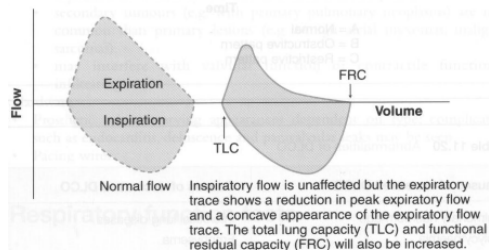
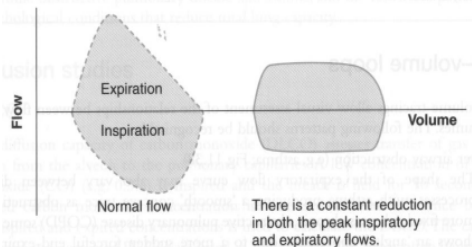


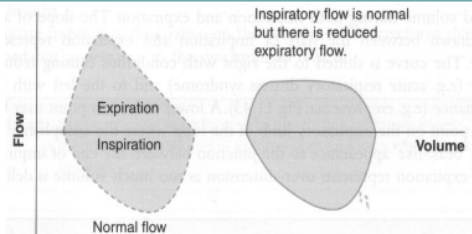
lower airway obstruction (eg asthma):
 - asthma produces a smooth concave trace as obstruction is more fixed;
 whereas, COPD sometimes shows an 'angled' appearance due to a more sudden forced end-expiratory collapse



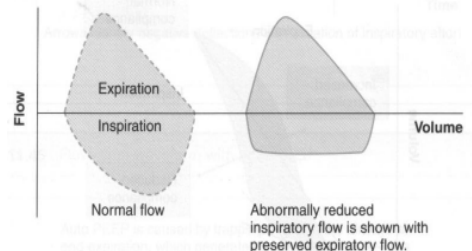
fixed upper airway obstruction (eg tracheal stenosis):



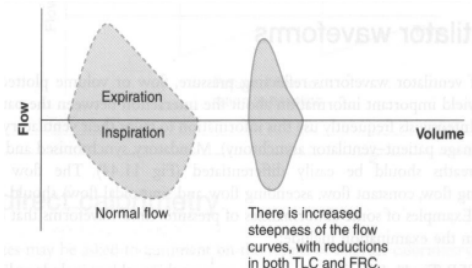
variable intrathoracic upper airway obstruction (eg tumour in the lower trachea):
 - normal inspiratory flow with a constant reduction in expiratory flow



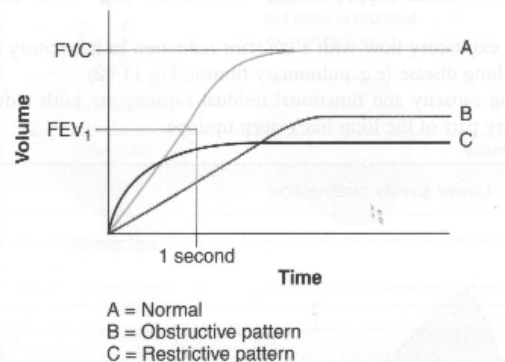
variable extrathoracic upper airway obstruction (eg vocal cord paralysis):
 - normal expiratory flow with a constant reduction in inspiratory flow



restrictive lung disease (eg pulmonary fibrosis)
 - total lung capacity and FRC are both reduced and the expiratory part of the loop has a steep upslope



spirometry



- forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC) and the ratio of FEV1/FVC are the primary measurements

abnormalities of DLCO

Causes of increased DLCO	Causes of decreased DLCO
Pulmonary haemorrhage	Interstitial lung diseases
Polycythaemia	Emphysema
Asthma	Congestive cardiac failure
Early congestive cardiac failure	Pulmonary vascular diseases (e.g. emboli)
Left to right intracardiac shunt	Severe anaemia
Severe obesity	Increased carboxyhaemoglobin
High altitude	Hypothyroidism
Exercise just prior to the session	Hypothermia
Hyperthyroidism	

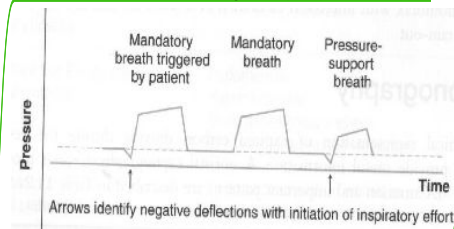
- the diffusion capacity of carbon monoxide assesses the transfer of gas from the alveoli to the pulmonary capillaries. A low concentration of CO is inspired and the breath is held for 10 seconds. The expired CO concentration is measured and the difference between the inspired and expired concentrations is used to calculate the DLCO

flow-volume loops

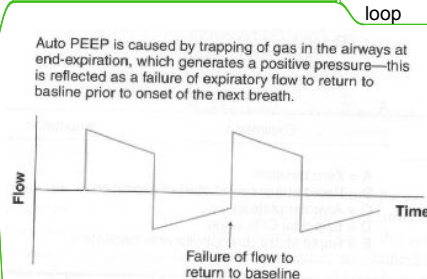
respiratory function tests

ventilator waveforms

Pressure-time waveform showing SIMV plus pressure support

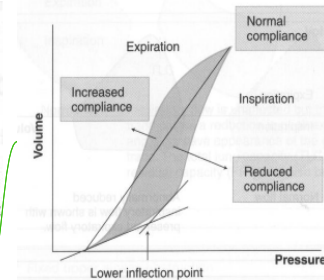


Flow-time waveform in a patient with auto-PEEP



Other examples of abnormal ventilator waveforms include:

- (i) circuit leaks - the baseline of the pressure-time waveform drifts down
- (ii) cardiac oscillations - the baseline of the pressure-time waveform shows slight up and down movement with heartbeat; these may trigger breaths
- (iii) inadequate inspiratory flow rate - on the pressure-time waveform there will be a 'scooped-out' appearance to the synchronised breaths



- a graphical representation of the relationship between pressure and volume during inspiration and expiration
- the slope of an imaginary line drawn between the start of inspiration and expiration represents lung compliance
- the curve is shifted to the right with conditions causing reduced lung compliance (eg ARDS) & to the left with increased lung compliance (eg emphysema)
- a lower inflection point on the inspiratory limb of the loop where the compliance suddenly increases may be recognised
- a 'beak-like' appearance to the junction between the end of inspiration and the start of expiration represents over-distension as too much volume is delivered