

Abstract

- Large sets of clinical data present an enormous opportunity to support clinical decision making and to improve care quality
- These data cannot be fully utilized without interactive data visualization and dashboards
- We conducted formal usability testing to validate the design of a new interactive surgical outcomes dashboard to demonstrate its effectiveness and to seek opportunities for improvement

Introduction

- Evaluating usability is a highly necessary task for any tool designed for interactive data visualization of large sets of clinical data^{1,2}
- An interactive, visual based dashboard was recently designed to replace the existing dashboard, which was dated, static and table-based.
- Because this data is used to make clinical decisions, it is imperative to conduct rigorous evaluations to investigate the usability of the dashboard prior to its official use.
- The purpose of this study is to conduct formal usability testing to validate the design of this dashboard.

Methods

- This study was conducted at the Heart Institute of Cincinnati Children's Hospital Medical Center
- Using the professional network of the authors, the participants were recruited and given a single letter code to identify them. They include:
 - Pediatric Cardiologists (C),
 - Surgeons (S),
 - Perfusionists (P),
 - Physician Assistants (A).
- Table 1 shows important background information for each of the participants listed above.
- Figure 1 shows the flow of the usability testing.
- After completing the tasks using each dashboard, a survey was administered to collect participant feedback.
- The survey was revised from the Systems Usability Scale (SUS), which contains 10 standard and validated questions assessing systems usability in a 5 point Likert scale. A full list of questions are listed in table 2.
- A final score above 68, according to the SUS scoring guidelines, was considered above average.
- The difference of the score means was examined using a pairwise t-test.

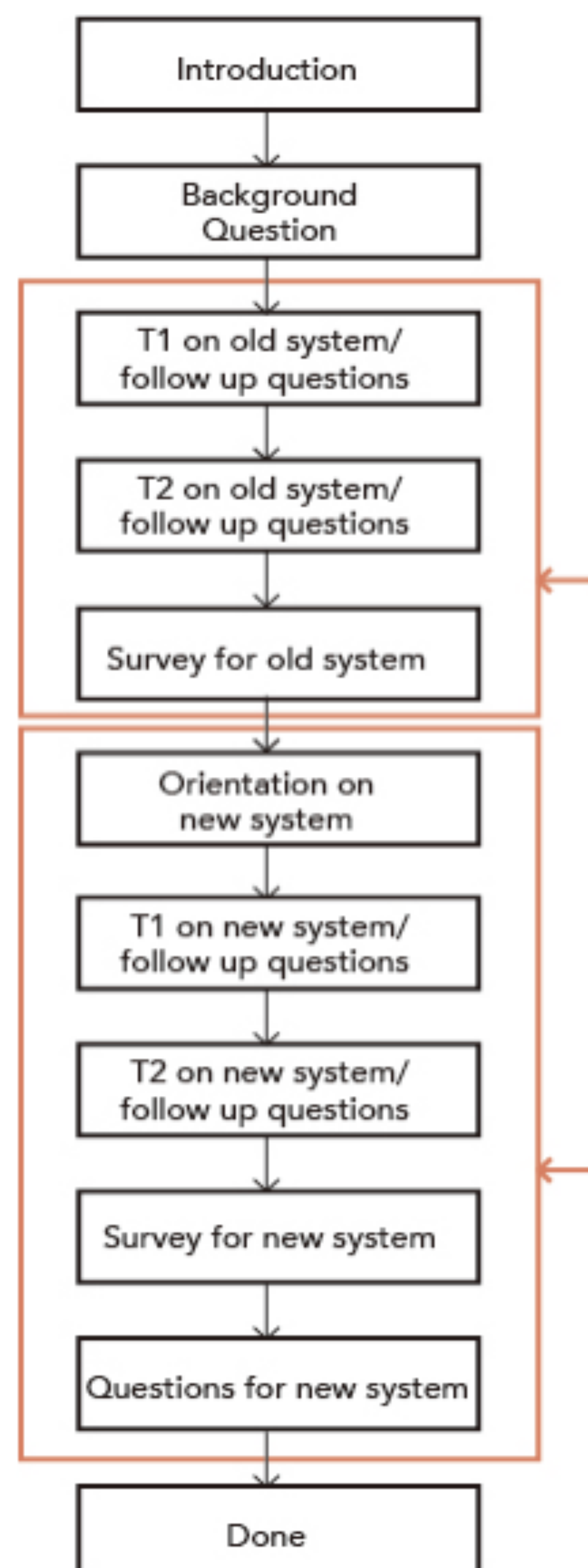


Figure 1. A visual representation of the sequence of events conducted during each test session

Table 1. Background Information for Study Participants

| User ID | Age Range | Sex | Role | Time in Current Position | Computer Expertise Level | Dashboard Frequency of use |
|---------|-----------|-----|------|--------------------------|--------------------------|----------------------------|
| P01 | 40-49 | M | P | >20 Years | Expert | Never |
| P02 | 20-29 | M | P | 1-4 Years | Intermediate | When being asked |
| P03 | 30-39 | M | P | 5-9 Years | Intermediate | Weekly |
| C01 | 30-39 | M | C | 5-9 Years | Intermediate | Never |
| C02 | 40-49 | F | C | 5-9 Years | Intermediate | When being asked |
| C03 | 30-39 | M | C | 5-9 Years | Intermediate | Monthly |
| C04 | 40-49 | M | C | 15-19 Years | Intermediate | Monthly |
| A01 | 30-39 | M | A | 1-4 Years | Intermediate | Never |
| A02 | 30-39 | F | A | 5-9 Years | Intermediate | Monthly |
| A03 | 30-39 | F | A | 5-9 Years | Intermediate | Weekly |
| S01 | 50-59 | M | S | 15-19 Years | Intermediate | Never |
| S02 | N/A | M | S | 15-19 Years | Novice | Never |

Table 2. Questions adapted from SUS to assess usability of the dashboard

| | |
|----|---|
| 1 | I think that I would like to use this system frequently |
| 2 | I found this system unnecessarily complex |
| 3 | I thought this system was easy to use |
| 4 | I think that I would need the support of a technical person to be able to use this system |
| 5 | I found the various functions in this system were well integrated |
| 6 | I thought there was too much inconsistency in this system |
| 7 | I would imagine that most people would learn to use this system very quickly |
| 8 | I found this system very cumbersome to use |
| 9 | I felt very confident using this system |
| 10 | I needed to learn a lot of things before I could get going on this system |

Results

Table 3. Average SUS Scores by Participant

| Participant | Existing Report | New Dashboard |
|----------------|-----------------|---------------|
| P01 | 72.5 | 90.0 |
| P02 | 70.0 | 97.5 |
| P03 | 77.5 | 82.5 |
| C01 | 40.0 | 92.5 |
| C02 | 62.5 | 77.5 |
| C03 | 55.0 | 90.0 |
| C04 | 62.5 | 75.0 |
| A01 | 85.0 | 90.0 |
| A02 | 32.5 | 87.5 |
| A03 | 72.5 | 82.5 |
| S01 | 52.5 | 62.5 |
| S02 | 80.0 | 67.5 |
| Average | 63.5 | 82.9* |

* a significantly higher average score of the new dashboard (p=0.006)

- Table 3 shows the average SUS Score given by each participant after using both the existing and new dashboards
- The new interactive dashboard had an average score of 82.9, which is considered above average.
- On the other hand, the old, static dashboard had an average score of 63.5, which is considered below average.
- The two-tailed pairwise t-test indicates that these two sets of scores were significantly different (p=0.006).

Conclusion

- We conducted usability testing on a recently designed,-interactive surgical dashboard and its existing static counterpart.
- The interactive dashboard had a significantly higher SUS score
- We will continue to analyze the data collected in the usability testing (e.g. audio recording and observation notes) to identify specific usability issues and room for improvement.
- In particular, we will focus on developing an educational plan to facilitate the smooth transition to the new dashboard.

References

1. Caban JJ, Gotz D. Visual analytics in healthcare--opportunities and research challenges. J Am Med Inform Assoc JAMIA. 2015 Mar;22(2):260-2.
2. Zhang Y, Sun W, Gutchell EM, Kvecher L, Kohr J, Bekhash A, et al. QAIT: a quality assurance issue tracking tool to facilitate the improvement of clinical data quality. Comput Methods Programs Biomed. 2013 Jan;109(1):86-91.