

Patient Journey Dashboard

Introduction

The **Patient Journey Dashboard** is a vital component of the exploratory data analysis phase for this project. It helps healthcare professionals visualize and analyze time-series patient data to identify early warning signs of Cytokine Release Syndrome (CRS) in patients undergoing CAR-T cell therapy for multiple myeloma.

Why the Dashboard Was Created

CRS is a potentially life-threatening condition associated with CAR-T therapy. Early detection is crucial for timely intervention and better patient outcomes. This dashboard was designed to:

- Provide an intuitive platform for visualizing patient data over time.
- Highlight CRS transitions with actionable insights.
- Facilitate data exploration to support machine learning (ML) model development for CRS prediction.
- Enable efficient analysis of biomarkers, wearable data, and treatment variables.

What the Dashboard Does

- **Interactive Data Exploration:**
 - Visualize multiple biomarkers or physiological parameters over time.
 - Compare one variable across multiple patients or multiple variables for a single patient.
- **CRS Event Highlighting:**
 - Annotates transitions in CRS occurrence:
 - $0 \rightarrow 1$: "Patient has CRS on [date/time]."
 - $1 \rightarrow 0$: "Patient has no CRS on [date/time]."
 - Marks CRS-positive points (CRS = 1) in red for easy identification.
- **Data Insights:**
 - Generates summary statistics for selected variables.
 - Displays correlation heatmaps to reveal variable relationships.
- **Customizable Visualizations:**
 - Choose plot types (line, scatter, bar) and themes.
 - Apply rolling window smoothing for trend analysis.
- **Distribution Analysis:**
 - Visualize histograms or density plots for variable distributions.
- **AI Integration:**
 - Generate custom insights using the Claude AI tool with free-text prompts.

How to Use the Dashboard

1. Filters & Controls

Patient & Variable Filtering:

- Use the sidebar to select individual patients or all patients.
- Choose variables of interest for visualization.

Comparison Modes:

- Multiple Variables per Patient: Compare several metrics for a single patient over time.
- One Variable Across Patients: Compare a single metric across multiple patients.

Data Range Filtering:

- Use a slider to filter data based on the time index.

2. Plot Customization

- Select plot types (line, scatter, bar) and themes.
- Apply rolling window smoothing for clearer trends.

3. Main Dashboard Features

CRS Highlighting: View CRS occurrences in time-series plots with annotations indicating transitions.

Correlation Heatmap: Discover relationships between selected variables.

Summary Statistics: Analyze key metrics (mean, standard deviation, etc.) for selected variables.

Distribution Analysis: Generate histograms or density plots for variables.

Demo

For example,

Case 1: Comparing Multiple Variables for a Single Patient

1. Filters and Summary Insights

The **Filters & Controls** sidebar allows the user to:

- 1. Select **Comparison Mode**: Here, "Compare Multiple Variables per Patient" is selected.
- 2. Choose a specific patient (e.g., Patient ID 7009).
- 3. Pick multiple variables (e.g., CRS on date, IFN-gamma, IL7, IL6).

Data Insights:

- 1. The **Summary Statistics** table provides essential descriptive statistics (count, mean, min, max, etc.) for the selected variables.
- 2. The **Correlation Heatmap** shows the relationships between the selected variables.

Filters & Controls

Select Comparison Mode:

☒ Compare Multiple Variables per Patient

☐ Compare One Variable Across Patients

Patient Selection

☐ Select All Patients

Select Patient IDs:

7009

×

⌵

Variable Selection

☐ Select All Variables

Select Variables to Compare:

CRS on date (0 No, 1 Yes)

×

IFN-gamma

×

IL7

×

IL6

×

⌵

Data Range Filter

Patient Journey Dashboard

Explore patient data and visualize variables over time (using datetime), correlate them, and analyze distributions. Use the sidebar to customize.

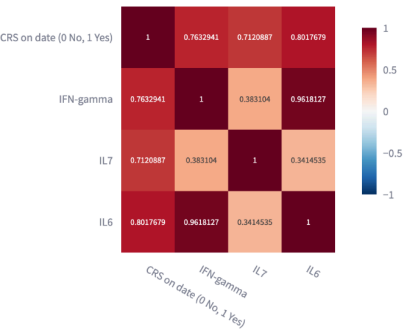
Data Insights

Summary Statistics

	ient_id	datetime	CRS on date (0 No, 1 Yes)	IFN-gamma	IL7
count	15,028	15028	15,028	15,028	15,028
mean	7,009	2023-01-01	0.3909	11.7966	6.2917
min	7,009	2023-01-01	0	7.749	5.5881
25%	7,009	2023-01-01	0	8.5607	5.9063
50%	7,009	2023-01-01	0	12.4354	6.381
75%	7,009	2023-01-01	1	14.6165	6.6615
max	7,009	2023-01-01	1	15.9459	6.7175
std	0	None	0.4868	3.0129	0.3676

Correlation Heatmap

Correlation Between Selected Variables



2. Time-Series Visualization

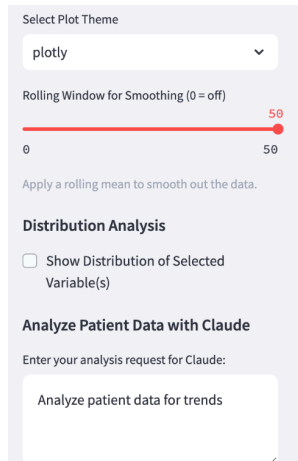
The **Variable Comparison** plot visualizes the selected variables over time for the chosen patient.

The x-axis represents **Date/Time**, while the y-axis represents the variable values.

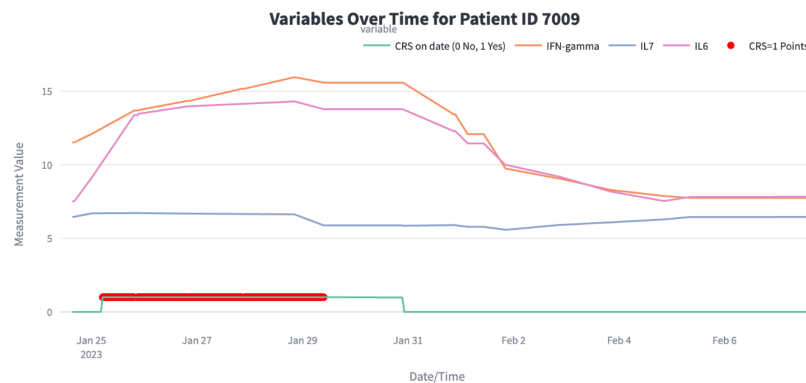
CRS transitions are marked with **red dots**.

Smoothing (Rolling Window) is applied to highlight trends more clearly.

CRS annotations, such as *"Patient has CRS on [date/time]"*, are included for critical transitions.



Variable Comparison



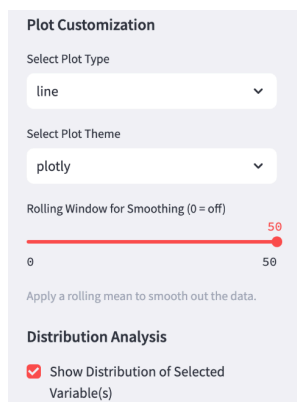
3. Distribution Analysis

Analyzes the distribution of all the selected variables, I have included the screenshot for one of them - **IFN-gamma**).

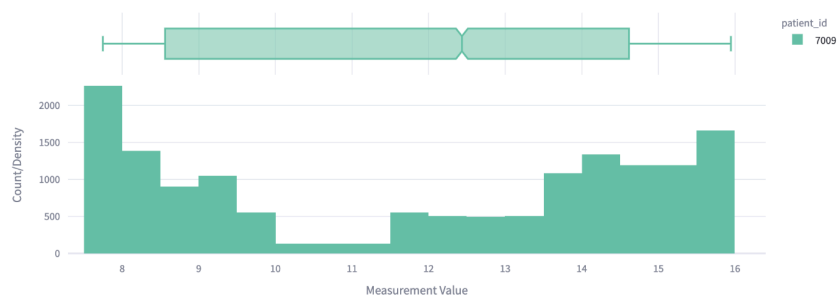
The histogram includes:

A **box plot** at the top for identifying outliers and spread.

A **frequency plot** showing the count/density of measurements.



Distribution of IFN-gamma



Case 2: Comparing One Variable Across Multiple Patients

Filters & Controls

Select Comparison Mode:

☐ Compare Multiple Variables per Patient

☒ Compare One Variable Across Patients

Patient Selection

☐ Select All Patients

Select Patient IDs:

7009

7008

7012

7014

7006

7011

Variable Selection

Select One Variable to Compare Across Patients

Highest Temp

Patient Journey Dashboard

Explore patient data and visualize variables over time (using datetime), correlate them, and analyze distributions. Use the sidebar to customize.

Data Insights

Summary Statistics

	patient_id	datetime	Highest Temp
count	74,807	74807	74,807
mean	7,010.3194	2023-02-14	98.5152
min	7,006	2022-03-14	96.8037
25%	7,008	2023-01-21	97.9
50%	7,011	2023-02-06	98.2742
75%	7,012	2023-02-21	98.8782
max	7,014	2023-04-14	102.5337
std	2.4968	None	0.9811

Select more than one variable to see a correlation heatmap.

Compare One Variable Across Patients

Patient Selection

☐ Select All Patients

Select Patient IDs:

7009

7008

7012

7014

7006

7011

Variable Selection

Select One Variable to Compare Across Patients

Highest Temp

Data Range Filter

Filter by Data Index Range:

0

331300

Variable Comparison

Highest Temp Over Time Across Selected Patients

Date/Time	7006	7008	7009	7011	7012	7014
May 2022	97.5	97.5	97.5	97.5	97.5	97.5
Jul 2022	97.5	97.5	97.5	97.5	97.5	97.5
Sep 2022	97.5	97.5	97.5	97.5	97.5	97.5
Nov 2022	97.5	97.5	97.5	97.5	97.5	97.5
Jan 2023	97.5	97.5	97.5	97.5	97.5	97.5
Mar 2023	97.5	97.5	97.5	97.5	97.5	97.5

Filters & Controls:

- **Comparison Mode:** *Compare One Variable Across Patients* is selected.
- **Patient Selection:** Multiple patient IDs are selected (e.g., 7009, 7008, 7012, 7014, 7006, 7011).
- **Variable Selection:** A single variable (**Highest Temp**) is chosen for comparison across patients.

Data Insights:

- The **Summary Statistics** table provides descriptive statistics (e.g., mean, min, max, etc.) for the selected variable across the chosen patients.
- The heatmap will not be generated as at least two variables need to be selected to display correlations, which is not applicable in this case.

Setup Instructions

Prerequisites

Before running the application, ensure you have the following:

- **Python Version:** Python 3.10 or higher.
- **Required Libraries:** Installable via `pip install -r requirements.txt`.

Steps to Set Up and Run the Dashboard

1. Extract the **dashboard.zip** file to a desired location.
2. Open a terminal and navigate to the extracted folder.
3. Place the folder containing the dashboard files in your desired location. The folder should include:
 - **final_data_clipped.csv** file (patient data) to this folder. The folder should include:
 - `med_dashboard.py`: The main application file.
 - `requirements.txt`: The dependencies file.
4. **Navigate to the Dashboard Folder**
Open a terminal and navigate to the folder location using the following command: `cd path_to_folder`
5. **Install Dependencies** : Run the following command to install all required Python libraries: `pip install -r requirements.txt`
6. **Run the Application:** Start the Streamlit application with the following command: `streamlit run med_dashboard.py`
7. **Access the Dashboard:** After running the above command, a URL will appear in your terminal. Open this URL in your web browser to access the Patient Journey Dashboard.