



Visualizing Clinical Event Sequences to Support EHR Data Retrieval

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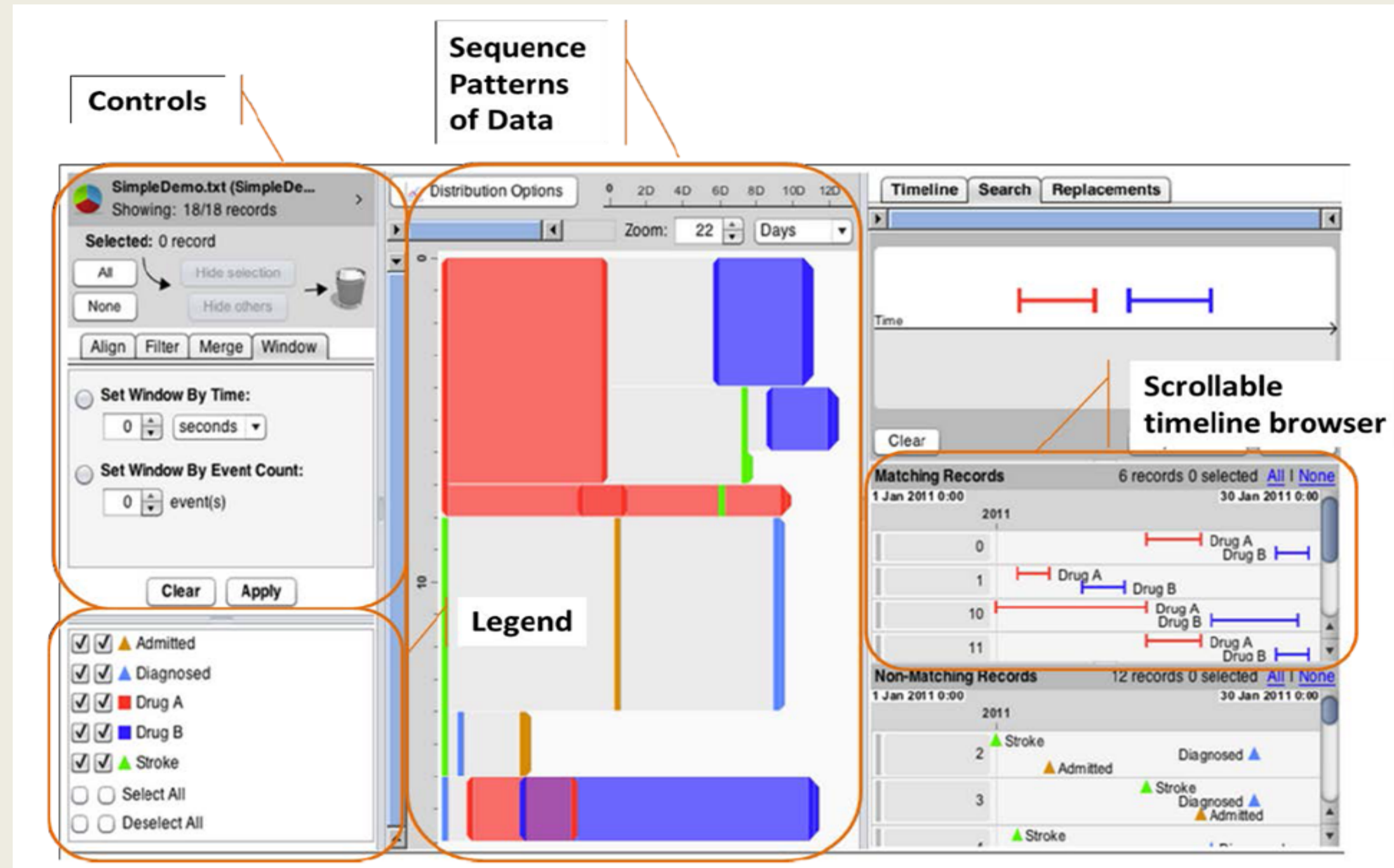
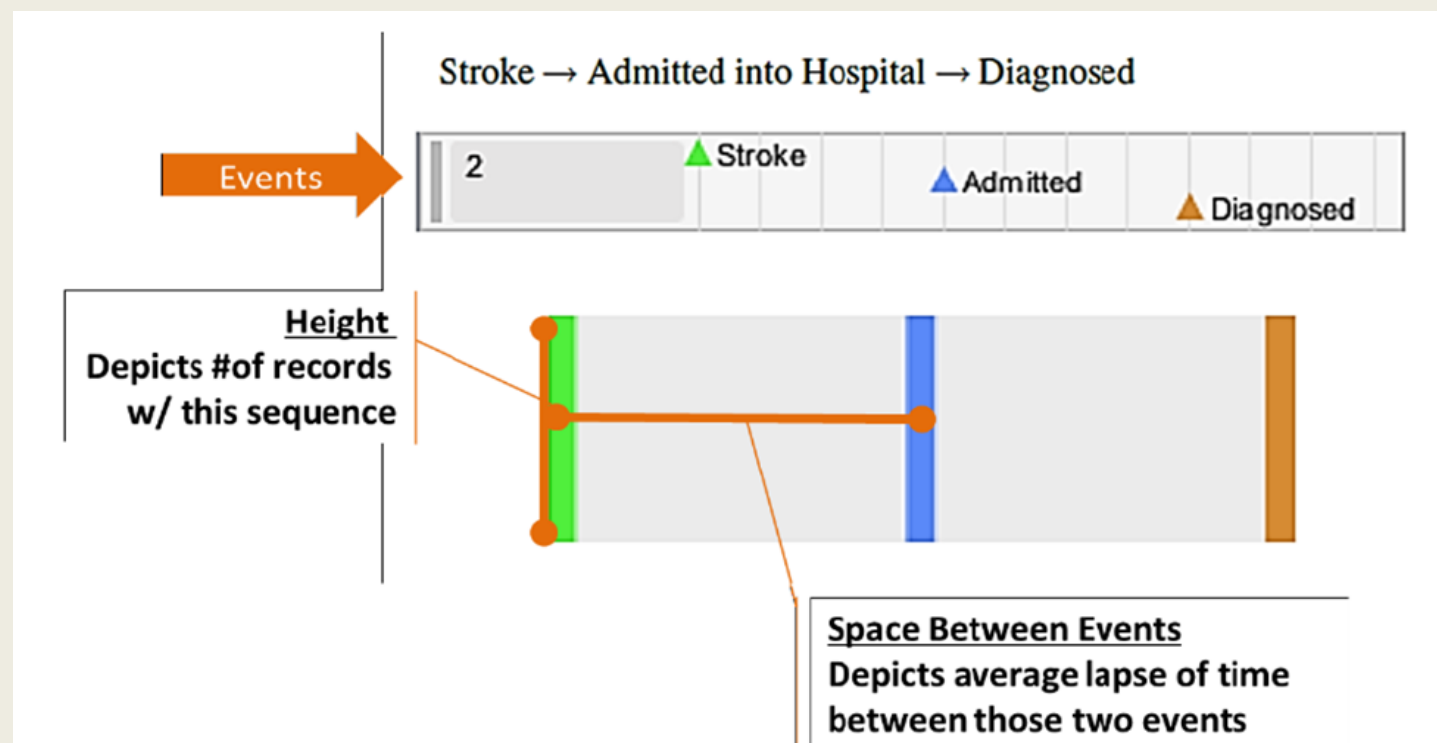
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Abstract

EventFlow is an application that helps analysts visualize complex temporal patterns—often an important task when retrieving and processing clinical data for retrospective observational studies. EventFlow illuminates how event types and sequences impact particular research questions. The visualization process improves the efficiency of data retrieval by revealing more specific requirements before analysts have to create complex query logic. The application also highlights data quality issues such as duplicate records or 100 year old babies.

Main Features of the EventFlow User Interface

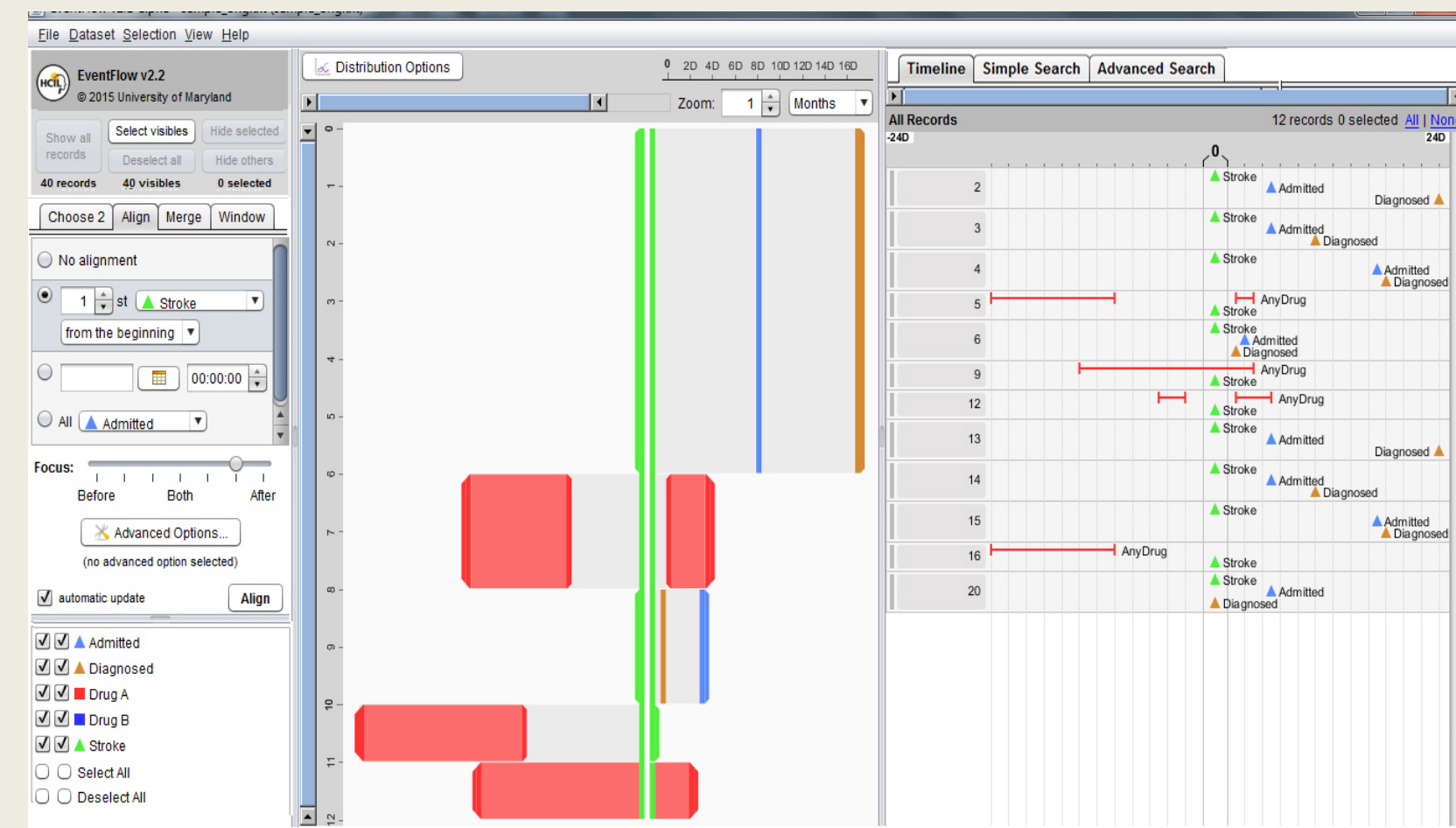
- Left panel: controls and egend
- Middle panel: aggregate all sequence patterns in the dataset
- Right panel: scrollable timeline browser showing individual records



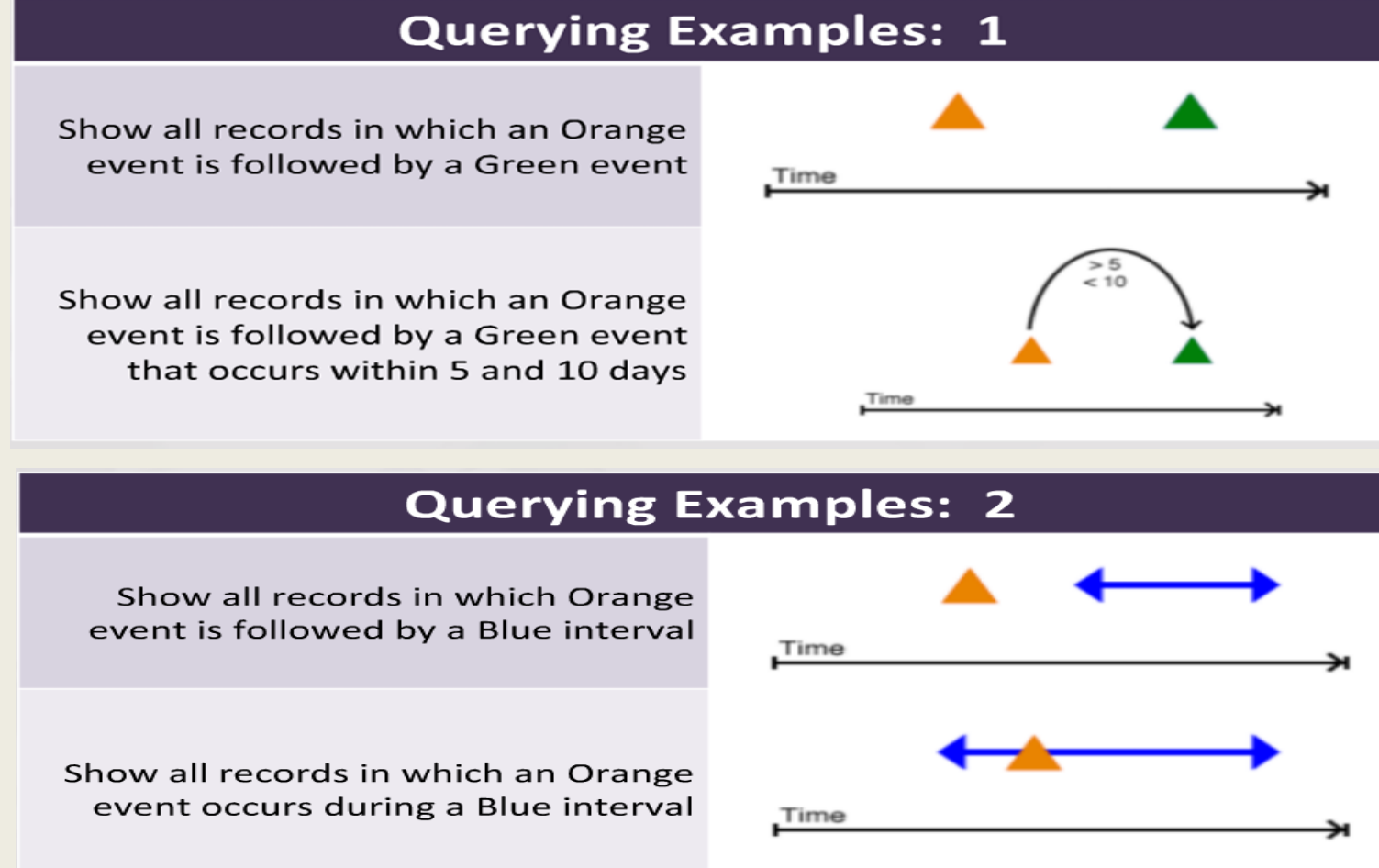
Why Visualize Temporal Medical Data?

- The sequence of events is important for many clinical research questions—e.g., “Which types of events occurred before an ICU admission?”
- Researchers are increasingly requesting EHR data for observational research—many studies focus on the timing and sequence of clinical events

Align by Reference Event



Query Event Sequences



What is EventFlow?

hcil.umd.edu/eventflow

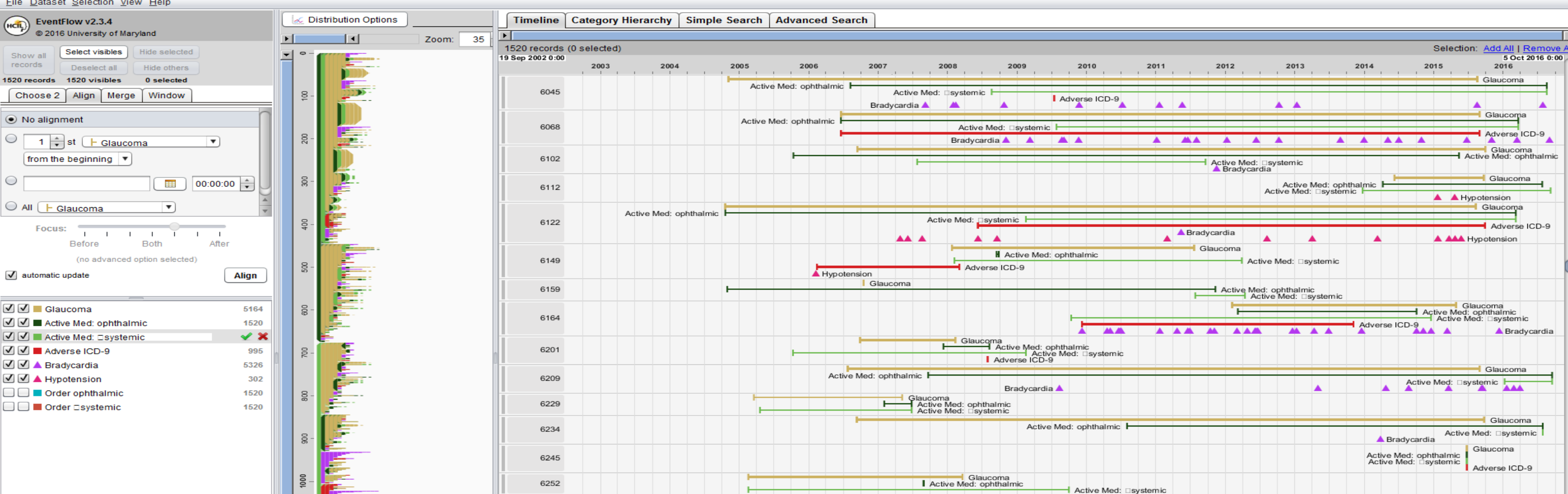
- Human-Computer Interaction lab (University of Maryland) developed EventFlow to help analysts visualize categorical temporal event data
- Applied to cybersecurity, sports analytics, and healthcare management
- Creators believe that user interfaces are evolving toward larger, information-abundant interactive visual displays that will help analysts assess data quality, compare populations, and spot actionable anomalies
- Key features:

- 1 Alignment by “sentinel” event
- 2 Aggregation of events
- 3 Filtering
- 4 Querying

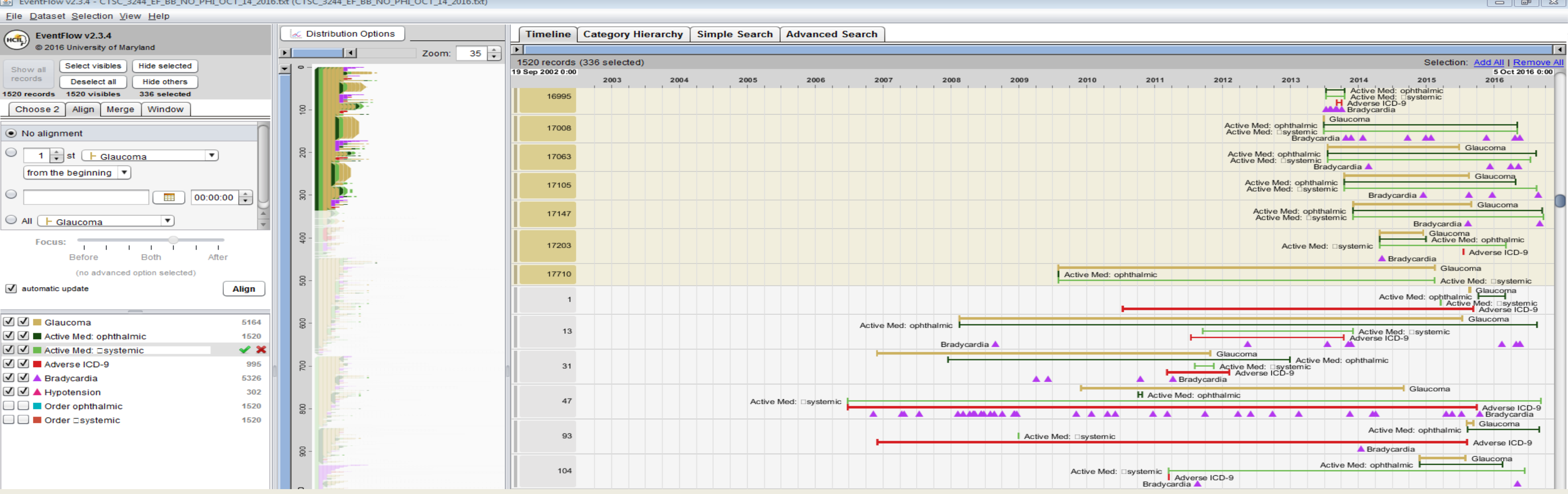
Use Case: Glaucoma, Beta-Blockers, Complications

- Are there important temporal sequences that predict adverse outcomes among glaucoma patients taking systemic and ophthalmic beta-blockers?
- De-identified data (below) includes patients actively taking both types of beta-blockers
- Lines. Interval between first and last event: adverse event, active medications, orders (not displayed)
- Triangles. Patient encounters with specific vital signs (bradycardia, hypotension)

View Individual Records with Scrollable Timeline



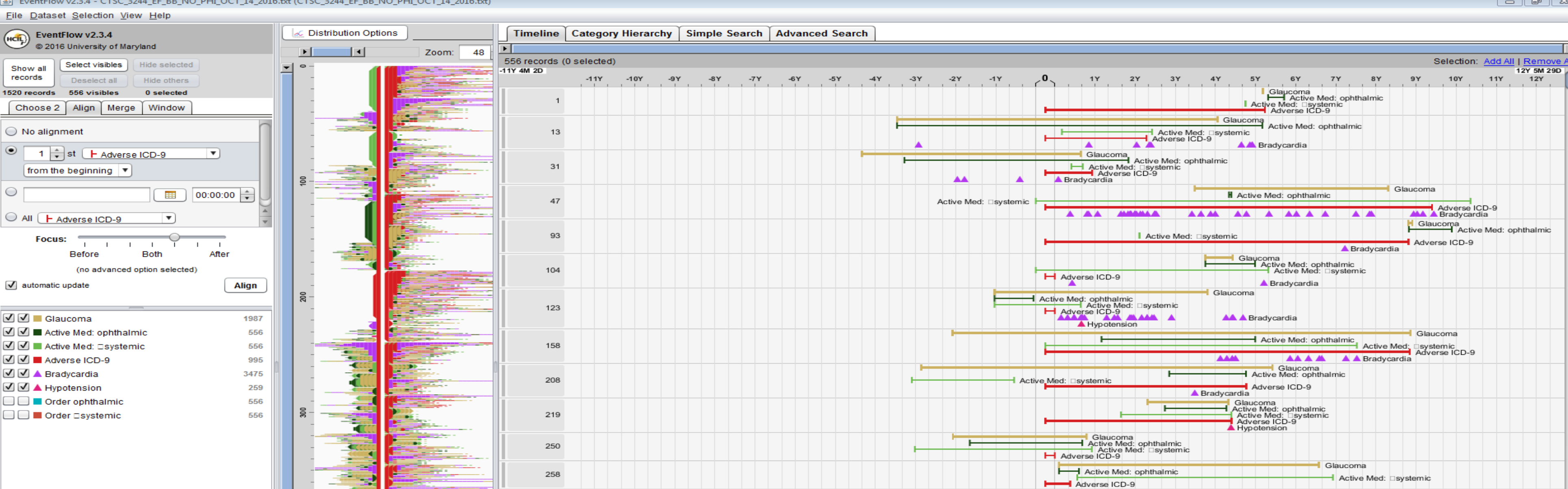
Aggregate Sequence Patterns



EventFlow at UC Davis

- Communicate complex event sequences to clinical investigators
- Help investigators generate hypotheses
- Facilitate more efficient ways to gather requirements
- Reduced SQL programming time—let investigators study event sequences on their own
- Clinical investigators enjoy using EventFlow to:
 - visualize complex temporal sequences
 - flag outliers for in-depth chart review
 - evaluate how particular sequences may be associated key outcomes

Align Sequences by First Adverse Event



The project described was supported by the National Center for Advancing Translational Sciences, National Institutes of Health, through grant number UL1 TR001860. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH