

## Visualization of a Patient's Problem List

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**OBJECTIVE:** To determine the potential of utilizing the Word Cloud format for the Problem List and evaluate its implementation in providers' workflow.

**INTRODUCTION:** A patient's Problem List (Figure 1) contains all documented conditions of a patient. It is used by provider's to **obtain a summary of a patient's health** problems, however, its necessity for manual curation can result in inaccuracies and/or make it difficult to understand as terms are added based on the digression of individual providers. The Word Cloud (Figure 2) **uses natural language processing** to pull terms directly from the patient's Electronic Health Record (EHR) and the relative size of a term is **based on the recurrence** of that term in the records. Incorporating the WC format can direct attention to a patient's more documented health issues and more effectively convey a summary of a patient's medical problems to their provider(s).



Figure 1. Problem List

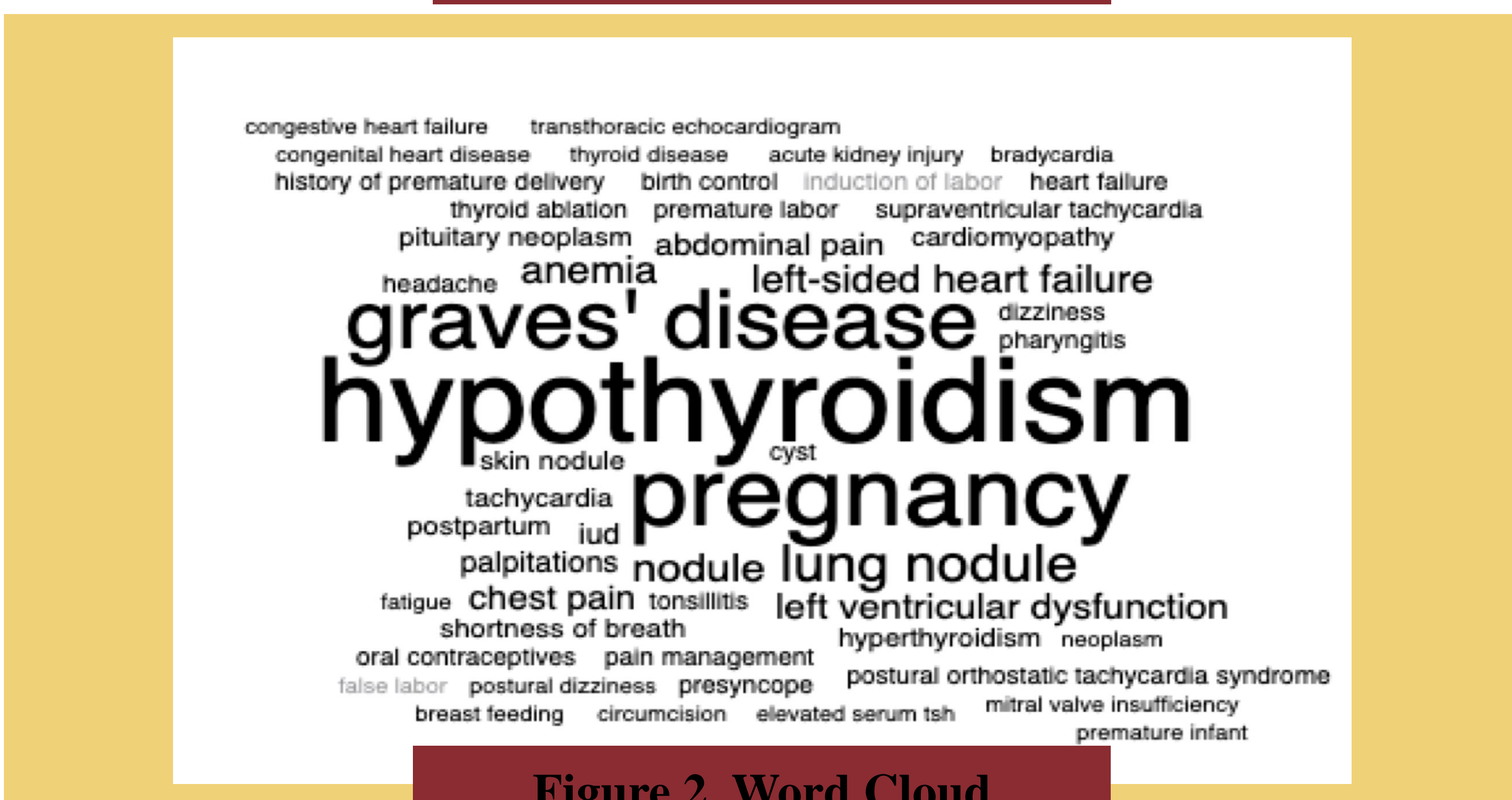


Figure 2. Word Cloud

**METHODS:** The Word Cloud was evaluated by the 10 Usability Heuristics for User Interface Design. Structured interviews and formative usability testing was performed on **15 Vanderbilt healthcare providers** for feedback and to obtain a System Usability Scale (SUS) score (Figure 3). The feedback was then categorized into three different aspects and synthesized for incorporation into future iterations of the Word Cloud.

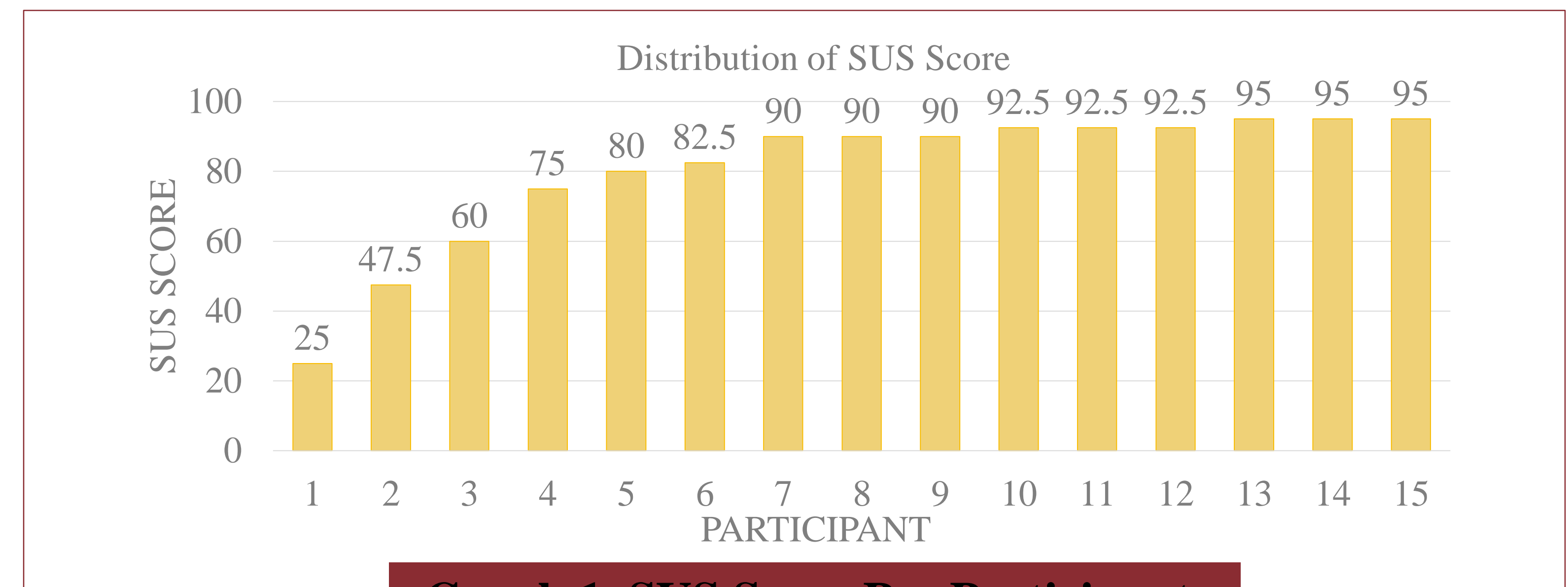
SUS Score	Adjective
90.9	Best Imaginable
85.5	Excellent
71.4	Good
50.9	Okay
35.7	Poor
20.3	Awful
12.5	Worst Imaginable

Figure 3. SUS Score Rank

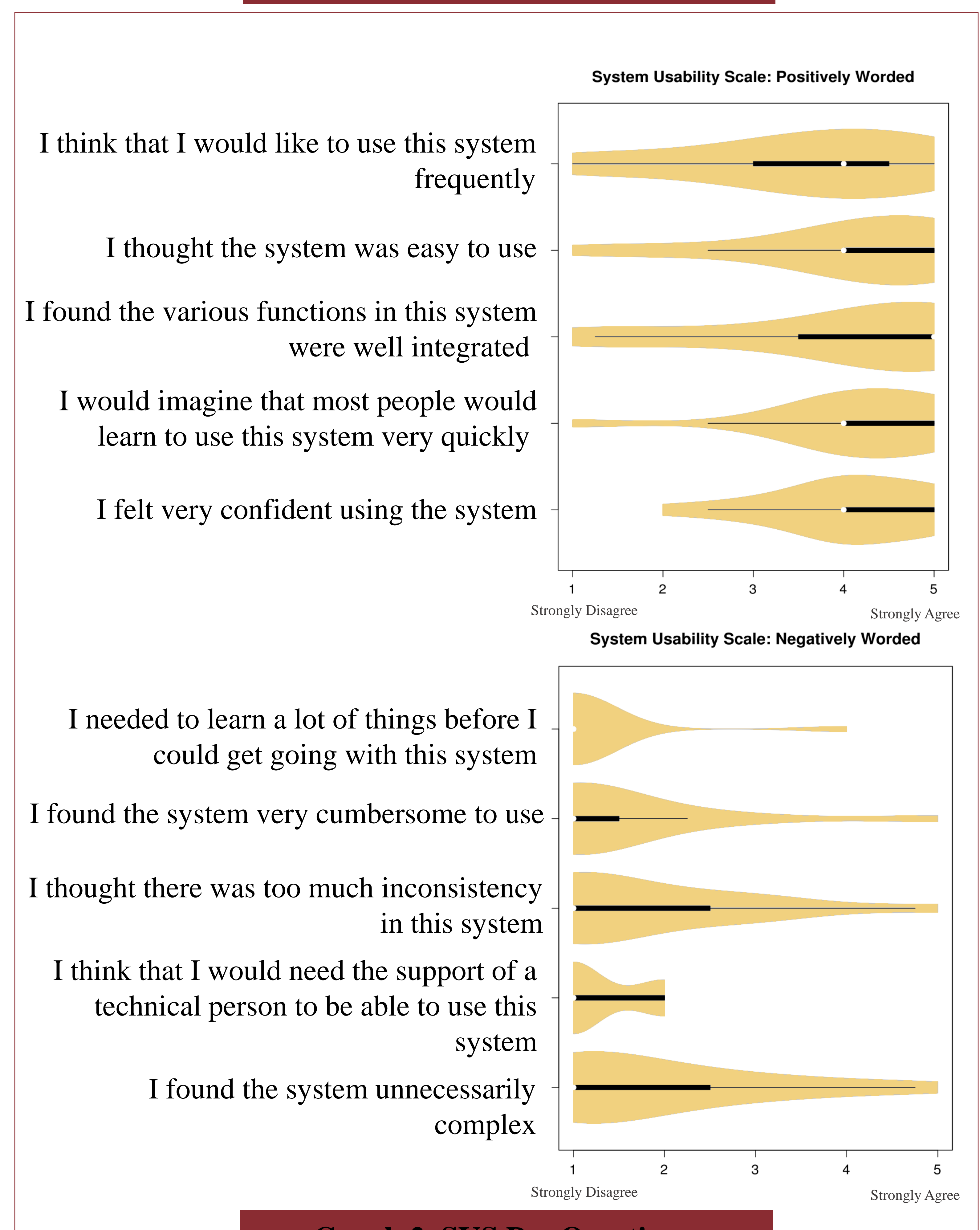
**RESULTS:** Provider comments for areas for improvement were divided into three categories:

- **Accuracy** involving reduction of Word Cloud redundancy of similar terms and tagging suspected diagnoses differently
- **Provider Customization** to give more context to terms and allow for specific provider organization of terms
- **Ease of Use** to make individual existing features more robust such as zoom functions, and color-blind sensitive color scheme

The Word Cloud SUS scores from providers were averaged to a score of 80.2 with a standard deviation of 20.6. The results per participant and per question are summarized in (Graph 1 and 2).



Graph 1. SUS Score Per Participant



Graph 2. SUS Per Question

**CONCLUSION:** In general, the Word Cloud was well received, and the average SUS score fell in the 'Good' and 'Excellent' range. The Word Cloud has shown to provide more information about a patient's health that is not shown on the current Problem List which can lead to **improved patient treatment decisions**. It is important to note, majority of providers surveyed were from Internal Medicine which may have increased consistency in the results, but also allows providers with more consistent Problem List use to comment on the Word Cloud usability. The results of this study provide **direction for future improvement** of the Word Cloud in order to better adhere to provider needs and show a desire from providers for its implementation.

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