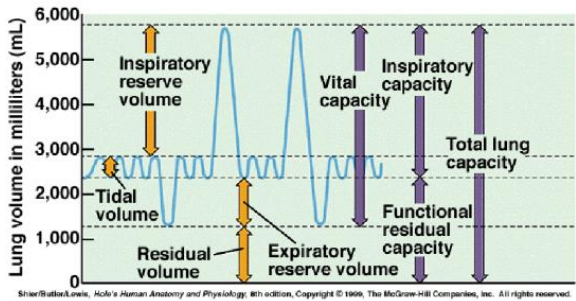


PULMONARY FUNCTION TESTS

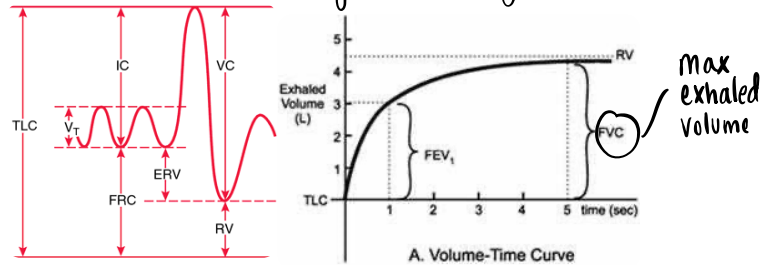
- **Spirometry** = monitors obstructive disease
- **Lung volumes** = diagnoses restrictive disease
- **Diffusing Capacity of Carbon Monoxide Capacity (DLCO)** = tests pulmonary vascular function

Respiratory Volumes and Capacities



Tidal Volume = the air coming in/out of your nose/mouth (about 500-600 mL)

Residual volume = the volume that stays in the lungs to keep them from collapsing.



Spirometry Values:

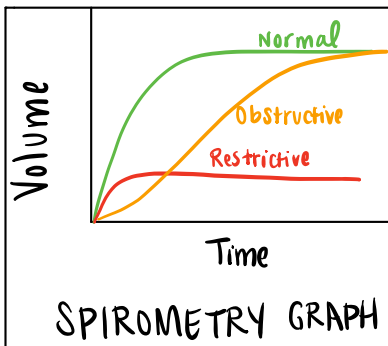
- **Forced vital capacity (FVC)** → a forced breath
- **Forced expiratory Volume in 1 second (FEV1)** → volume exhaled during first second
- **FEV1/FVC** → % of the total FVC expelled from the lungs during the first second of forced exhalation.
 - Important in distinguishing obstructive & restrictive diseases.

Flow Volume Loop

Obstructive Disorders = limitation of **EXPIRATORY** airflow

Restrictive Disorders = reduced lung volumes and compliance.

Obstructive Diseases have something in the way, so the first second (FEV₁) won't be great, but it's not restrictive so there won't be an issue with getting air out.
Restrictive Diseases don't have anything in the way, so FEV₁ will be great but you'll have an issue getting air out (FVC).



FVC of 80-120% is normal

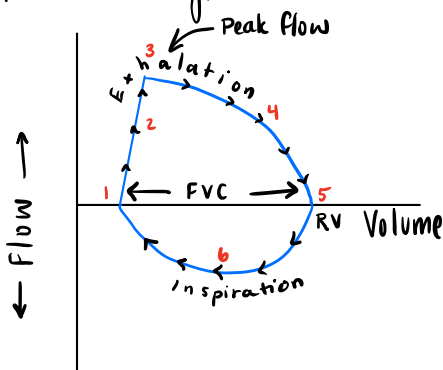
FEV₁ of ≥80% is normal

FEV₁/FVC of ≥70 is (LLN) normal

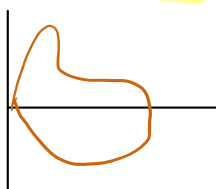
* The use of LLN reduces misclassification

* Note that we breathe our air in large airways first, and that obstructive diseases are of the small airways, so once large airway air is exhaled, flow decreases rapidly d/t small airway obstruction.

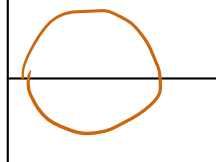
Flow Volume Loops graph airflow as a function of volume. Changes in the contour of the loop can help define the type/location of obstruction.



Small airways obstruction (ie COPD)



Large airways obstruction

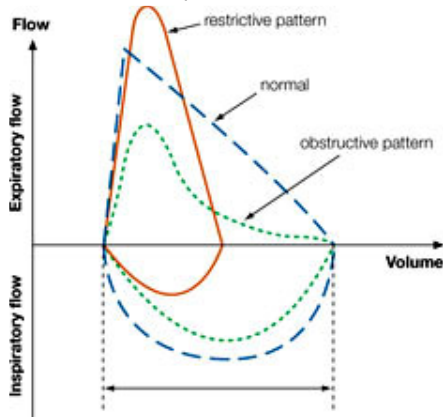


- If **FEV₁/FVC ≤ 70%** and **FEV₁ ≤ 80%** = **OBSTRUCTIVE** defect.
 - If FVC normal → pure obstruction
- If **FEV₁/FVC ≥ 70%** and **FEV₁ ≤ 80%** and **FVC ≤ 80%** = **RESTRICTIVE** defect, get lung volumes to confirm.

Pre & Post Bronchodilator

- Administer bronchodilator and calculate percent change in FEV_1
→ It is considered "reversible" if 12% or greater change in FEV_1

Obstructive vs. Restrictive Patterns



- Obstructive Patterns have a "dog leg" or car seat appearance.
- Restrictive Patterns have a reduced FVC b/c full expansion of the lung is limited.
 - FEV_1 may be reduced because the stiffness of fibrotic lungs increases the expiratory pressure.
 - FEV_1/FVC will be normal.

- * If you have decreased FVC, determine lung volumes; need to find out RV to calculate lung volumes.
 - Helium Dilution
 - Nitrogen Washout

Carbon Monoxide Diffusion Capacity (DLCO)

- Normal = 76-140 %

↓ DLCO

- Loss of pulmonary vasculature
- Smoking
- CO poisoning
- Acute lung disease
- Anemia

↑ DLCO

- Polycythemia
- Alveolar hemorrhage
- Mild bronchitis