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Implementation of a COPD Eradication Program Multidisciplinary Program for Prevention, Diagnosis, and Management of Pre-COPD

Puesta en Marcha de Erradicación de la EPOC. Programa Multidisciplinario de Prevención, Diagnóstico y Manejo de la Pre- EPOC

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ABSTRACT

Chronic obstructive pulmonary disease (COPD) is preventable by definition; however, there are some steps that need to be taken in order to attain that goal. Its heterogeneous nature is one of the main obstacles and challenges. In this regard, the risk factors for COPD are evolving beyond smoking. Despite the precision of the spirometry in diagnosing COPD, it is not sensitive enough to identify individuals at risk, thus, a new approach is required for precision medicine in lung health. For that reason, we launched a Multidisciplinary Unit with new approaches to prevention, risk prediction, definition, diagnosis, and treatments that can make significant changes. The goals are focused on preventing the development of COPD through a new medical care approach intended for patients in the Pre-COPD stage, as well as translational research for understanding the theragnostic markers of the disease.

Key words: COPD; Pre-COPD; Early diagnosis

RESUMEN

La enfermedad pulmonar obstructiva crónica (EPOC) por definición es prevenible sin embargo aún faltan gestos para alcanzar este objetivo. Su carácter heterogéneo es uno de los principales obstáculos y retos. Al respecto, los factores de riesgo de EPOC están evolucionando, más allá del fumar. La espirometría a pesar de su precisión en el diagnóstico de la EPOC, no es sensible para identificar individuos de riesgo por lo que se requiere de un nuevo abordaje de medicina de precisión en la salud pulmonar. Es por ello que lanzamos una unidad multidisciplinaria de nuevos abordajes de prevención, predicción de riesgos, definición, diagnóstico y tratamientos que puedan generar cambios significativos. Los objetivos se focalizan en evitar el desarrollo de la EPOC a través de un nuevo enfoque en la asistencia médica del paciente en la etapa Pre-EPOC, como así también en la investigación traslacional para el conocimiento de marcadores teragnósticos de la enfermedad.

Palabras clave: EPOC; Pre-EPOC; Diagnóstico precoz

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is one of the leading causes of death worldwide and represents a significant burden on public health in terms of lost productivity and direct, indirect, and associated costs[1]. According to its definition,[2] COPD is preventable. But, unlike other chronic diseases such as cardiovascular diseases, very few efforts have been made to attain that goal, probably due to its heterogeneous nature.

Currently, COPD poses important challenges. First of all, the global pattern of COPD risk factors is evolving. Although smoking is the main contributor to COPD,[3-4] other risk factors such as exposure to environmental pollution in low socio-economic countries have become important, as well as vaping and marijuana in young people.[2] In fact, one-third of COPD cases are not related to smoking or environmental exposure, but rather to physiopathogenic mechanisms involved in the trajectory of lung function since the early stages of life, such as low birth weight, prematurity, and intrauterine toxic exposure; childhood infectious and obstructive respiratory diseases, the effects of tuberculosis, and physical inactivity.[5]

Secondly, COPD often has late diagnosis. While spirometry is a non-invasive, accessible, and reproducible test with diagnostic precision for COPD, it is not the most sensitive test to identify individuals at risk before they get sick, because by the time the spirometry detects an obstruction or restriction, significant damage to the airways has already occurred.[6-10]

Finally, current scientific perspectives emphasize the *eradication of COPD*[10, 11]. In this sense, Martinez et al[13] have proposed the concept of focusing on a **pre-COPD** stage in order to achieve these objectives. It is hopeful to be able to identify individuals at risk of developing COPD and to implement preventive and follow-up measures, or possible early therapeutic interventions in this group of patients in order to modify the course of the disease and reduce morbidity and mortality, and the burden on public health.

Consequently, the current risk model and prediction instruments are inadequate and require a new approach to *precision medicine* in lung health. This is why we launched a *Multidisciplinary Unit* of new approaches to prevention, risk prediction, definition, diagnosis, and treatments that can make significant changes.

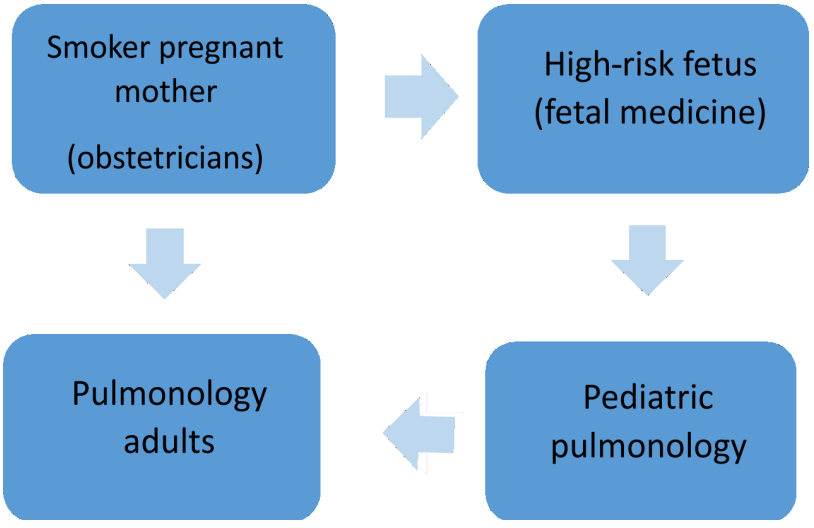
The objectives of the Pre-COPD unit are

- To identify risks of respiratory diseases during gestation and intrauterine development.
- Emphasize the prevention of risk factors, early diagnosis, and treatment of obstructive respiratory diseases during childhood.
- Preserve lung health and primary prevention of COPD.
- Detect risk factors in early stages and stratify them.
- Optimize the care of patients at risk.
- Modify the course of the disease.
- Educate and raise awareness among the population about COPD prevention and care.
- Generate translational research activities in the field.
- Train human resources with expertise in the area.

Medical assistance services

- Prevention and diagnosis of respiratory diseases during pregnancy.
- Prevention, diagnosis, and treatment of obstructive and infectious respiratory diseases during childhood.
- Follow-up of children with high-risk of respiratory disease until adulthood.
- Care for teenagers and young adults with exposure to risk of respiratory disease.
- Primary prevention of COPD in high-risk groups.
- Early diagnosis of COPD – Pre COPD.
- Medical assistance for smoking cessation.
- Personalized care for patients at risk of developing COPD in order to prevent the development of the disease.
- Respiratory rehabilitation.
- Education of the patient and his/her family regarding COPD prevention and care.

This comprehensive care starts from conception, identifying smoking mothers and fathers at risk of developing COPD; pregnancies at risk of developing respiratory disease; children aged 0 to 15 with obstructive and infectious respiratory disease; adults 16 to 55 years, with or without respiratory symptoms, smokers, and individuals exposed to inhalable materials such as all kinds of smoke, dust, and irritating and chemical vapors. In this way, the patient is identified and diagnosed, a personalized treatment is administered, and periodic



According to the patient's age group, the treating physician varies. The obstetrician refers parents with risk of COPD to the adult pulmonologist, while the newborn is referred to the pediatrician. The pediatrician then refers the patient to the adult pulmonologist for clinical/functional follow-up and prevention of disease development when the patient reaches 16 years of age.

Figure 1. Flow of patients at risk of developing COPD

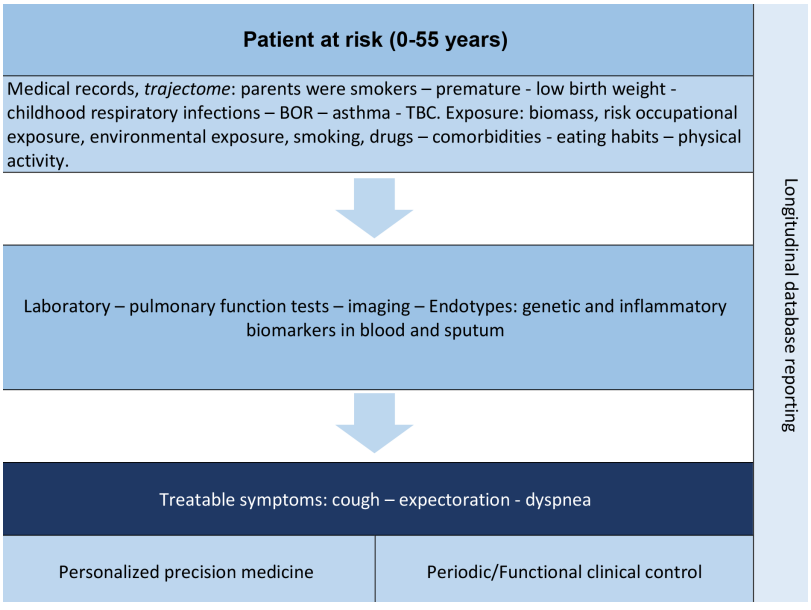


Figure 2. management of pre-COPD. Data to be collected, actions and follow-up

follow-up and evaluation are carried out in order to preserve functional lung capacity and respiratory health. Figure 2 (https://www.sanatorioallende.com/landing/unidad-de-pre-epoc#general).

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Teaching - human resources training - community outreach activities

Monthly meetings are held at the institution with the members of the Unit to discuss clinical cases in order to improve their management, update the related bibliography, research, and plan outreach activities for the population. In terms of human resources training, two fellows are pursuing their doctoral degrees in the area. Virtual campaigns are conducted annually regarding COPD awareness, early diagnosis, and smoking cessation.

Research

COPD is heterogeneous in its mechanisms of development and progression, and is drastically different in each patient, thus requiring the use of precision medicine for its approach.[14] In this sense, there are significant gaps in the research being conducted worldwide, with limitations in the understanding of the disease's development mechanisms that hinder the progress of *precision medicine*. To fill these gaps, research is necessary at the cellular, molecular, and genetic levels; likewise, the development of imaging technologies and the detailed analysis of clinical data promise to provide an unprecedented level of clarity regarding the knowledge of physiopathogenic mechanisms of the disease and to prevent its development.

The actions that the Unit is carrying out in this regard, focusing on a *precision medicine*, are:

- Storage, analysis, and monitoring of clinical and functional data of patients at risk of developing COPD in the digital REDCAP system for longitudinal data analysis (Graphic 2).
- Translational research on the mechanisms of COPD development. Cellular and omic (proteomic, genomic) analysis in cooperation with basic researchers from the *Universidad Nacional de Córdoba*.
- Analysis of potential early *theragnostic* COPD markers.

According to the involved specialty, a ***trajectome*** is prepared, that is to say, the patient's entire history of risk and functional factors in the different stages of respiratory development is included. A phenotype and inflammatory endotypes are identified. Depending on the symptoms, the therapeutic approach is personalized and precise, and includes hygienic and dietary measures. The clinical and functional follow-up is periodic, and the data are stored for subsequent analysis.

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