Student Roll No: CL24M013

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Departments Visited	Date
Neurology	12/0/2025

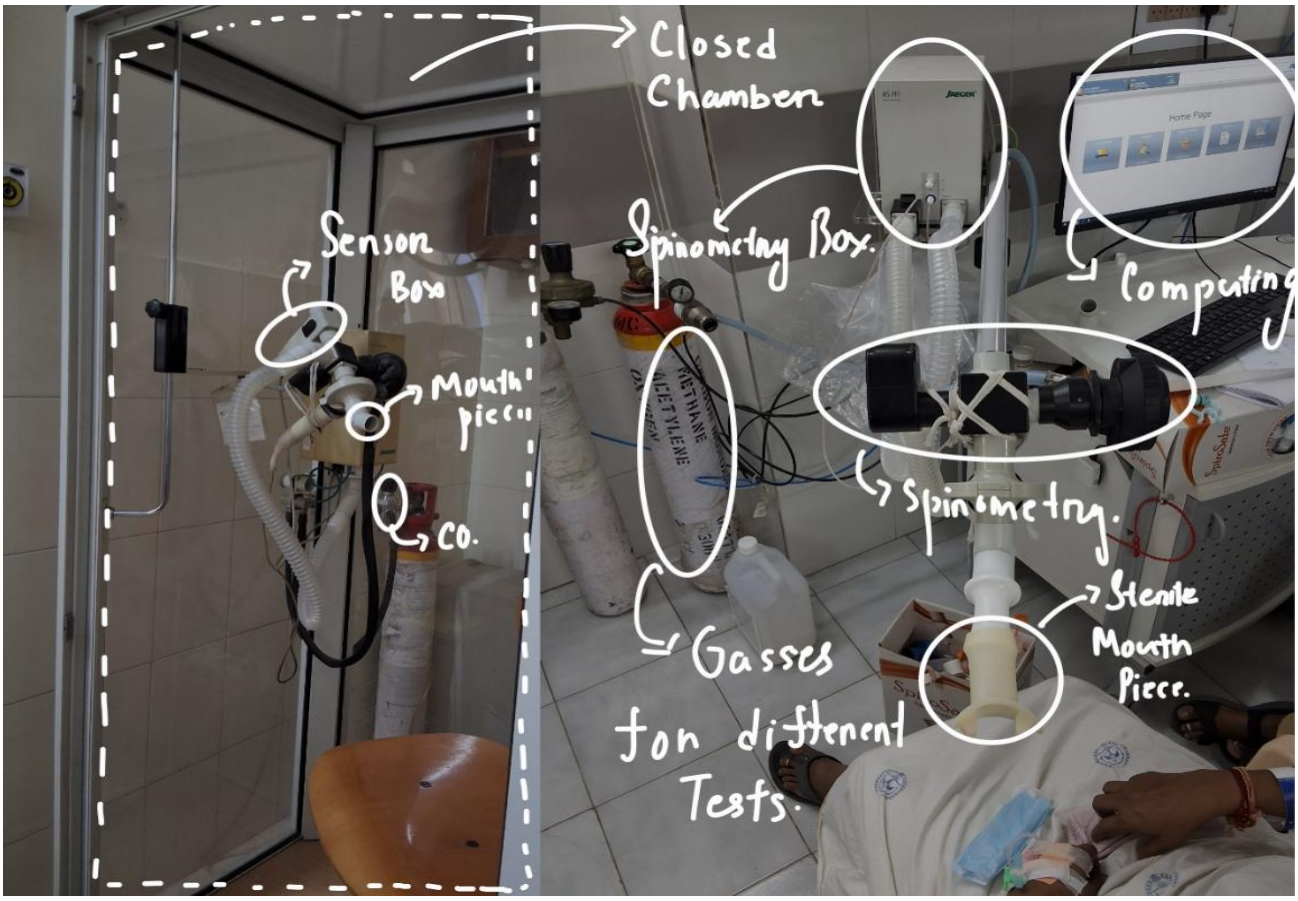
I have attached photos of our visit, which were clicked after permission from the guiding doctor, assistant & patient. The images will only be used for educational Purposes.

Respiratory Medicine Department

Start Time: -14:20 | Clinician: - Sukesh Chandran and assistants | End Time: -15:30

Lab Area.

The study of respiratory medicine involves various diagnostic techniques, including spirometry, bronchoscopy, and sleep studies, performed in specialized lab areas. Spirometry, a key lung function test, is conducted using advanced equipment imported from Germany and Switzerland, distributed through Chennai for maintenance and servicing. It helps in early and routine bronchial health checks by measuring Forced Expiratory Volume (FEV1) and Forced Vital Capacity (FVC) simultaneously. The test generates a flow-volume curve, where the ability to exhale at least 70% of total lung capacity within the first second indicates normal airway function.



A decline in this percentage suggests possible airway obstruction, commonly seen in conditions like asthma and COPD. Since spirometry is effort-dependent, patient cooperation is essential for accurate results. In addition to spirometry, lung function testing also involves residual volume measurement, which cannot be directly recorded. Instead, indirect methods such as helium dilution, body plethysmography, and nitrogen washout are used. These methods rely on the inertness of gases and are time-dependent, with equilibrium reached under controlled conditions. Body plethysmography follows Boyle's Law, where changes in lung pressure within a sealed chamber help estimate lung volumes while keeping temperature and pressure constant. Overall, these tests provide crucial insights into pulmonary function, aiding in the diagnosis and management of respiratory diseases.

Lung function testing also includes the assessment of alveolar and blood diffusion capacity, where gases like carbon monoxide (CO) and oxygen (O_2 at 0.3%) are used to analyze how efficiently the lungs transfer gases into the bloodstream. A healthy individual should exhibit a diffusion capacity of more than 80%, ensuring effective oxygenation. This test helps in diagnosing restrictive lung diseases, which affect lung expansion, and obstructive lung diseases, which impact airflow through the airway pathways. Another critical parameter measured is total lung capacity, which is essential for detecting conditions like diaphragm paralysis. For more precise diagnoses, high-end tests such as bronchoprovocation are performed. This test involves controlled exposure to substances like Lung function testing also includes the assessment of **alveolar and blood diffusion capacity**, where gases like **carbon monoxide (CO)** and **oxygen (O_2 at 0.3%)** are used to analyse how efficiently the lungs transfer gases into the bloodstream. A healthy individual should exhibit a **diffusion capacity of more than 80%**, ensuring effective oxygenation. This test helps in diagnosing **restrictive lung diseases**, which affect lung expansion, and **obstructive lung diseases**, which impact airflow through the **airway pathways**. Another critical parameter measured is **total lung capacity**, which is essential for detecting conditions like **diaphragm paralysis**. For more precise diagnoses, **high-end tests** such as **bronchoprovocation** are performed. This test involves controlled exposure to substances like **methyl choline** in varying concentrations to determine airway sensitivity, making it useful for diagnosing **allergy-related respiratory conditions**.

Various advanced equipment is used for these tests, including devices from **NDD (Ezion Pro)** and **Jaeger Master Screen**, which comply with **PF1 and ISO standards**. These high-end lung function analyzers cost around **35 lakhs**, ensuring accuracy and compliance with guidelines set by the **American Thoracic Society**. Regular **calibration** of these machines is necessary to maintain precision in measurements, ensuring reliable and reproducible results in respiratory diagnostics.

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Sleep tests are conducted to diagnose Obstructive Sleep Apnea (OSA), a condition characterized by snoring and repeated interruptions in breathing during sleep. These tests use nasal-based sensors, ECG, and SpO_2 monitoring to collect physiological data. The collected parameters are analyzed together to identify sleep disturbances, with a diagnosis confirmed if there are 30 or more apnea events per hour.

If the test results are positive, further evaluation may involve an ENT consultation to determine if surgery is required. An alternative treatment is the Auto C-PAP, a pneumatized device that helps maintain airway patency. This device costs around ₹80,000 and is particularly useful for patients with issues related to tongue and pharyngeal muscle relaxation.

A more detailed sleep study, polysomnography, records additional EEG parameters to assess brain activity and sleep architecture. In cases where lung function abnormalities are suspected, bronchoscopy may be performed, which includes biopsy analysis for further investigation.

Pathophysiology of COPD

Chronic Obstructive Pulmonary Disease (COPD) is a progressive lung disorder characterized by persistent airflow limitation due to chronic inflammation, mucus hypersecretion, and alveolar destruction. Long-term exposure to irritants like cigarette smoke and pollutants triggers an immune response, leading to airway narrowing, fibrosis, and excess mucus production. In emphysema, alveolar walls break down due to protease-antiprotease imbalance, reducing gas exchange efficiency and causing air trapping. This leads to lung hyperinflation, hypoxemia, and hypercapnia, increasing the risk of pulmonary hypertension and core pulmonale. COPD also has systemic effects like muscle wasting and cardiovascular complications. Although irreversible, COPD can be managed through bronchodilators, corticosteroids, oxygen therapy, and lifestyle modifications to slow disease progression and improve quality of life.

Technology Used

Here the listed technologies were used for diagnostic purpose in the clinics.

1. ***Spirometry***
2. ***Body Plethysmography***
3. ***Helium Dilution***
4. ***Nitrogen Washout***
5. ***Diffusion Capacity Testing (DLCO)***
6. ***Bronchoprovocation Test***
7. ***Polysomnography (PSG)***
8. ***Auto C-PAP***

9. ***Nasal-Based Sensors***
10. ***Bronchoscopy***

These were the main technologies used for diagnostic purposes in the Respiratory Medicine department.

Limitations/Problems and their Solution.

Problem: During COVID-19 like situation the respiratory department was shut because of infection spread. Can a disposable spirometer be developed.

Solution: The idea is to develop a disposable spirometer using biodegradable material and use a mobile based app to analyse the values.