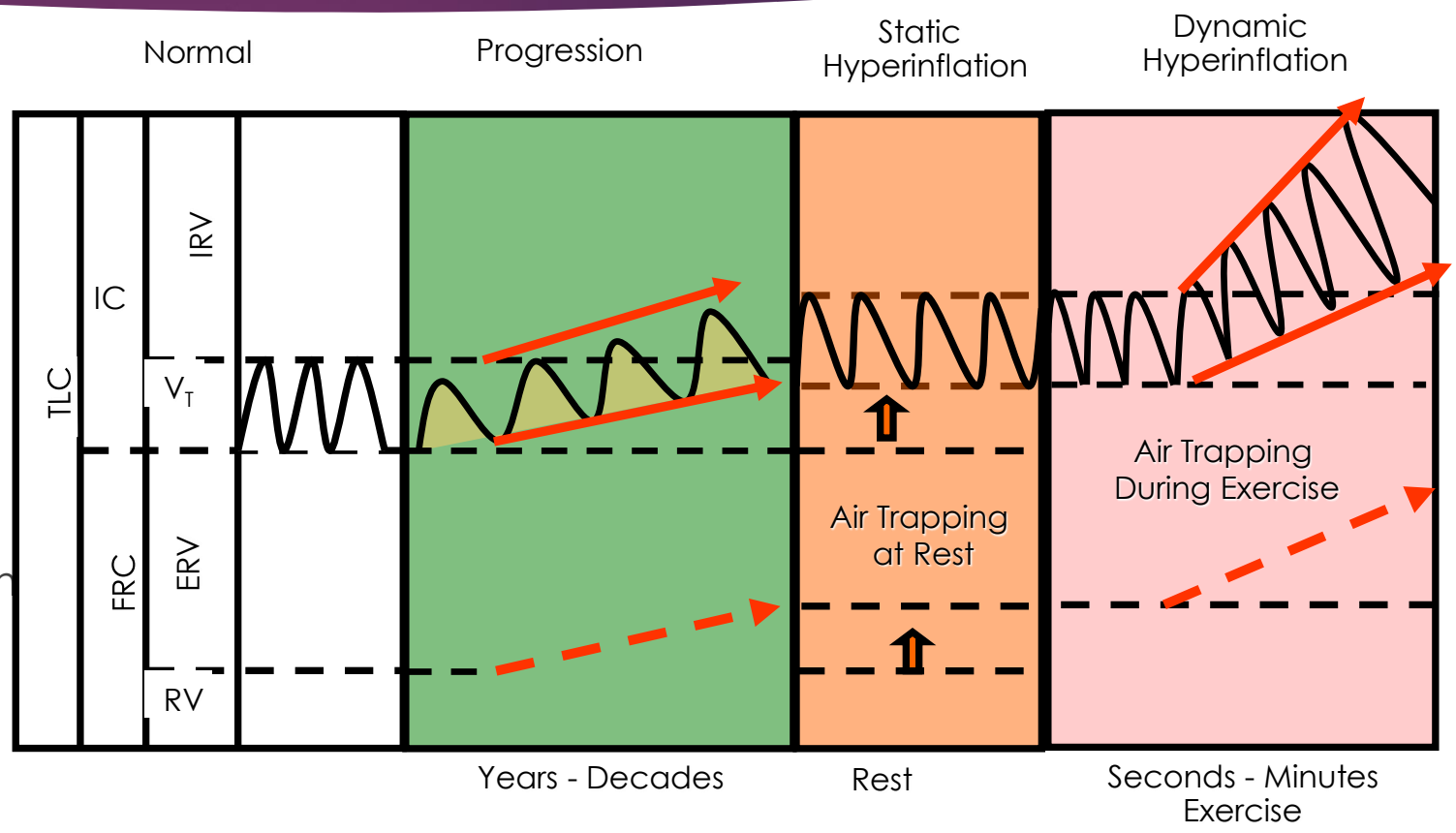

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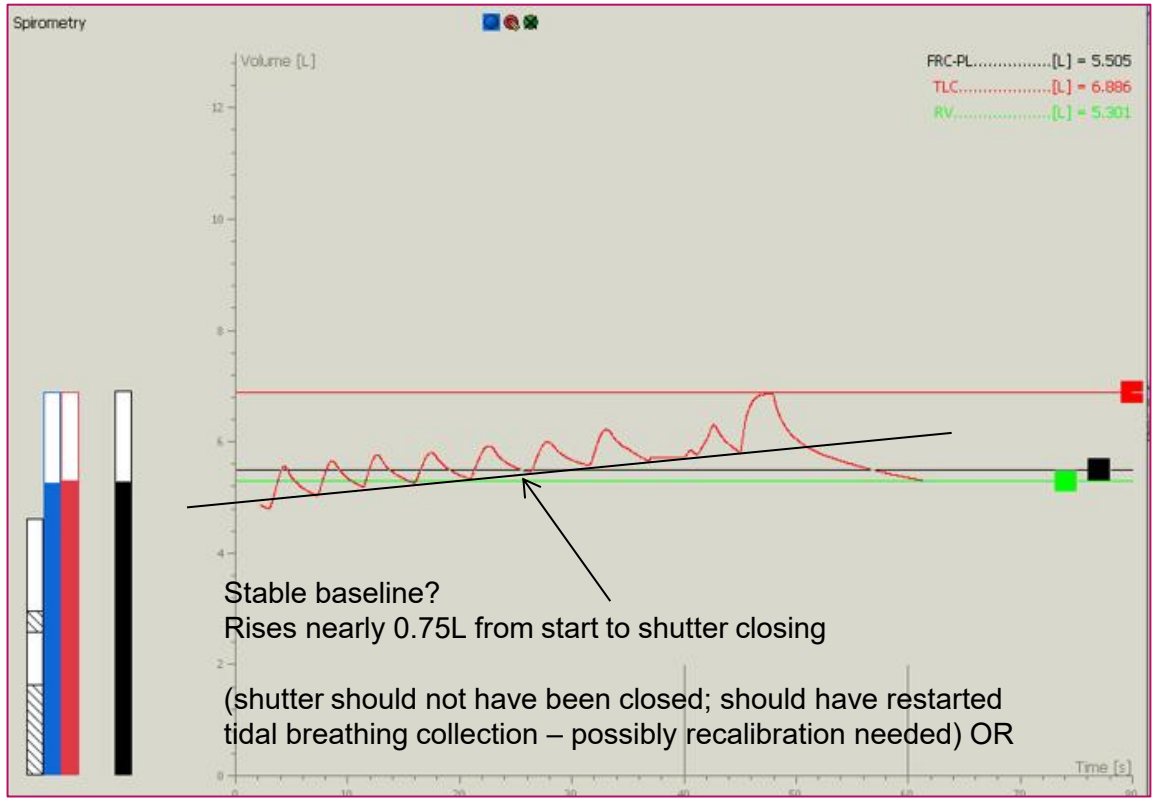

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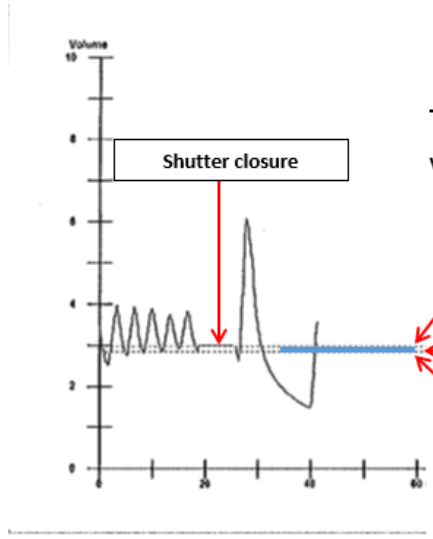

TGV (thoracic gas volume):
volume at time of shutter closure

Denotes lung volume during shutter closure (thoracic gas volume, TGV)

'switch-in error' – added to or subtracted from TGV to yield FRCpleth

Denotes average end-expiratory lung volume of tidal breaths just prior to shutter closure (FRCpleth)

FRCpleth: TGV adjusted to the average end-expiratory lung volume (EELV) using the switch-in error

Lung Volumes

- Quality Assurance & Calibration
  - Grading
  - New Acceptability & Usability Criteria
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TABLE 2 Acceptability criteria for thoracic gas volume (functional residual capacity) measurement using body plethysmography

	Tidal breathing prior to shutter closure and pants/small breaths during shutter closure
Acceptable	Pre-shutter closure: • stable end-tidal lung volume¶ During shutter closure: • closed pants • overlapping straight lines with no thermal drift • straight lines with minimal thermal drift • pant frequency 0.5–1 Hz or pant frequency >1.0–1.5 Hz with no or minimal obstruction on spirometry
Useable#	Any of: Pre-shutter closure: • unstable end-tidal lung volume¶ without significant shift in either direction During shutter closure: • portions of closed pants • portions of overlapping straight lines • parallel straight lines (thermal drift) • pant frequency >1.5–2.0 Hz with no or minimal obstruction on spirometry
Not acceptable or useable (reject)	Any of: Pre-shutter closure: • unstable end tidal lung volume¶ with significant shift in either direction (*e.g.* increase in end-expiratory lung volume with each breath) During shutter closure: • open pants • no straight lines • excessive thermal drift • pants are clipped (mouth pressure transducer range exceeded) • pant frequency <0.5 Hz, >2.0 Hz or >1.5 Hz and evidence of significant obstruction on spirometry

Refer to supplementary figures S1–S3 for examples of normal and abnormal tracings. #: interpret with caution; ¶: stability defined as three or more tidal breaths with the difference between maximum and minimum end-expiratory lung volume within 15% of the tidal volume [10].

Bhakta NR, McGowan A, Ramsey KA, et al. European Respiratory Society/American Thoracic Society technical statement: standardisation of the measurement of lung volumes, 2023 update. Eur Respir J 2023; 62: 2201519 [DOI: 10.1183/13993003.01519-2022].

Lung Volumes

- Quality Assurance & Calibration
  - **New Acceptability & Usability Criteria**
  - Grading
- Patient Preparation & Safety
  - Contraindications
  - Pre-test restrictions

TABLE 3 Acceptability and usability criteria for spirometry for calculation of residual volume and total lung capacity

	Spirometry manoeuvre after FRC measurement
Acceptable[#]	Linked spirometry: • if aged >6 years, SVC ⩾ (FVC − 150 mL) • if aged ⩽6 years, SVC ⩾ (FVC − 100 mL) or (FVC − 10% of FVC), whichever is smaller
Useable[¶]	Any of: • unlinked spirometry with an MBW or helium dilution FRC measurement with stable pre-phase end-tidal lung volume[+] • if aged >6 years, SVC ⩾ (FVC − 250 mL) • if aged ⩽6 years, SVC ⩾ (FVC − 200 mL) or (FVC − 10% of FVC), whichever is smaller
Not acceptable or useable (reject)	Any of: • unlinked spirometry in body plethysmography • unlinked spirometry with an MBW or helium dilution FRC measurement with unstable pre-phase end-tidal lung volume[+] • if aged >6 years, SVC < (FVC − 250 mL) • if aged ⩽6 years, SVC < (FVC − 200 mL) or (FVC − 10% of FVC), whichever is smaller

FRC: functional residual capacity; SVC: slow vital capacity; FVC: forced vital capacity; MBW: multiple-breath washout. [#]: meets American Thoracic Society (ATS)/European Respiratory Society (ERS) acceptability criteria for within-manoeuvre evaluation of inspiratory capacity and SVC [10]; if forced spirometry is not performed in the same session with lung volumes, an alternative is to require that at least three measures of vital capacity that meet ATS/ERS acceptability criteria for within-manoeuvre evaluation are obtained and that the largest of these vital capacities is a substitute for the FVC in this table; [¶]: interpret with caution; [+]: stability defined as three or more tidal breaths with the difference between maximum and minimum end-expiratory lung volume within 15% of the tidal volume [10].

Bhakta NR, McGowan A, Ramsey KA, et al. European Respiratory Society/American Thoracic Society technical statement: standardisation of the measurement of lung volumes, 2023 update. Eur Respir J 2023; 62: 2201519 [DOI: 10.1183/13993003.01519-2022].

Lung Volumes

- Quality Assurance & Calibration
  - New Acceptability & Usability Criteria
  - **Grading**
- Patient Preparation & Safety
  - Contraindications
  - Pre-test restrictions

TABLE 4 Grading system for a lung volume test performed using body plethysmography

Grade[#]	Number of FRC measurements[¶,+]	Number of SVC measurements[¶]	Repeatability[§] of FRC
A	⩾3 acceptable	⩾3 acceptable	Within 5%
B	⩾2 acceptable	⩾2 acceptable	Within 5%
C	⩾2 acceptable	⩾2 acceptable	Within 10%
D	1 acceptable and ⩾1 useable	1 acceptable and ⩾1 useable	Within 10%
E	1 acceptable and 0 useable	1 acceptable and 0 useable	NA
U	0 acceptable and ⩾1 useable	0 acceptable and ⩾1 useable	Within 10%
F	0 acceptable or useable		

FRC: functional residual capacity; SVC: slow vital capacity; NA: not applicable. [#]: overall grade is lowest of FRC, SVC and FRC repeatability grades. For example, if number of FRC measurements and repeatability of FRC are both grade A (three acceptable efforts and repeatable), but SVC is grade B (only two acceptable efforts), then the overall grade is B; [¶]: number of measurements refers to the manoeuvres used for calculation of FRC and other lung volumes; [+]: if all spirometry manoeuvres are not acceptable or useable, report FRC only; [§]: difference between the highest and lowest value divided by the mean×100.

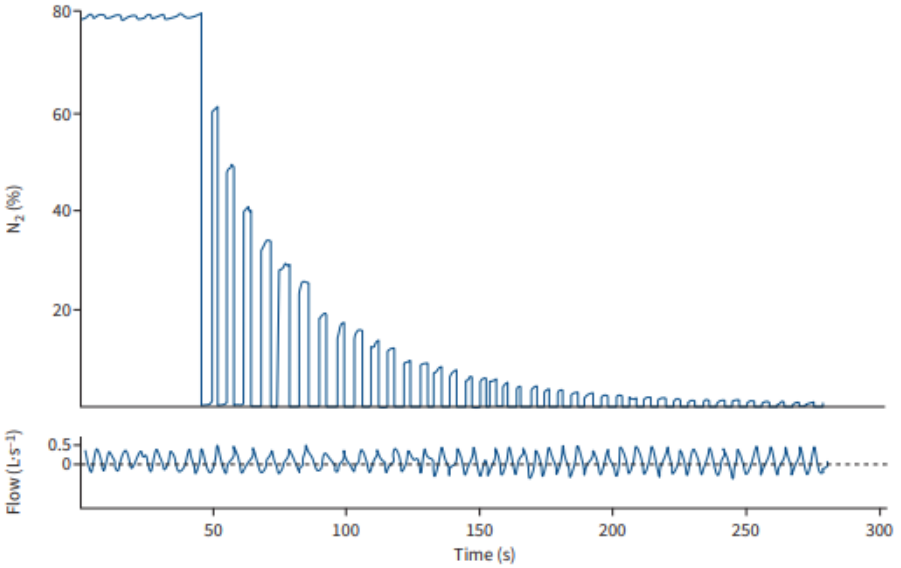
Bhakta NR, McGowan A, Ramsey KA, et al. European Respiratory Society/American Thoracic Society technical statement: standardisation of the measurement of lung volumes, 2023 update. Eur Respir J 2023; 62: 2201519 [DOI: 10.1183/13993003.01519-2022].

Lung Volumes

- Quality Assurance & Calibration
  - New Acceptability & Usability Criteria
  - Grading
- Patient Preparation & Safety
  - **Contraindications**
  - **Pre-test restrictions**

Lung Volumes (MBW)

- Measurement Technique
  - 30-60 s of stable quiet tidal breathing
  - Switch in close to FRC
  - Continue tidal breathing
  - Washout completed once the tracer gas reaches 1/40th of tracer gas
    - 3 consecutive tidal breaths
  - Then perform a Linked SVC maneuver
  - Repeat after doubling the wash time for wait time



1. Bhakta NR, McGowan A, Ramsey KA, et al. European Respiratory Society/American Thoracic Society technical statement: standardisation of the measurement of lung volumes, 2023 update. Eur Respir J 2023; 62: 2201519 [DOI: 10.1183/13993003.01519-2022].

Lung Volumes (MBW)

TABLE 5 Acceptability and grading criteria for functional residual capacity measurement by multiple breath washout (MBW)

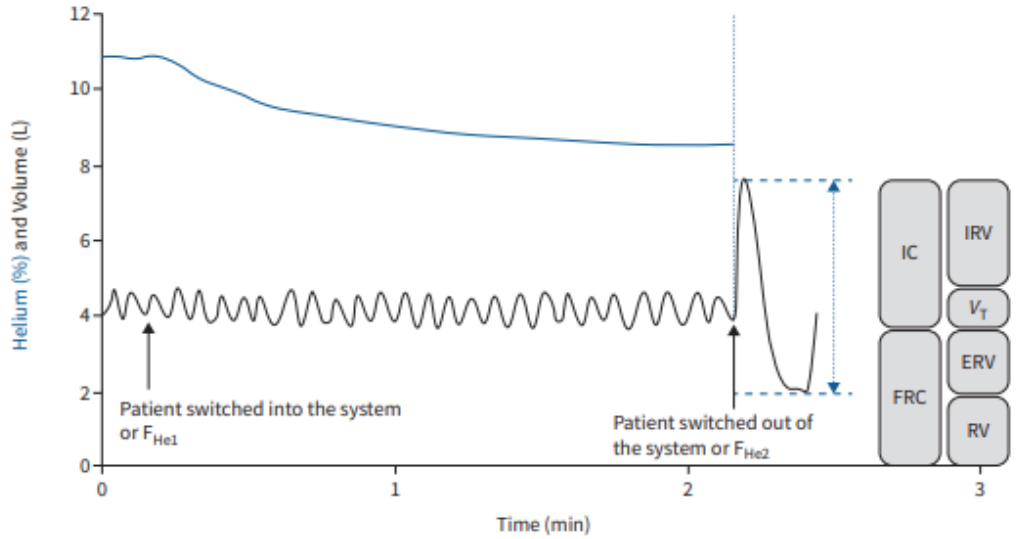
	Tidal breathing prior to washout and washout phase characteristics
Acceptable[#]	Pre-switch-in:[+] • relaxed tidal breathing with stable end-tidal lung volume[§] During washout:[f] • relaxed tidal breathing without sigh, cough, or breath-hold • flow is stable with no forced breathing or signs of hyperventilation (CO_2 within 4–6% range if available) • no evidence of leak • end-of-test criteria met (three consecutive tidal breaths under target concentration) When performed: • adequate wait time between MBW manoeuvres (at least twice the washout time; longer with obstructive lung disease)
Useable[¶]	As for acceptable except any of: Pre-switch-in:[+] • unstable end-tidal lung volume[§] without significant shift in either direction • irregular tidal breaths (swallow, small breath) in pre-phase During washout:[f] • irregular first breath of washout (swallow, small breath) • sigh, cough, or breath-hold in rest of washout but no increase in end-tidal tracer gas concentration • end-tidal lung volume is unstable during washout but no increase in end-tidal tracer gas concentration
Not acceptable or useable (reject)	Any of: Pre-switch-in:[+] • unstable end tidal lung volume[§] with significant shift in either direction (*e.g.* increase in end-expiratory lung volume with each breath) • flow is highly erratic with or without forced breathing or hyperventilation (CO_2 outside 4–6% range if available) • sigh, cough, or breath-hold During washout:[f] • sigh, cough, or breath-hold in first breath of washout • sigh, cough, or breath-hold in rest of washout resulting in increase in end-tidal tracer gas concentration[##] • significant shifts in end-tidal lung volume during washout resulting in increase in end-tidal tracer gas concentration[##] • flow is highly erratic with or without forced breathing or hyperventilation (CO_2 outside 4–6% range if available) • evidence of leak • end-of-test criteria not met: manoeuvre does not have three consecutive tidal breaths under target concentration When performed: • inadequate wait time between MBW manoeuvres for gas concentrations to re-equilibrate (less than twice the washout time or end-tidal tracer gas concentration has not returned to baseline)

Refer to supplementary figures S3 and S4 for examples of normal and abnormal tracings. CO_2: carbon dioxide. [#]: acceptable manoeuvres can be challenging to obtain in MBW, especially in young children; [¶]: interpret with caution; [+]: pre-switch-in (also known as pre-phase) grading criteria are relevant to the last three breaths before the washout phase; [§]: stability defined as three or more tidal breaths with the difference between maximum and minimum end-expiratory lung volume within 15% of the tidal volume [10]; [f]: grading criteria are relevant to all breaths of the washout until the end-of-test criteria are reached; [##]: increases in end-tidal tracer gas concentration during the washout in response to irregular breathing pattern can indicate the release of trapped gas from unventilated regions of the lung and is a reason to reject the trial.

1. Bhakta NR, McGowan A, Ramsey KA, et al. European Respiratory Society/American Thoracic Society technical statement: standardisation of the measurement of lung volumes, 2023 update. Eur Respir J 2023; 62: 2201519 [DOI: 10.1183/13993003.01519-2022].

Lung Volumes (He-Dilution)

- Measurement Technique
  - 30-60 s of stable quiet tidal breathing to determine a baseline FRC
  - Switch in close to FRC
  - Continue tidal breathing
  - Helium (He) equilibration complete when change is < 0.02% for 30 s
  - Then perform a Linked SVC maneuver
  - Repeat after doubling the dilution time for wait time



1. Bhakta NR, McGowan A, Ramsey KA, et al. European Respiratory Society/American Thoracic Society technical statement: standardisation of the measurement of lung volumes, 2023 update. Eur Respir J 2023; 62: 2201519 [DOI: 10.1183/13993003.01519-2022].

Lung Volumes (He-Dilution)

TABLE 6 Acceptability and grading criteria for functional residual capacity measurement by helium (He) dilution

	Tidal breathing prior to dilution phase and dilution phase characteristics
Acceptable	Pre-switch-in: • stable end-tidal lung volume[¶] During dilution: • relaxed tidal breathing without sigh, cough, or breath-hold • stable end-tidal lung volume • no leak • end-of-test criteria met: (Δ[He]<0.02%×30 s) When performed: • adequate wait time between manoeuvres (at least twice the dilution time; longer with obstructive lung disease)
Useable[#]	**As for acceptable except any of:** Pre-switch-in: • unstable end-tidal lung volume[¶] without significant shift in either direction During dilution: • non-uniform dilution curve • minimally unstable end-tidal lung volume • sigh, cough or breath-hold with no leak
Not acceptable or useable (reject)	**Any of:** Pre-switch-in: • unstable end-tidal lung volume[¶] with significant shift in either direction (*e.g.* increase in end-expiratory lung volume with each breath) During dilution: • unacceptable breathing pattern • evidence of leak • failed end of test When performed: • inadequate wait time between manoeuvres

[#]: interpret with caution; [¶]: stability defined as three or more tidal breaths with the difference between maximum and minimum end-expiratory lung volume within 15% of the tidal volume [10].

1. Bhakta NR, McGowan A, Ramsey KA, et al. European Respiratory Society/American Thoracic Society technical statement: standardisation of the measurement of lung volumes, 2023 update. Eur Respir J 2023; 62: 2201519 [DOI: 10.1183/13993003.01519-2022].

Lung Volumes (MBW & He-dilution)

TABLE 7 Grading system for a lung volume test performed by multiple breath washout (MBW) or helium dilution

Grade[#]	Number of FRC[¶,+] measurements	Number of SVC[¶] measurements	Repeatability[§] of FRC
A	⩾2 acceptable	⩾2 acceptable	Within 10%
B	1 acceptable and ⩾1 useable	1 acceptable and ⩾1 useable	Within 10%
C	⩾2 useable	⩾2 useable	Within 10%
D	⩾2 acceptable or useable	⩾2 useable	Within 25%
E	1 acceptable and 0 useable	1 acceptable and 0 useable	NA
U	0 acceptable and 1 useable	0 acceptable and 1 useable	NA
F	0 acceptable or useable		

1. Bhakta NR, McGowan A, Ramsey KA, et al. European Respiratory Society/American Thoracic Society technical statement: standardisation of the measurement of lung volumes, 2023 update. Eur Respir J 2023; 62: 2201519 [DOI: 10.1183/13993003.01519-2022].

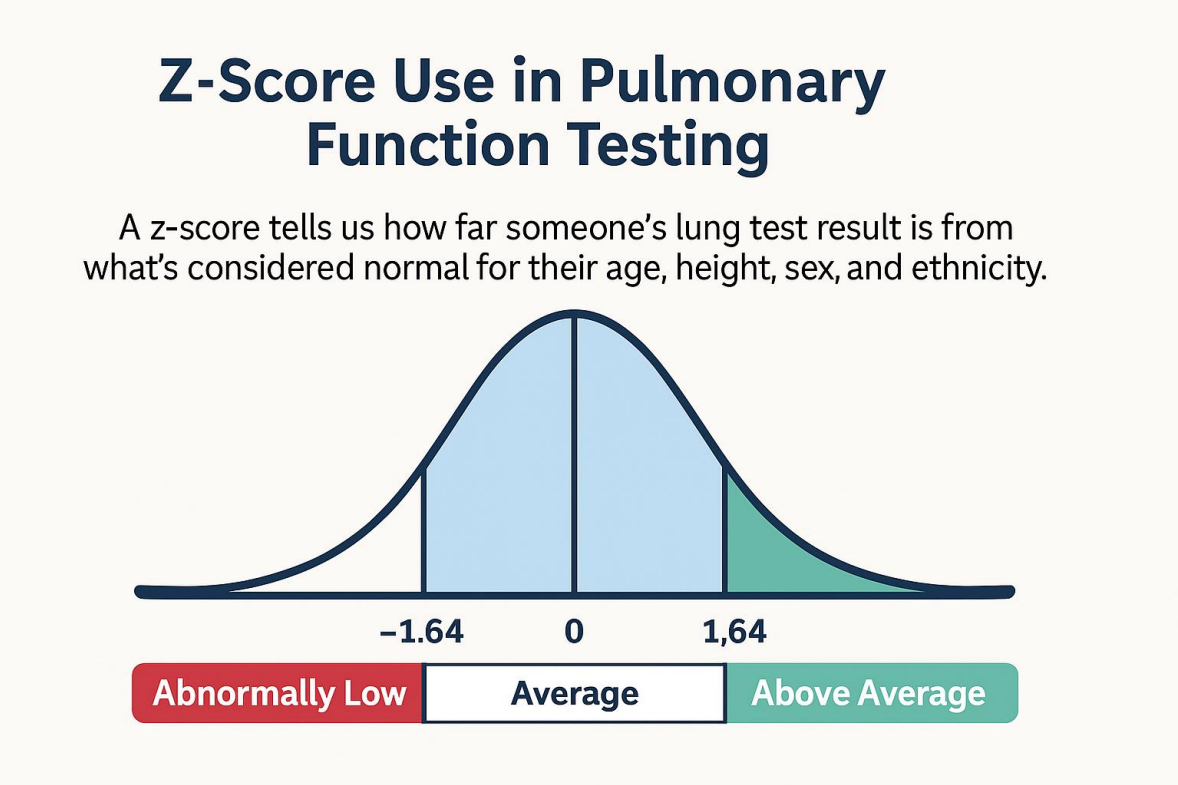
BIO QCs

- “Healthy”
- Non-Smokers
- Consistency
- Weekly/Monthly
- Voluntary

Operator Comments

- Height
- Weight
- Grading Difference
- Medication Alerts
- Technique Challenges
- Rare episodes

z-scores


Z-Score Use in Pulmonary Function Testing
A z-score tells us how far someone's lung test result is from what's considered normal for their age, height, sex, and ethnicity.
–1.64
0
1,64
Abnormally Low
Average
Above Average

z-scores

Spirometry	Lung Volumes	DLCO
Mild: ≥70% & <LLN Moderate: 60-69% Moderate to Severe: 50-59% Severe: 35-49% Very Severe: <35% **(Spirometry can only suggest restriction)**	Restriction TLC: <80% Decreased RV & FRC Obstruction TLC: >120% Increased RV & FRC	Mild: >60% & <LLN Moderate: 40-60% Severe: 40%
z-score Mild: -1.65 to -2.5 Moderate: -2.51 to -4.0 Severe: <-4.1	z-score TLC, FRC, RV, RV/TLC +1.64 (Obstruction)	z-score Mild: -1.65 to -2.5 Moderate: -2.51 to -4.0 Severe: <-4.1
Restrictive Patients +1.64 FEV1/FVC (ratio) w/decreased FVC and FEV1	Restrictive TLC, FRC, RV -1.64	Increased DLCO +1.64 Very Rare, (polycythemia)

Race Neutral

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1. Graham BL, Steenbruggen I, Miller MR, Barjaktarevic IZ, Cooper BG, Hall GL, Hallstrand TS, Kaminsky DA, McCarthy K, McCormack MC, Oropez CE, Rosenfeld M, Stanojevic S, Swanney MP, Thompson BR. Standardization of Spirometry – 2019 Update: An Official American Thoracic Society and European Respiratory Society Technical Statement. Am J Respir Crit Care Med
2. Bhakta NR, McGowan A, Ramsey KA, et al. European Respiratory Society/American Thoracic Society technical statement: standardisation of the measurement of lung volumes, 2023 update. Eur Respir J 2023; 62: 2201519 [DOI: 10.1183/13993003.01519-2022].
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5. Graham BL. [Vyaire Medical]. (2023, Sept. 8). *Understanding 2017 ATS/ERS DLCO Quality Grading Making Sense Out of Alphabet Soup*. https://www.youtube.com/watch?v=K8-8wpt9J4g (Graham BL, 35:38)

Thank you and any Questions