

## Lungs Exam

Examination of the lungs is best performed with the patient sitting down and the upper body undressed.

Inspection can already yield signs for pulmonary conditions, such as a barrel chest caused by emphysema. Additional diagnostic clues include an altered respiratory rate, an imbalance between inspiration and expiration, or signs of dyspnea, such as intercostal retractions or a notable use of the accessory muscles of respiration.

Now begins the percussion of the lungs.

The examiner places one middle finger firmly on the patient's chest and strikes it with the middle finger of the other hand. Physiologically, the air-filled pulmonary tissue should produce a resonant sound. Below the level of the lungs, auscultation produces a dull sound.

Percussion of the lungs is always performed on both sides and should follow a predetermined pattern. The examination usually starts cranially, about a hand's width lateral to the spine and then moves caudally, alternating between both sides. In the lower thoracic area, percussion is also conducted from medial to lateral. Dullness to percussion can indicate effusion or, for example, a tumor. In contrast, hyperresonance results from emphysema or pneumothorax.

The mobility of the lungs is best assessed by first determining the transition from resonance to dullness on complete exhalation, which corresponds to the inferior border of the deflated lungs. Percussion is then repeated on maximum inspiration to find the border while the lungs are inflated. The distance between both borders determines pulmonary respiratory mobility.

Unilateral dullness to percussion should always be compared to the other side to confirm the finding. Pleural effusion typically presents as dullness that rises from medial to lateral.

Respiratory expansion of the thorax can be checked by palpation. During expiration, the examiner places both hands on the lateral thorax and applies mild pressure to create skin folds. On inspiration, these folds should vanish bilaterally. In case of impaired ventilation, for example in atelectasis or pneumothorax, respiratory expansion can be asymmetric.

Palpation is also used to assess tactile fremitus.

If the patient is asked to say the words "Ninety-Nine" in a deep voice, mild vibrations should be felt in the lower lung segments, around the level of the 8th to 10th rib. Increased tactile fremitus, which indicates increased sound conduction, can be found in, for example, pneumonia, whereas decreased fremitus - and therefore decreased conduction - can result from pleural effusion.

Closely related to tactile fremitus, is bronchophony. The patient is asked to whisper "sixty-six" while the examiner auscultates the lungs. In states of increased sound conduction, the whisper is louder. If sound conduction is decreased, it is quieter, or may disappear completely.

The most important test when examining the lungs is auscultation while the patient is breathing regularly and through the mouth. It follows the same pattern as percussion. Auscultation allows evaluation of the breath sounds, which can be diminished or increased, for instance. Furthermore, the ratio of inspiration to expiration time should be noted. Auscultation may also reveal other abnormal findings, such as dry or wet crackles, or pleural friction rub.

Breath sounds heard over normal pulmonary tissue are vesicular. Auscultation across the upper airways results in bronchial breath sounds, which have a higher pitch in comparison. Bronchial breath sounds heard over pulmonary tissue are considered pathological and hint at the presence of pneumonia.

Evaluating the right middle lobe is best achieved through anterior auscultation. Therefore, if pneumonia is suspected, the lungs should always be examined from the anterior as well.

Auscultation is not limited to the lungs, but should also include the trachea. Tracheal stenosis produces inspiratory stridor, which can best be heard posteriorly in the paravertebral area, or anteriorly above the sternum.