Week 3 Submission – Plan for Evaluation

To evaluate the design approach for visualizing the **Heart Failure Clinical Records** data, a structured evaluation process is necessary. The evaluation will focus on ensuring that the visualization design effectively supports data interpretation and insights, helping to answer key questions related to patient mortality and clinical outcomes.

**1. The Target Question You Want to Answer**

The core questions the evaluation seeks to answer include:

* **How well do the visualizations help users identify key clinical features that correlate with heart failure mortality?**
* **Do the visualizations provide a clear understanding of the distribution and impact of age, ejection fraction, and other clinical features in relation to mortality?**
* **How effective are the visualizations in helping users make predictions or detect patterns based on the data?**

**2. The People You Would Recruit to Answer That Question**

For a well-rounded evaluation, you would recruit:

* **Healthcare Professionals**: Cardiologists or medical researchers who work with heart failure patients and understand the clinical significance of the data.
* **Data Analysts**: People with experience in analyzing healthcare data but not necessarily experts in cardiology.
* **Non-technical Users**: Laypersons who may have an interest in healthcare but lack technical expertise. This group helps assess whether the visualizations are intuitive for non-experts.

**3. The Kinds of Measures You Would Use to Answer Your Data**

**a. Insight Depth:**

* **Definition**: How deeply participants can explore and understand the relationships between variables (e.g., age, ejection fraction, mortality).
* **What it Tells You**: Insight depth helps measure how well the visualizations enable users to uncover non-obvious insights or trends (e.g., subtle correlations between ejection fraction and mortality).
* **Evaluation**: Participants could be asked to explore the data and note down patterns they observe. You would measure how detailed and accurate their observations are.

**b. Ease of Use (User Experience):**

* **Definition**: How easy it is for participants to interact with and interpret the visualizations.
* **What it Tells You**: Evaluates the usability and clarity of the visualizations. Are the color schemes, axes, legends, and tooltips easy to understand and use?
* **Evaluation**: You could run a **usability test** where participants complete tasks (e.g., finding the age group with the highest mortality rate) and report the ease or difficulty of doing so.

**c. Accuracy:**

* **Definition**: The correctness of conclusions that participants draw from the visualizations.
* **What it Tells You**: Accuracy will tell whether the visualizations support the correct interpretation of the data or cause confusion.
* **Evaluation**: Ask participants to answer questions about the dataset (e.g., "Does ejection fraction strongly predict mortality?") and check their answers against the data.

**d. User Satisfaction:**

* **Definition**: How satisfied users are with the visualization design and their overall experience.
* **What it Tells You**: Measures emotional engagement and perceived usefulness of the tool.
* **Evaluation**: A post-task survey could be used to capture satisfaction levels, asking participants to rate how useful and enjoyable the visualizations were.

**4. The Approach You Will Use to Answer That Question**

* **Mixed-Method Approach**: Use a combination of qualitative and quantitative methods to evaluate the visualizations.
  + **Formal Experiment**: For insight depth, accuracy, and ease of use, participants will perform specific tasks with the visualizations, and you will collect task performance metrics (time to complete tasks, errors made).
  + **Usability Testing**: Observing participants as they use the visualizations and asking them to verbalize their thought process. This helps identify pain points or confusing aspects of the visualizations.
  + **Survey/Questionnaire**: After the tasks, ask participants to complete a survey to measure satisfaction and ease of use.

**5. How You Would Instantiate Those Methods**

Here’s what the participants would do:

1. **Introduction and Familiarization**:
   * Participants would be introduced to the dataset, the visualization dashboard, and the core questions.
   * They would explore the visualizations (e.g., feature importance bar chart, scatter plot, box plot) to get comfortable with the tools.
2. **Task Completion**:
   * Participants would be given several tasks, such as:
     + **Task 1**: "Identify the top 3 clinical features most predictive of mortality."
     + **Task 2**: "Find the age group with the highest rate of heart failure mortality."
     + **Task 3**: "Is low ejection fraction more common among patients who died?"
   * During this phase, you will time their performance and track errors.
3. **Observation and Feedback**:
   * While participants perform the tasks, observe how they interact with the visualizations. Record areas where they seem confused or take unexpected actions.
   * After completing the tasks, ask participants to provide feedback on how intuitive or difficult the tasks were.
4. **Post-Task Survey**:
   * Ask participants to fill out a survey with questions about satisfaction, clarity, and perceived usefulness of the visualizations.
   * Include both **Likert scale** questions (e.g., "How easy was it to understand the relationship between ejection fraction and mortality?") and **open-ended** questions (e.g., "What changes would improve your experience?").

**6. What Criteria Would You Use to Indicate that Your Visualization Was Successful**

* **Insight Generation**: Participants should consistently be able to generate correct and insightful answers to questions about the data.
* **Ease of Use**: If users complete tasks with minimal confusion, and if non-experts can understand and interact with the visualizations, this would indicate success.
* **Accuracy of Interpretation**: A high level of correct interpretation of the visualizations shows that the design is successful in conveying the intended insights.
* **User Satisfaction**: Positive feedback in post-task surveys, particularly around clarity and usefulness, would suggest that the visualization meets the needs of the target audience.

**Conclusion:**

By running a formal experiment combined with usability testing and post-task surveys, you can comprehensively evaluate how well the visualizations meet your goals for insight generation, ease of use, and accuracy. Success would be indicated by participants' ability to draw accurate conclusions, feel comfortable with the interface, and report high levels of satisfaction with the visualization.