Creating Patient Timeline Visualizations with R plotly and timevis packages

Kaylee Ho, MS

Division of Biostatistics, Weill Cornell Medicine

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Collaborators

- Arindam RoyChoudhury, PhD

  `Associate Professor of Biostatistics`

- Manish Shah, MD, FASCO

  `Chief, Solid Tumor Oncology Service`
  `Director, Gastrointestinal Oncology Program`

- Uqba Khan, MD

  `Assistant Professor in Clinical Medicine`

Background

- Study Design: single-institution, retrospective study
- Goal: To evaluate the impact of antibiotics on clinical outcomes of patients with advanced or metastatic cancers who were treated with immune checkpoint inhibitors (ICIs)
  - Unclear whether there is a particular timeline of antibiotics use that may be associated with their maximal effect on antitumor immune response
  - Use of antibiotics was assessed between 180 days before and after initiation of immunotherapy
  - Biopsy and resection information was also collected from EMR data

Background (continued)

- Response Assessment: Eligible patients were categorized as responders or non-responders based on radiographic assessment (CT, MRI or PET scans) using the Response Evaluation Criteria in Solid Tumors (RECIST 1.1) criteria
- 414 patients included in the study

Results

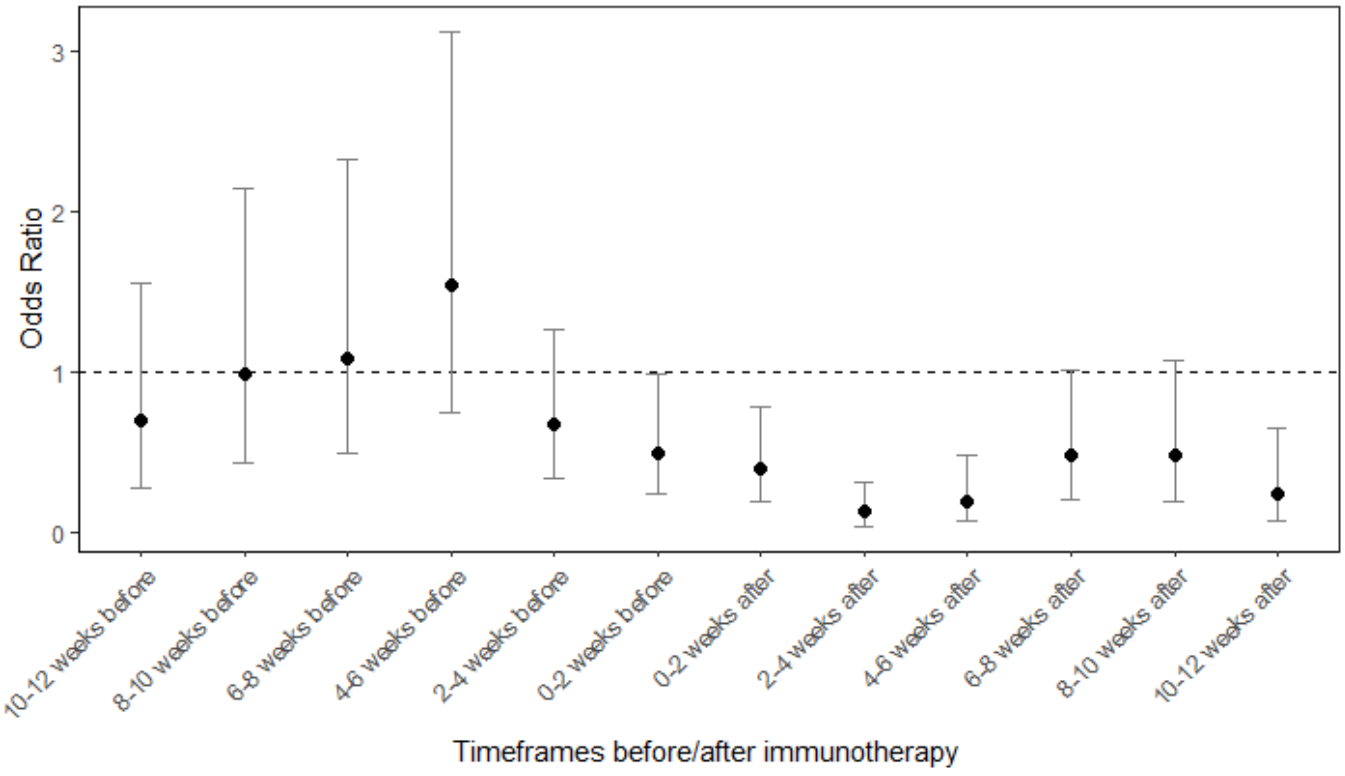


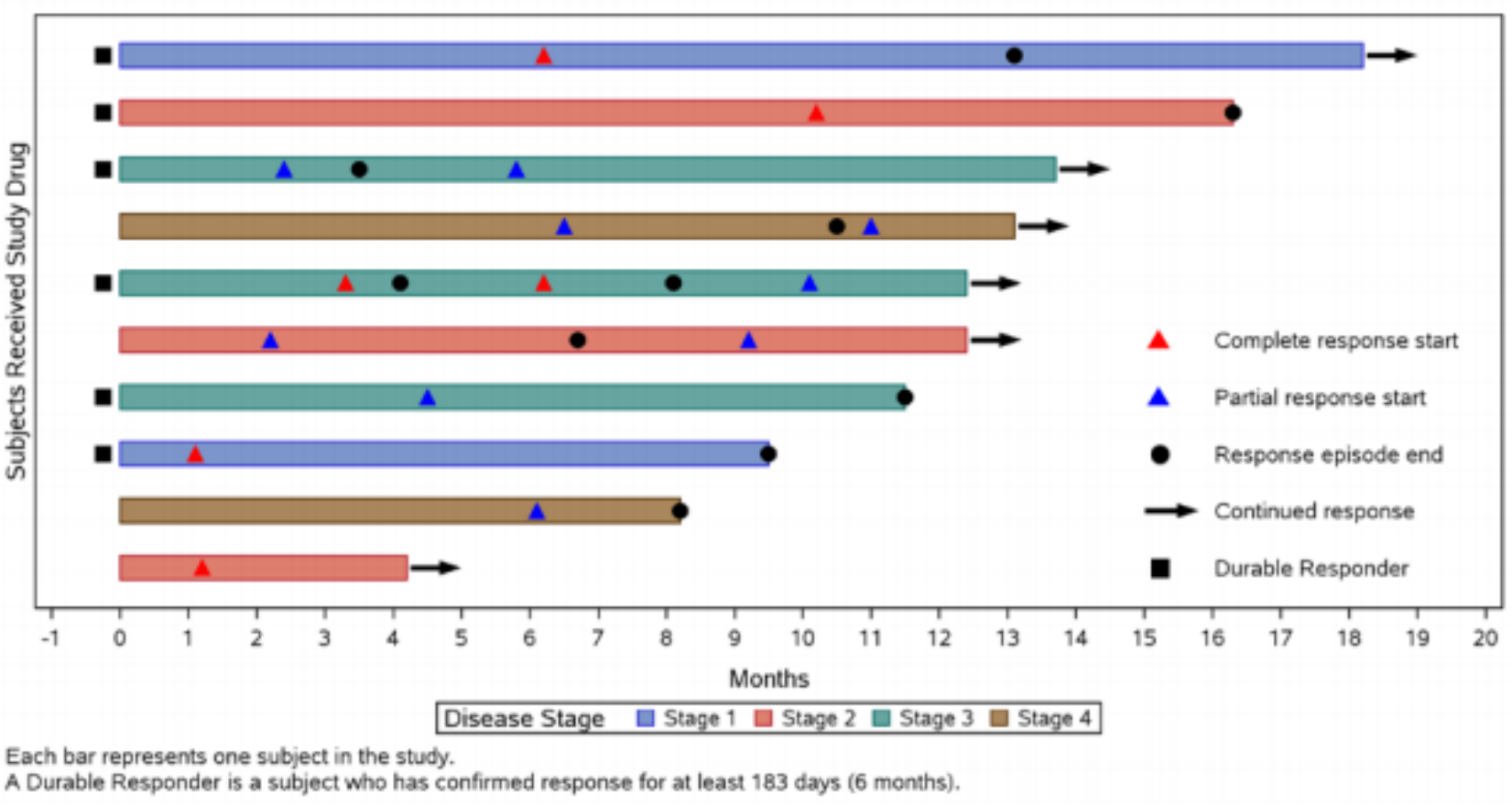
Figure 1: Odds ratio for negative impact of antibiotics on response to ICIs for every 2-week window from 12-weeks before to 12-weeks after initiating ICIs.

- In addition to the actual analysis, I was asked to create individual patient timelines

Swimmer Plot

- is a graphical tool involving horizontal bars that can be used to show multiple pieces of information about a given data set in one glance
- is used to look at data on an individual subject level and tell a story about the effects of a study treatment on tumor response for oncology patients
- in this example, information include duration of treatment, responder status (Yes/No), biopsy dates, antibiotics dates, resection dates

Swimmer Plot example



- SAS swimmer plot created by Stacey Phillips
- Creating a survival swimmer plot in R: https://bit.ly/2meBkIR

Packages

These are the packages I used to make patient timelines:

- `library(here)`
- `library(tidyverse)`
- `library(plotly)`
- `library(timevis)`
- `library(DT)`
- `library(shiny)`

`plotly` package and ggplotly

- Plotly creates Plotly objects that are interactive
- can turn ggplots into a Plotly objects using `ggplotly()`
  - will extract and translate all of the attributes of the ggplot2 figure into JSON (the colors, the axes, the chart type, etc), and draw the graph with plotly.js.

`timevis` package

- package created by Dean Attali
- lets you create fully interactive timeline visualizations in R that can be included in Shiny apps and R markdown documents
- includes an extensive API to manipulate a timeline after creation, and supports getting data out of the visualization into R.
- is based on the vis.js Timeline module and the htmlwidgets R package.
- I used `timevis()` and `renderTimevis()`