

# ARTIFICIAL INTELLIGENCE (AI) IN EARLY DETECTION OF EXACERBATIONS AND TREATMENT ADHERENCE, PILOT CASE

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## INTRODUCTION

Cystic Fibrosis (CF) is characterized by exacerbations that lead to a progressive deterioration in patients' quality of life. This deterioration is also contributed to by the loss of adherence to treatments. CFTR modulators present new challenges as patients experience fewer exacerbations and with milder signs and symptoms.

As their quality of life improves, adherence to treatment tends to decrease, the clinical significance of which in the medium and long term has not yet been elucidated. Having a tool that allows us to monitor these parameters helps optimize treatments.

## MATERIAL AND METHODS

A "Conversational AI for CF" tool (FIBRA) was created, which communicates via text messages using the TELEGRAM app and allows the collection of symptom and sign parameters, gathering data on patient adherence.

FIBRA has an AI engine based on an innovative technology called Dialog Description Language (DDL), the result of 15 years of research and development. Using DDL, FIBRA can interpret what the user and/or doctor requests or can respond to a question. The powerful natural language processing AI of DDL performs the data collection task that a doctor would do with their patient daily.

FIBRA is cloud-based, simply a contact on the Telegram app, a lightweight and secure chat application that does not reveal the user's phone number, who only needs to have data, minimizing installation friction.

FIBRA collects 5 data points: cough, sputum, fatigue, lack of appetite, and dyspnea on a 4-level Likert scale: less, same, more, or much more. These daily collected data provide information for evaluating the daily evolution of a patient's condition.

The collected data feeds into an AI model that determines the degree of risk, delivering a three-level alert system: green, yellow, and red.

The protocol FIBRA follows is that if there is a red alert or two consecutive days of yellow, the system notifies an Emergency Telegram group, detailing the data that triggered this, along with changes in symptoms.

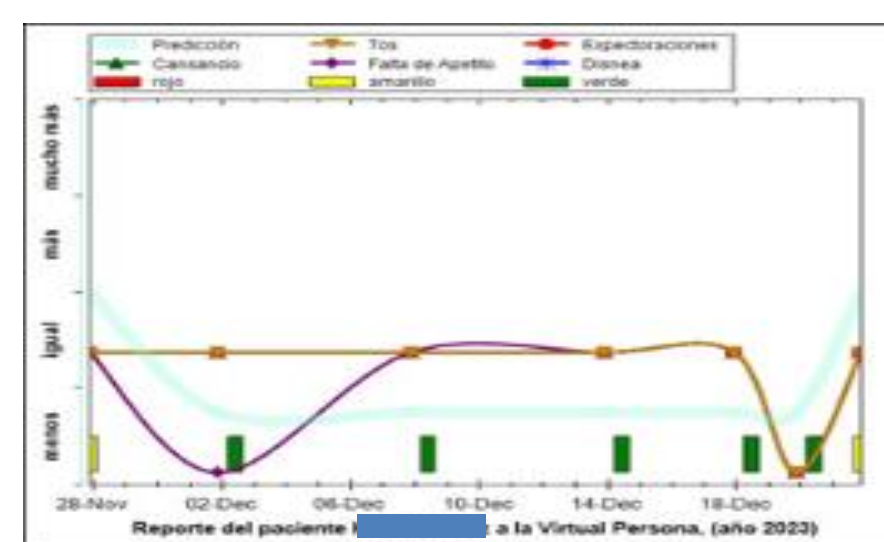
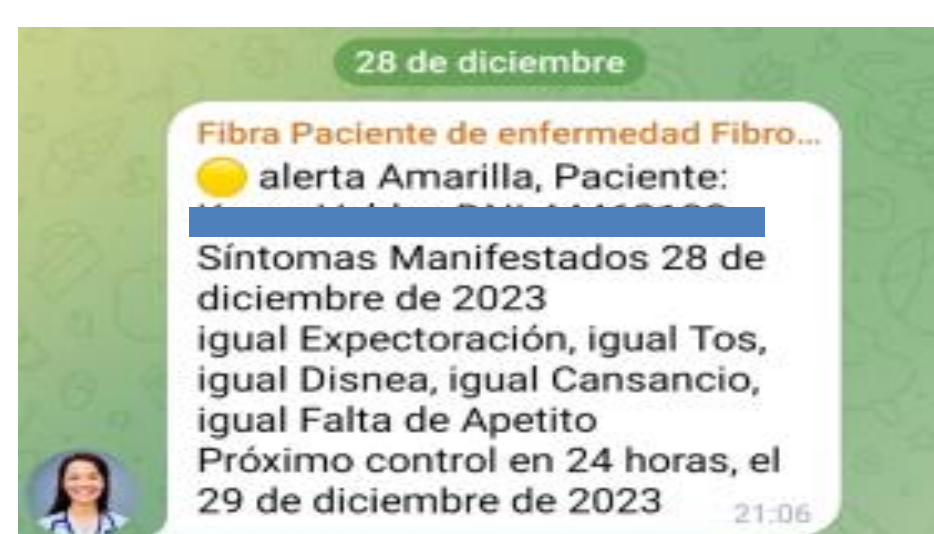
Additionally, it graphs the patient's signs and symptoms over a specified period, allowing the medical team to have a projection of the patient's symptoms over time.

## PILOT CASE

KV. Female, 21 years old.  
Bilateral bronchiectasis.  
Exocrine pancreatic insufficiency.  
CF-related diabetes.  
Sweat test: 65 mmol/L, 68 mmol/L.  
Molecular: F508del/F508del.  
Intermittent colonization with methicillin-resistant *Staphylococcus aureus* (MRSA).

Frequent exacerbations before triple therapy.  
Elezacaftor 100/ Tezacaftor 50 / Ivacaftor 150; 75, 3 tablets per day, since April 2022.

The patient remained stable during the months prior to the start of FIBRA symptom and sign monitoring (August 2023), without having contacted for symptoms attributable to exacerbations. On December 28th, a yellow alert is issued by the system, which repeats until January 4, 2024.



Graph along with the message that FIBRA delivers to the doctor

Telephone communication with the patient indicates that the symptoms are mild. FIBRA alerts that these persist for the next 48 hours, generating a yellow alert again. After communicating with the medical team, it is decided to administer antibiotics with coverage for MRSA. In 48 hours, the symptoms partially remit, and after 7 days of treatment, the patient reports feeling well.

## DISCUSSION

Early detection of exacerbations is a key element for real-time monitoring of symptoms and signs, allowing the medical team to quickly access this data and make decisions regarding the best treatment for the patient.

The FIBRA tool, developed based on conversational AI and operated via cell phone, does not require the medical team to monitor each patient's follow-up daily. Instead, the system does it methodically.

The graphic record it generates allows access to data over several days, enabling the observation of the patient's evolution.

These alert systems must have adequate sensitivity and specificity to avoid overloading medical attention with non-significant alerts or, conversely, missing symptoms or signs that indicate an exacerbation requiring treatment.

At the same time, it allows adjusting the alert to mild symptoms or signs that persist over time, enabling the medical team to decide if it's relevant to contact the patient directly.

The next step is to have a larger number of patients to allow FIBRA to be adjusted to respond to care demands optimally.