

Zoom meeting 16/07/2021: Lung Function.

After 19th July we are still using masks and PPE within the trust. We have a new phone number that will appear instead of an unknown number when we are contacting you: 0161 701 9999. Please answer the phone if you see this number.

We are looking for feedback on the ILD website

www.northwestipfmanchester.weebly.com

Please email us with any constructive feedback for this ILDNURSEMANC@mft.nhs.uk.

Support group notes:

Why perform a lung function test?

- Assist with diagnosis.
- Monitors lung condition and response to treatment.
- Pre-operative assessment.
- Clinical trials.
- Epidemiological studies.

How we predict your values

Your FVC and other pulmonary function tests (PFTs) are used to establish the status of your lung function by comparing your measurements to standards based on your age, gender, race, height, and weight.



$$\begin{aligned} &\text{Male predicted Vital Capacity (L)} \\ &= (6.10 \times \text{Height}) - (0.028 \times \text{Age}) - 4.65 \\ &= (6.10 \times 1.88) - (0.028 \times 27) - 4.65 \\ &= 11.486 - 0.756 - 4.65 \\ &= 6.08 \text{ L} \end{aligned}$$



$$\begin{aligned} &\text{Female predicted Vital Capacity (L)} \\ &= (4.66 \times \text{Height}) - (0.026 \times \text{Age}) - 3.28 \\ &= (4.66 \times 1.65) - (0.026 \times 65) - 3.28 \\ &= 7.689 - 1.69 - 3.28 \\ &= 2.72 \text{ L} \end{aligned}$$

Routine lung function tests

Routine Tests	Additional Tests
• Oxygen Saturation	• Blood gas
• Slow spirometry	• Lung volumes (nitrogen washout / body box)
• Forced spirometry	• Exercise tests
• Gas transfer test	• Flight assessment

Pulse oximetry and oxygen saturation

- Devices that detect the percentage of oxygen bound to haemoglobin which is a protein located within the red blood cells that carries oxygen.
- Pulse oximeters work by emitting red light (660nm) and infrared light (940nm) from a transmitter to a detector, through body tissue (e.g. finger).
- Oxygenated haemoglobin absorbs more infrared light and allows more red light to pass through.
- Deoxygenated haemoglobin absorbs more red light and allows the infrared light to pass through.
- This gives us our oxygen saturation as a percentage.

Slow spirometry

- volume of air in the lungs from maximal inflation to complete exhalation.

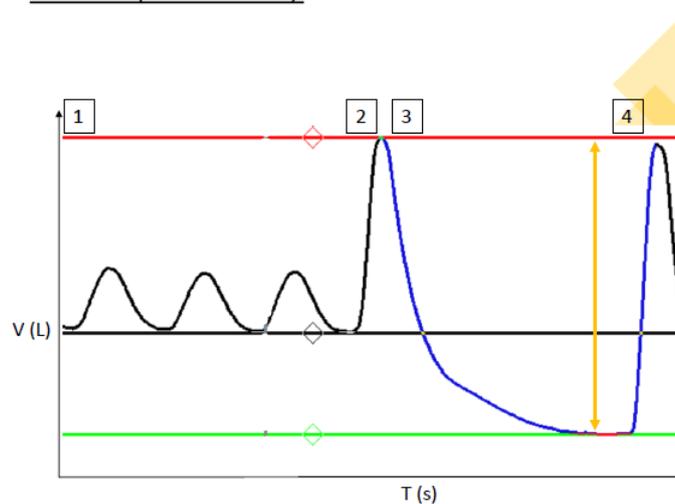
Slow spirometry

- Measures Vital Capacity (VC) –

Volume of air in the lungs from maximal inflation to complete exhalation.

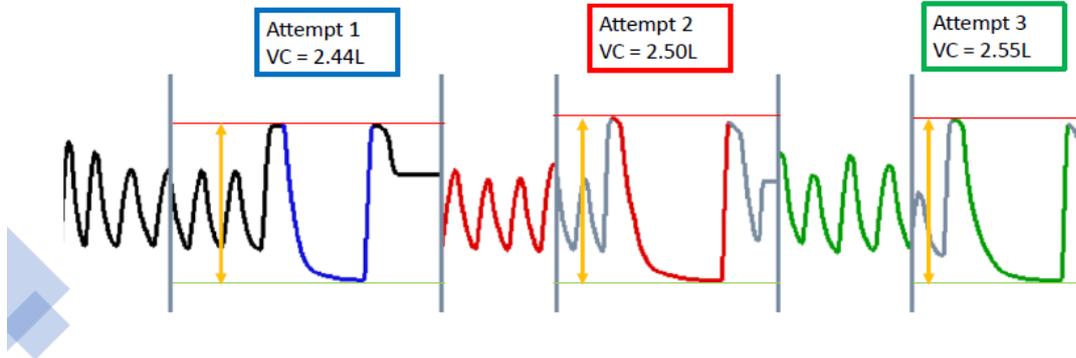
- Technique:

1. Normal breathing
2. Big breath in
3. Blow all the way out
4. Big breath in again



VC - Repeatability Criteria

- Minimum of 3 technically acceptable attempts.
- Best 2 attempts within 150ml (0.15L)



Forced spirometry: FVC

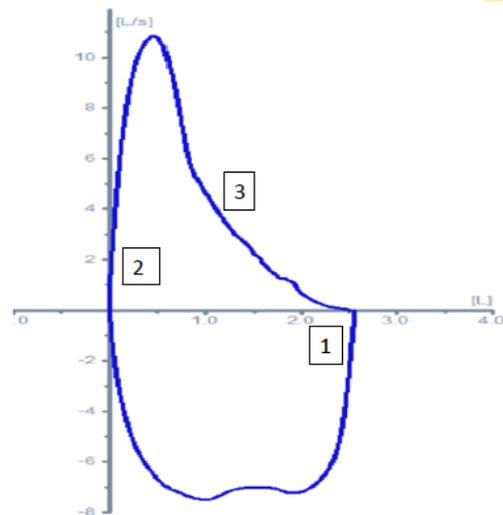
Forced spirometry

Technique:

1. Big breath in
2. Blast the air out
3. Continue to blow until empty
4. Big fast breath in again

Measurements:

- Forced expiratory volume in 1 second (FEV1) (L)
- *Forced* Vital Capacity (FVC) (L)
- FEV1 / VC ratio
- Peak expiratory flow (PEF) (L/s)



Forced vital capacity (FVC) is the amount of air that can be forcibly exhaled from your lungs after taking the deepest breath possible, as measured by spirometry.

Minimum of 3 technically acceptable attempts:

FEV1: best 2 attempts within 150ml

FVC: best 2 within 150ml.

PEF: All 3 within 10%.

Gas transfer test:

Involves full inhalation of a test gas that contains carbon monoxide (0.3%) and methane (0.3%).

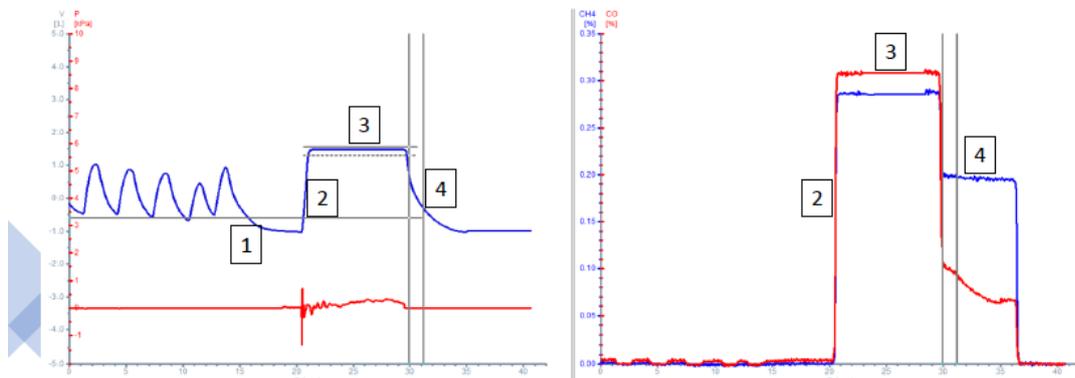
Carbon monoxide diffuses across lung tissue and binds to hemoglobin on red blood cells, like oxygen but much easier. The rate and which Carbon monoxide uptake occurs is referred to as **KCO**.

Methane doesn't diffuse across the lung tissue. The volume inhaled and concentration exhaled gives an indication of the surface area of the lung that is available for gas exchange, referred to as the alveolar volume (VA).

$$\text{TLCO} = \text{VA} \times \text{KCO}$$

Technique:

1. Blow out until empty
2. Big breath in of test gas
3. Hold breath for 5-7s
4. Blow out steadily.



How **ILD/Fibrosis** may affect results?

Lung tissue is less compliant or stiffer which reduces lung expansion.

Example: thin balloon vs thick balloon.

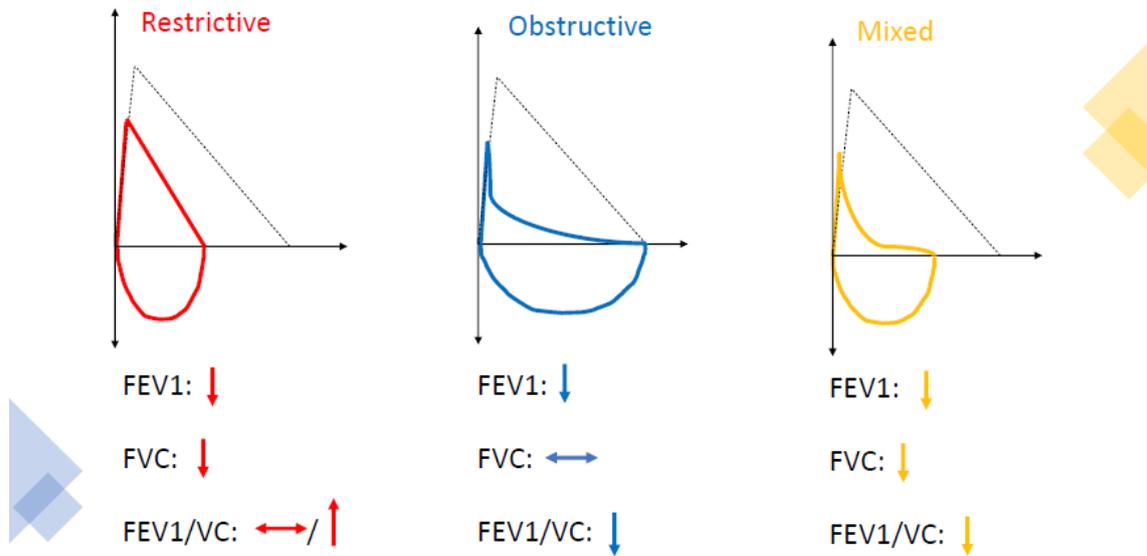
Forced spirometry tests measure how efficiently air can be forcibly exhaled from the lungs, which can help to differentiate between **obstructive** and **restrictive** lung conditions.

ILD/ Fibrosis is classed as a restrictive lung condition

Restrictive= reduced lung volume

Obstructive= Reduced airflow (e.g COPD/ Asthma).

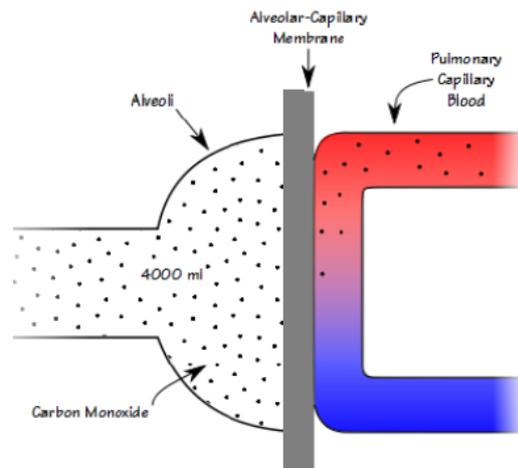
Obstructive and restrictive lung conditions



How ILD/Fibrosis may affect gas transfer

ILD or fibrosis may cause changes to the alveolar tissue which can disrupt how easily the carbon monoxide is able to diffuse into the bloods.

$$\bullet \text{ TLCO} \downarrow = \text{VA} \downarrow \times \text{KCO} \downarrow$$



Questions:

Is it safe to inhale carbon monoxide in lung function test? Yes normally washes out in 4 minutes, do a maximum of 4 tests with carbon monoxide to keep it safe.

A lot of patients find LFT challenging as fibrosis gets worse, what could people do before their lung function test to help with energy to get them through it? - bring bottle of water, ask for plenty of breaks, let team know. If you can, get someone to come with you to bring you to appointment to avoid worry of getting home. Call team to help get you to the appointment if needed. Don't drink

alcohol or smoke before. Don't have a large meal 2 hours before if possible, as this can sit on your stomach, make sure you have good nutrition.

What does it mean that my gas transfer result dropped over a period of 9 months?- depending on condition your LFT can get worse, for example if you've been unwell or had an acute problem. Would have to find out if it's a progression or exacerbation following a chest infection. Repeat tests would be needed to clarify results. Weight can play a role. If you struggle to get out and exercise, this can limit the amount your lungs can expand.

Does weather affect LFT? People can struggle if weather particularly hot or cold. Variable person to person. Machines are calibrated to specific temperatures

Sometimes we get results in litres and sometimes percentages, could we have this in % as this is easier?- if you are a regular patient, we include both measurement and trend reports. You can ask your Dr/Nurse for the %.

On nintedanib, when I get my LFT should I expect to see my FVC stable, down or improved?
Nintedanib and Pirfenidone limits progression of fibrosis, can stop value decreasing. We are looking to limit decrease of LFT.

Is there any data for how the medication has limited disease? – we do see everyone is different with progression of disease and how the medications work. Nintedanib and Pirfenidone trials shows that on average that it increased life expectancy by 50%, we wouldn't know how you would be unless we cloned you on and off the medications to see how you would personally deteriorate or stay stable. Studies have shown that this can prolong life.

Problem with lung function: I struggle to breath in as it makes me cough, don't feel like I'm giving a true reflection of my lung capacity- most common complaint during lung function as can cause difficulty, you may find we do the tests a few times to try and get accurate representation. Cough can limit the numbers slightly, if we feel results have been underestimated, we add this to lung function report so the doctors are aware you struggled with the test. Some people find drinking water helps.

What's a body box test ?- Perspex cabinet that is pressure sealed environment, momentarily block tube, to assess volume of air inside lungs. Measure residual volume.

Is this good to test for asbestosis? – LFT and gas transfer are the best to test for this.

FVC favorite for decisions to be made, determined factor for medications- why isn't DCLO given equal importance? We don't know baseline of lung capacity pre condition- imperfect rule. Lung function does vary, FVC and transfer factors vary- issue is transfer factor has more variability- ie anemia, heart failure, chest infection- can cause it to vary, so we choose the best of two readings. FVC used in studies as this has been linked to mortality- lower FVC can mean lower survival, more robust than the transfer factor.

Recent Lung Function Test at Wythenshawe test room far away could we have a temporary reception? – lab in chest clinic is an open environment, due to Covid had to restrict patients. Can't use due to social distancing. Letters amended to come to entrance 15 as now on F11, less of a walk.

When we've had lung function test is there a way to get a report on the day? – Unsure if guidance allows us to give reading out straight away. New IT system coming next year, as part of this there will be a patient facing section so you could get access to reports/clinical letters/Lung function test /Blood results through the internet.

I have a bad cough, I take morphine morning and night, when cough worse have 2.5ml Oramorph. By the time I get from the car to the lung function department, could I take my Oramorph before I do my Lung function Test?- Yes you can, as long as its within your prescribed amount for the day. Bring the things you normally use to manage SOB and cough i.e. nonmedical sweet, water, handheld fan.

IPF patients struggle with reflux- how does this effect spirometer readings? Reflux can cause burping and cough, can cause early termination of test. Reflux shouldn't influence results at all, but might make it slightly more difficult.

Every time I've had a lung function test, I have to use my oxygen to get to the room, but I am advised to be off oxygen for a period before doing the test, How does this make a difference? Oxygen does not affect the results of the spirometry tests. Oxygen use will affect gas transfer test as the oxygen is competing with the carbon monoxide to attach itself to the hemoglobin. We would usually ask once sat down ready of test and recovered, once comfortable to remove to complete test. We need to wait for 10mintues to complete gas transfer test.

Seen BBC news COVID patients own blood could treat lung scarring? Do we know any information about this? Lots of trials on lung scarring that related to long covid... whether that transfers over to lung fibrosis is something we don't know at present.

Drs have told me they have tried different formulas to get my FVC within criteria for antifibrotics, can you explain what these formulas mean? We use 2/3 robust formulas that are globally recognized. GLI (Global Lung Initiative) formula is sometimes used to try and get patients into criteria to be on medication. Our lab uses GLI although some other labs don't- making it difficult to compare results between hospital trusts

Immunosuppression and the vaccine:

Does the vaccine work on people who are immunosuppressed?

there is a small study on patients with transplants kidney/heart mostly. When you have a transplant, or if have a connective tissue disease you can be on immunosuppression such as mycophenolate.

The study measured antibodies after the first vaccine and found the levels to be very low.
Second vaccine only 30-50%
third vaccine- 80% covered.

We don't know if the antibody tests are measuring the right thing, we are measuring the spike protein. The antibodies might give you a sense of a false sense of security. Data not good enough to rely on at present.

Generally as health care providers: we are unsure if this will work in you as vaccines works by reacting to part of the virus, your body needs to create immunoreceptors to this. Although government say shielding not advised, we are advising our immunosuppressant patient to be very cautious, wear masks, avoid crowded areas and to continue to isolate. As we don't know how you have responded to vaccines.

Only limited research to clarify this.

Dr Chaudhuri is advising my patient to continue to be very vigilant as covid cases very high. Patients with fibrosis 3X more likely to pass away if you get covid.

Action for Pulmonary Fibrosis will put something on their website to advise you to be extremely careful, wear masks, avoid crowded place, stay outdoors, if indoors stay ventilated when indoors. I wouldn't change what you have been doing.

Clinicians don't agree with government about the safety of relaxing restrictions.

Will my mask protect me from others? – yes protecting others and yourself as you have a visible barrier.

A Final Note

Apologies to Yasmin as we have been meaning to include this for some time. We spoke a few meetings back about being a carer and Yasmin shared the Gujarati word for carer- Himmat, which means courage. She also shared this poem:

H—Hope, Health and Happiness

I— Is

M—Much

M—More

A—Accomplished

T—Together

Thanks for sharing this Yasmin.