MEDICAL INTERNATIONAL RESEARCH

Innovation in Spirometry Oximetry Telemedicine

Basic of Spirometry

www.spirometry.com

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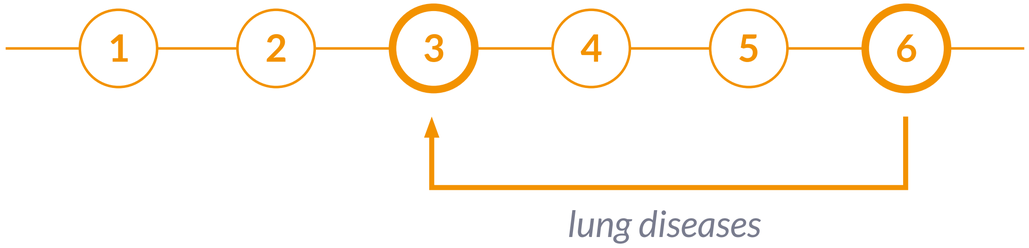
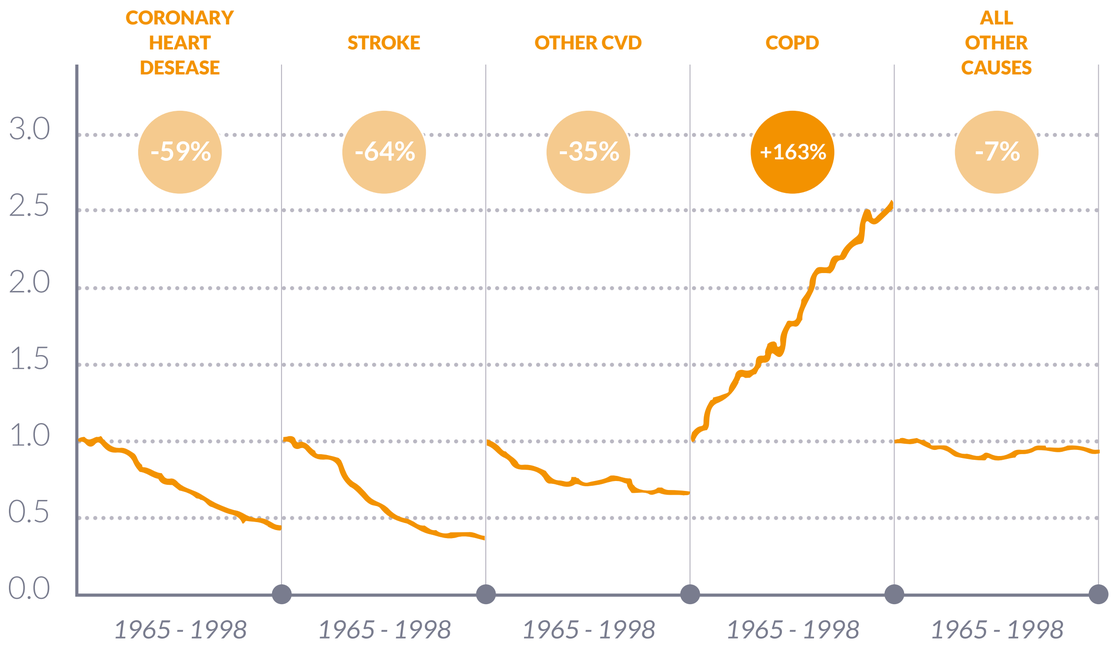
Evolution of lung diseases

Lung diseases are currently the 6th most common cause of death.
WHO predicts that lung diseases will be the 3rd most common cause of death in 2020.



While other causes of mortality (heart disease, cancer, etc) are diminishing, lung diseases continue to kill ceaselessly.

Percent Change in Age-Adjusted Death Rates, U.S., 1965-1998
Proportion of 1965 Rate
[Data: ATS, American Thoracic Society]



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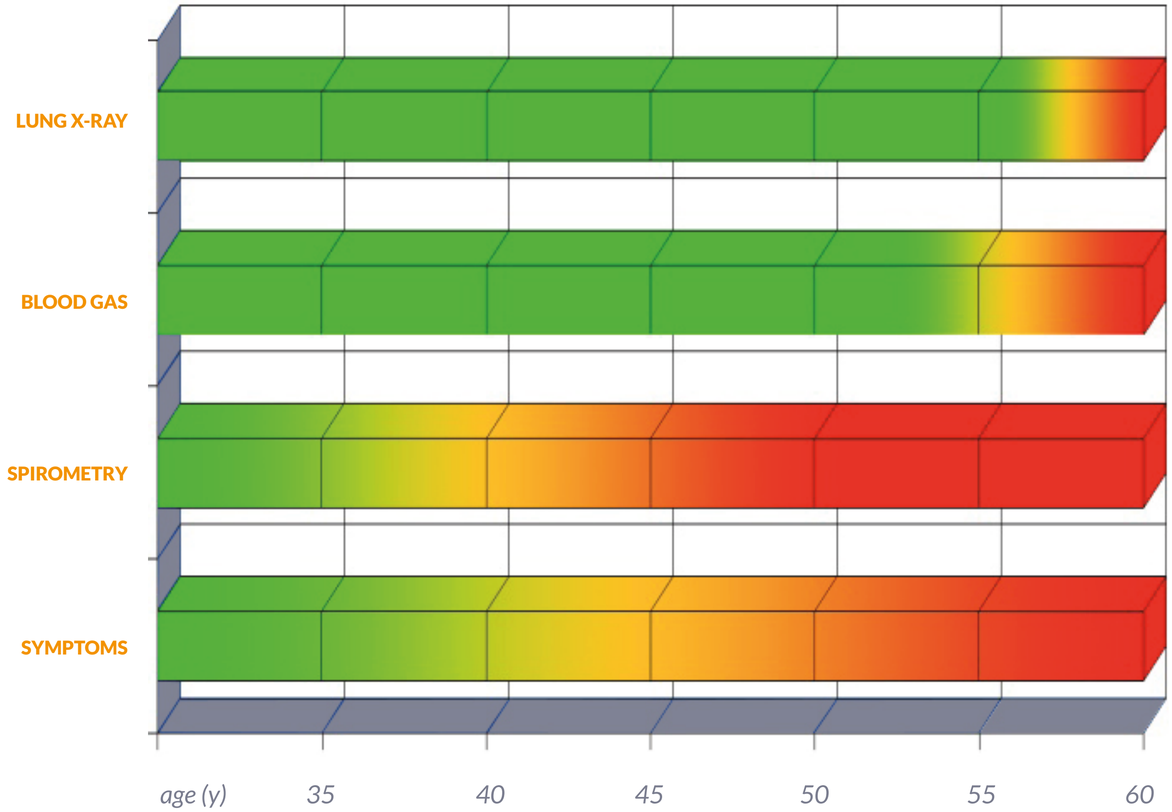
Early diagnosis of lung diseases: COPD

Respiratory diseases are very often asymptomatic and remain silent during a long period of 5-15 years. When the first symptoms become evident, the illness has already reached an irreversible stage and consequently becomes an infirmity.

The illness can be detected
with an X-ray or blood gas,
but this detection is often too late.

[Data: Hyatt et al, 1997]



Spirometry is the best standard diagnostic tool, being the most reproducible and objective for screening respiratory diseases.

GOLD, Global Initiative for Cronic Lung Disease

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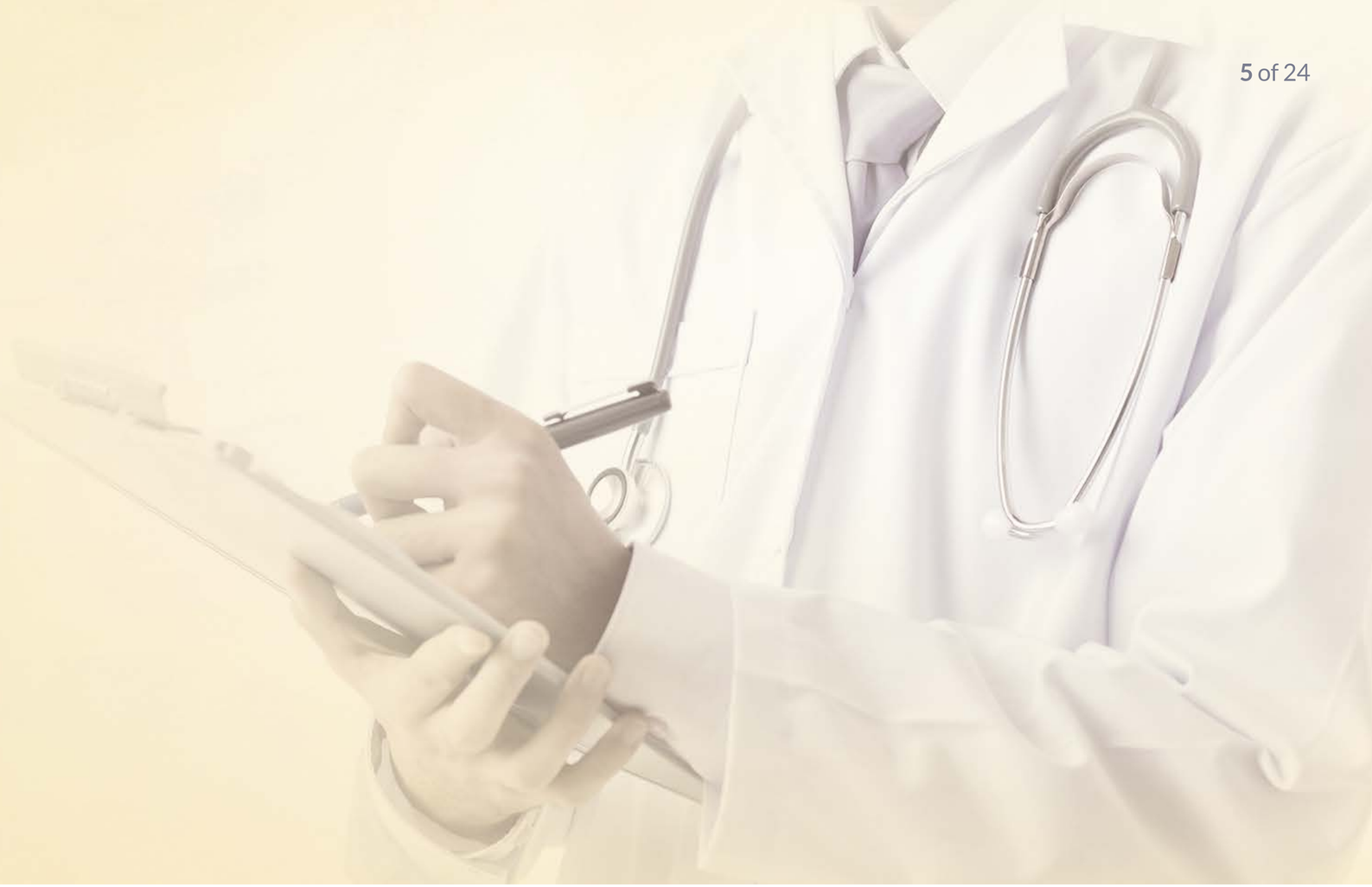
Diagnosis for smokers

A spirometry test should be routinely performed on patients ***older than 45 years*** *who report smoking cigarettes (current smokers and those who quit the previous year)*

Consensus statement from
National Lung Health Education Program
Chest 2000; 117: 1146-1161



Spirometry for all

In our experience through several national and international projects, GIVEN THE APPROPRIATE TRAINING the GP is able through the correct use of a spirometer to recognise and to diagnose COPD as well as asthma. The spirometer is one of the key tools he must use.*

* See DIDASCO abstract ATS 2002

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Lung function tests
are performed
by a spirometer

Spirometry

Spirometry is at the forefront of evaluations of respiratory function. It is a screening test.

The lung function test measures the flow (velocity) and volume of air exhaled during a forced exhalation and then a forced inhalation.

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Difference between peak flowmeter and spirometer

		CURVE IMPRESSION	SAVE	REIMBURSEMENT
	Provides the peak flow and FEV1. Does not give either the patient's curve or history. **Allows a simple follow-up of the patient.**	✗	✗	✗
	Provides the FVC (forced vital capacity) associated with time, allowing a dynamic evaluation of the time/ volume curve during the examination, in addition to the PEF and FEV1. **Allows diagnosis, screening and a detailed follow-up of the patient.**	✓	✓	✓

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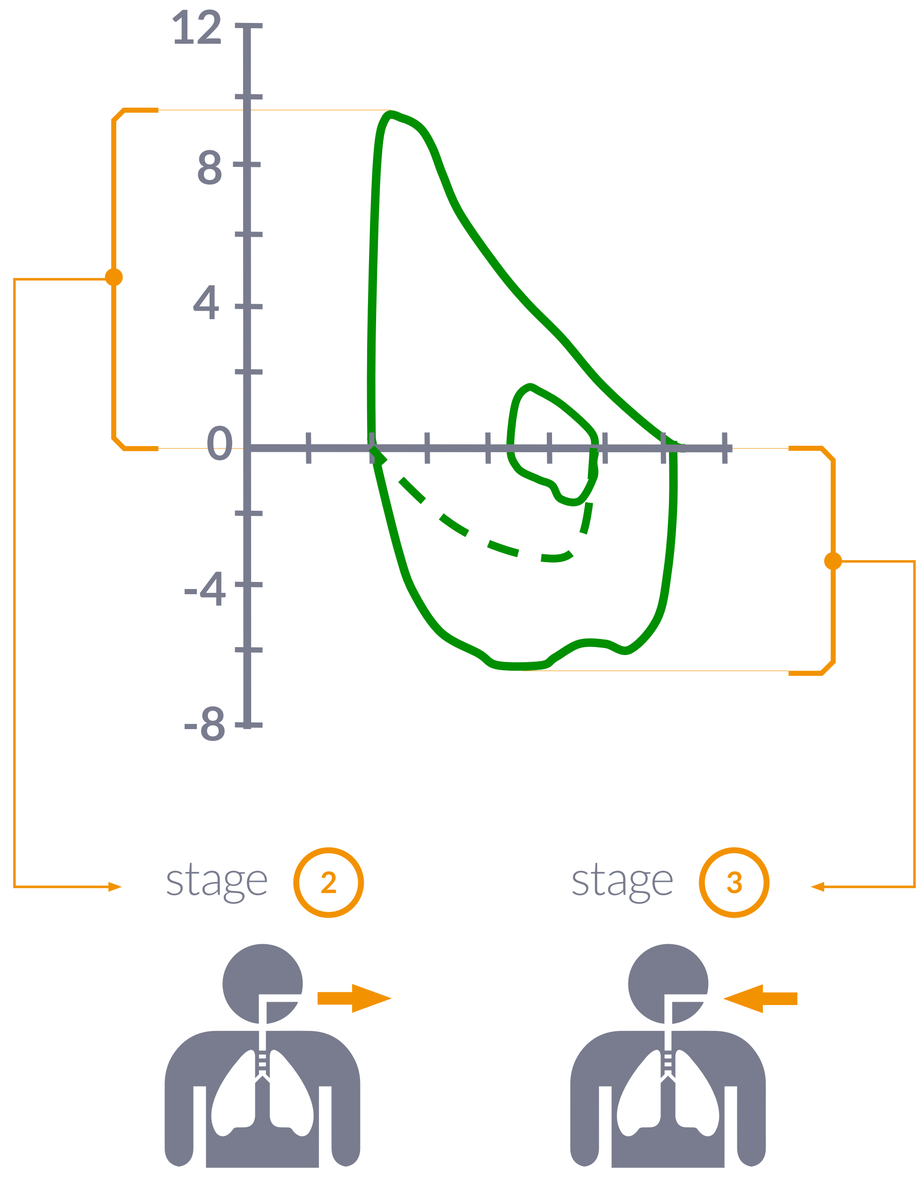
Phases of a spirometry test

The standard spirometry test is carried out in 4 stages:

1. Complete inspiration (slowly, not forced)
2. Maximum exhalation, complete and forced
3. Maximum inhalation, complete and forced
4. Normal breathing at rest

A curve is obtained that represents the flow and volume variation during phases 2 and 3 of the test.



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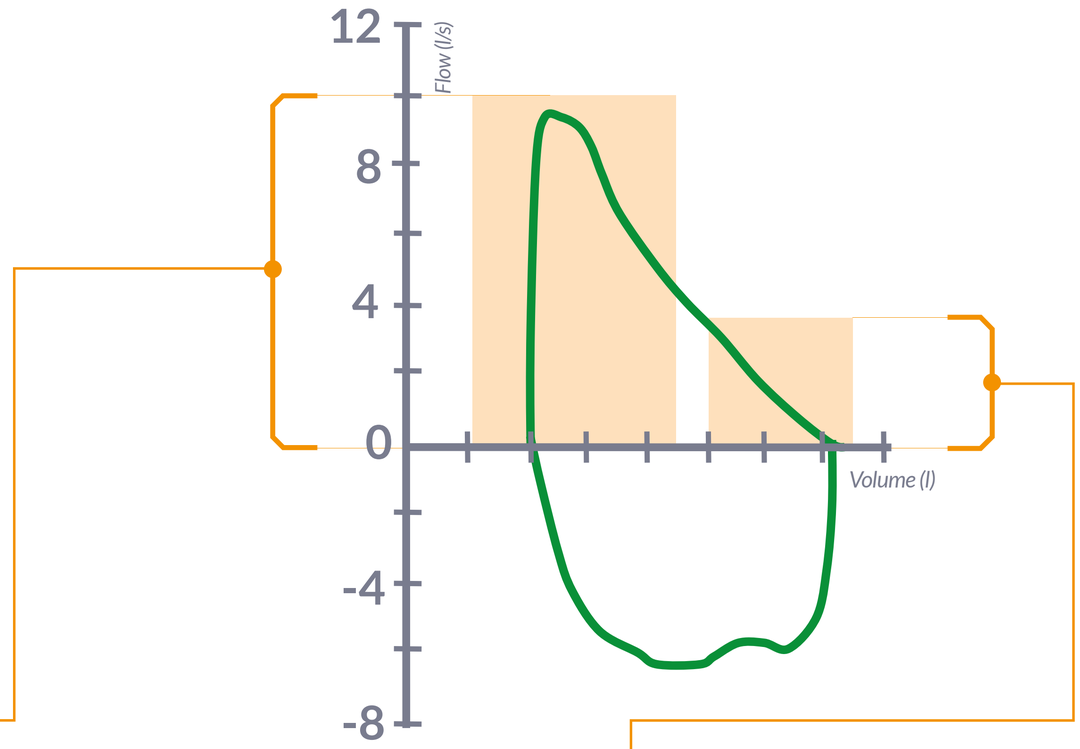
The curve and compartments of the lung

The shape of the FLOW/VOLUME CURVE therefore gives us information about the performance and functionality of each lung compartment.

The flow/volume curve is unique and characterises a person's lungs in the same way as their fingerprint. To each their own!



The first half of the expiratory curve and peak flow coming from the large airways depend on effort.
As a result, the patient's collaboration is required so that their own outline can be obtained.

The second half of the curve, which comes from the medium-sized and small airways, does not depend on effort.
Consequently, the patient is not able to modify its outline.

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Results of the test located on the curve

1 / 2

1 **PEF**

Peak Expiratory Flow

Maximum value of expiratory flow
measured during a forced expiratory test

2 **Average exhaled flow 25-75**

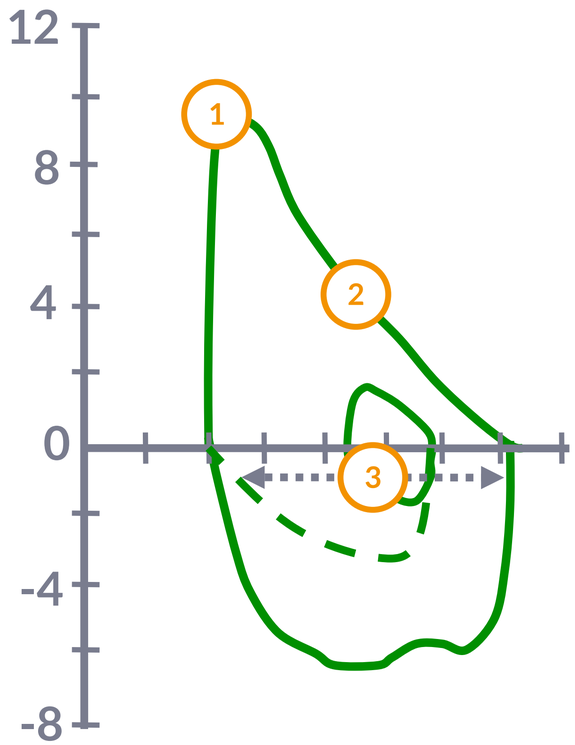
Average exhaled flow between 25 and 75 of exhaled volume

The average of the expiratory flow in the interval between 25% and 75% of the FVC

3 **FVC**

Forced Vital Capacity

Maximum volume of air that can be exhaled with force and maximum velocity after maximum inspiration



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Other results of the lung function tests

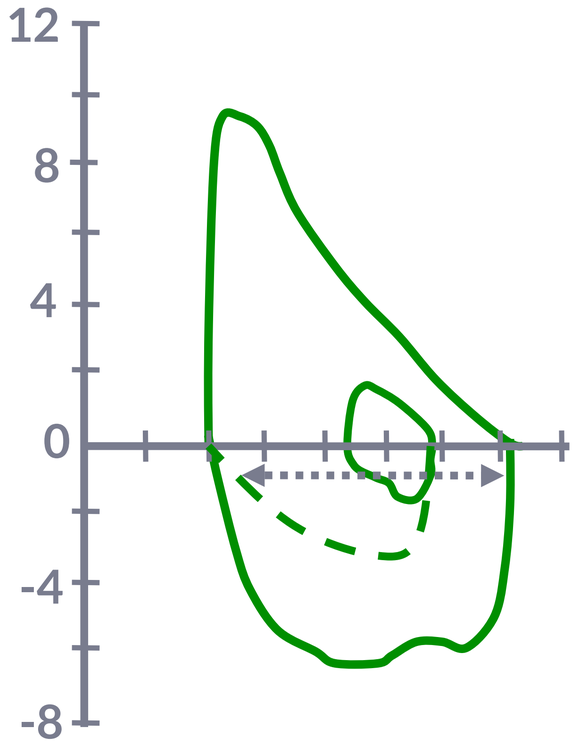
2 / 2

FEV1
Forced Expiratory Volume in 1 second
Volume of air exhaled in the first 1 second

FEV6
Forced Expiratory Volume in 6 seconds
Volume of air exhaled in the first 6 seconds

FEV%
FEV1 / FVC * 100
Forced expiratory volume in 1 second
divided by the FVC, multiplied by 100

FEV1 / FEV6
Forced expiratory volume per second
divided by FEV6



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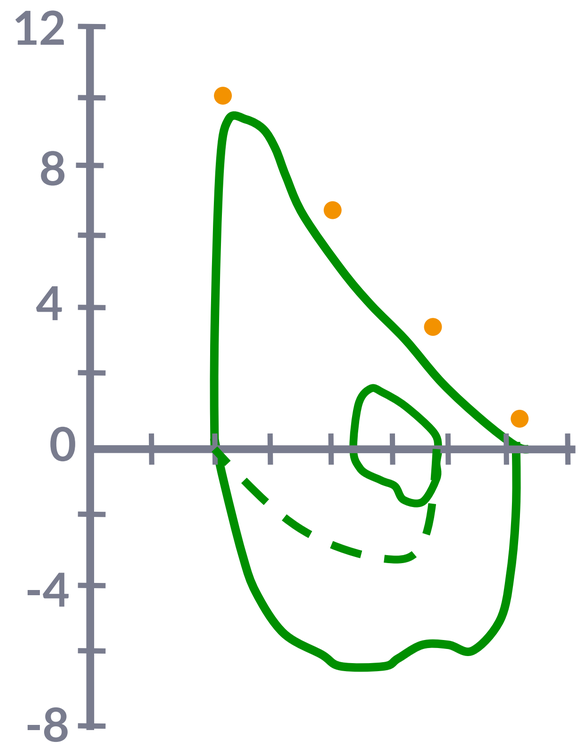
Spirometry test and theoretical values

The results of a spirometry test
are interpreted with reference to theoretical
(predicted) values.

Calculation of these values is based on:

- Age
- Height
- Sex
- Ethnic Group



The percentage of the difference between the measurement and theoretical value is significant for interpreting the test.

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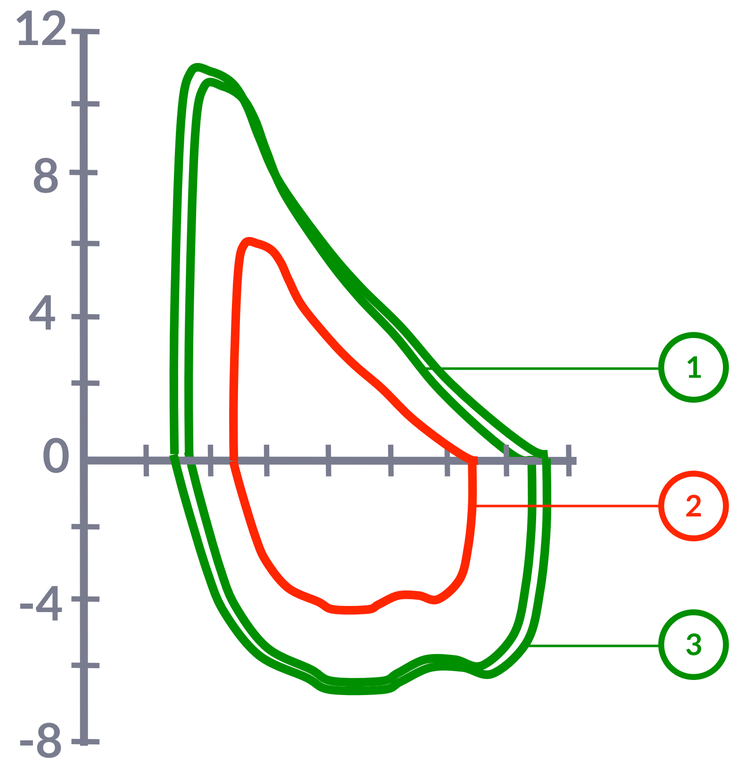
The concept of reproducibility

Carry out at least 3 acceptable tests
and a maximum of 8 tests, with:

- ✔ Difference between the two largest FVCs of less than 200 mL
- ✔ Difference between the two largest FEV1s of less than 200 mL



Curves (1) and (3) are reproducible

Curves (1) and (2) are not reproducible

Curves (3) and (2) are not reproducible

How to perform a spirometry test

1 / 5

The spirometry result can vary depending on the tests.

In order to obtain an acceptable and reliable result, **the patient's collaboration** is essential.

The test operator (physician, nurse, technician…) must be adequately trained.

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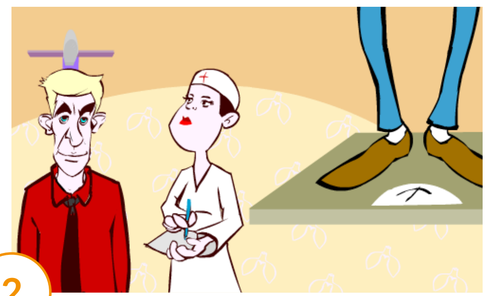
How to perform a spirometry test

2 / 5

1

No bronchodilator
half a day beforehand.



2

Measure weight
and height.

3

Enter patient data.

4

Have the patient sit
in an upright position.

5

The patient should
be seated comfortably.

6

Loosen clothing.

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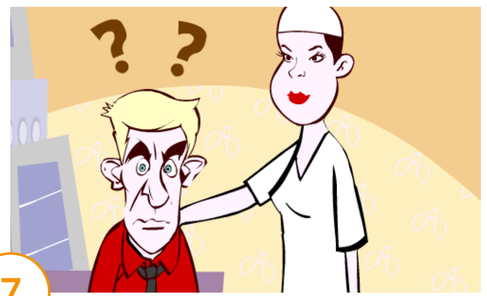
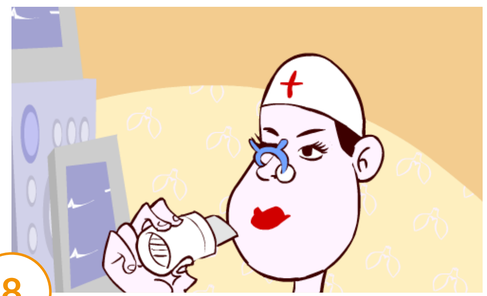
How to perform a spirometry test

3 / 5



7

Explain the procedure
to the patient.



8

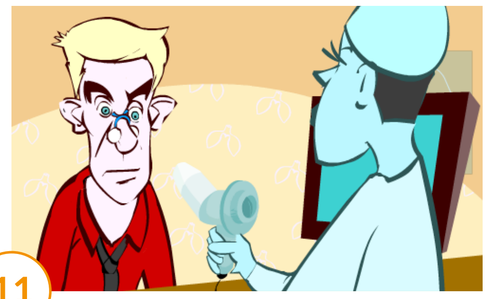
Demonstrate the
procedure if necessary.

9

Place the nose clip.

10

Insert the single-use
turbine.



11

Ask the patient
to hold the spirometer
with both hands.

12

Ensure that the
mouthpiece fits securely
in the patient’s mouth.

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How to perform a spirometry test

4 / 5

13

Breathing at rest.

14

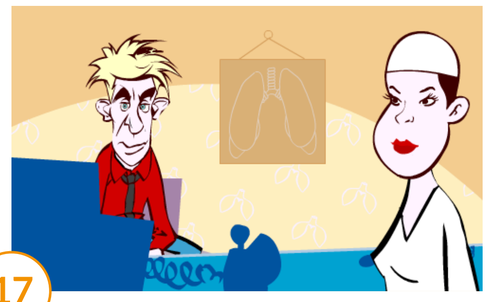
Complete inhalation.

15

Complete exhalation with force for at least 6 seconds.

16

Complete and forced inhalation.



17

Show the result to the patient.

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How to perform a spirometry test

5 / 5

Time of exhalation > 6 seconds
If breathing out does not last 6 seconds, the FEV6 cannot be obtained since this value is based on exhalation for 6 seconds.

Up to a maximum of 8 tests
Beyond that, the patient will be fatigued and unable to carry out an acceptable additional test.

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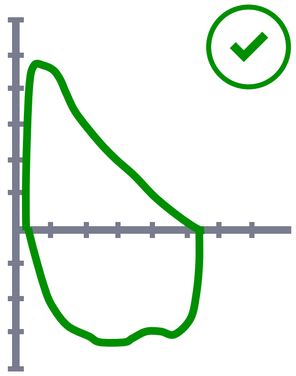
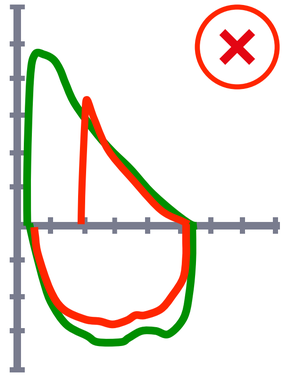
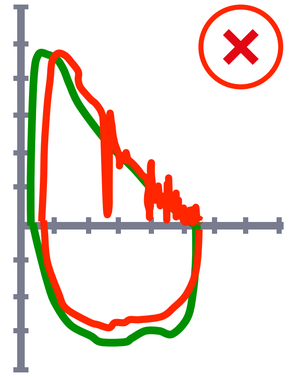
Most common errors



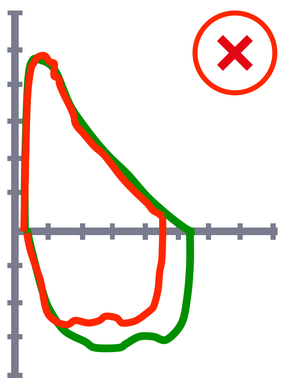
Normal Curve



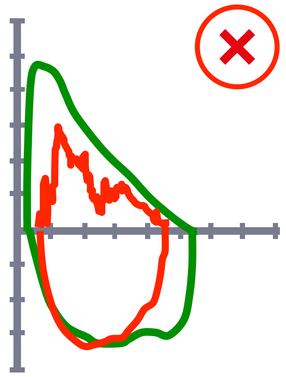
Previous inhalation
submaximal



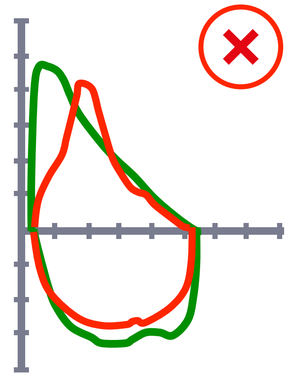
Coughing during
the test



Test stopped suddenly



Mouthpiece obstructed
or glottis closure



PEF too late
and less than maximal

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MIR distributes its quality and reliability directly or through a distribution network in more than 93 countries

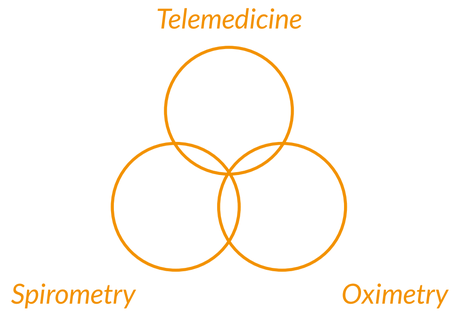
Single-use turbine

The MIR company and its entire product range has all the certifications to respond to growing market demand.

All its products have FDA certification

Single-use turbine

MIR has been working in the sectors of spirometry and telemedicine for 20 years and in oximetry for several years.



MIR products are at the cutting edge of technology thanks to its investments in R&D.

SOFTWARE

DEVICES

TECHNOLOGY

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Secure packaging

Tested and packed individually

Single-patient sensor

No sterilisation

No calibration

No cross-contamination

No antibacterial filter

Always 100% hygienic

ATS/ERS certification

Not affected by condensate

Not affected by ambient conditions

The best sensor for spirometry

“FlowMIR” single-use turbine: advantages

Technical description

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“FlowMIR” single-use turbine: the best sensor

The best sensor

	PNEUMOTACH	ULTRASONIC	TURBINE
			
Influence on results: • *Pressure* • *Humidity* • *Temperature* • *Viscosity*	YES	YES	NO
Measurements changes due to condensation of water vapour in expiration	YES	NO	NO
Requires calibration	YES	YES	NO
Hygiene	✔ *Not perfectly hygienic because of its lack of insulation*	✔ *Not perfectly hygienic because of its lack of insulation*	✔ *Flawless insulation and hygiene*

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