Building Visual Transition Networks to better understand Clinician Needs for Optimal Visual Interfaces

Daniel Hoffman[1]; Zach Hettinger, MD[1,3,4]; Ann Bisantz, PhD[2]; Allan Fong[1]; Nat Benda[2]; Lindsey Clark[1]; Angie Hernandez[1]; Nicolette McGeorge[2]; Sudeep Hegde[2]; Danielle Chevallier[2]

[1]National Center for Human Factors in Healthcare; [2]University at Buffalo; [3]MedStar Union Memorial Hospital; [4]Georgetown University School of Medicine

Introduction

- Health IT Systems do not appear to be designed around the needs of current practitioners
- Visual Transition Networks (VTN's) can assist in exposing how practitioners interpret an interface
- The interface studied was developed through a grant focused on the development of novel interfaces for ED patient tracking
- The objective of this study is to see if VTN's could be used to study the actual use of Health IT interfaces
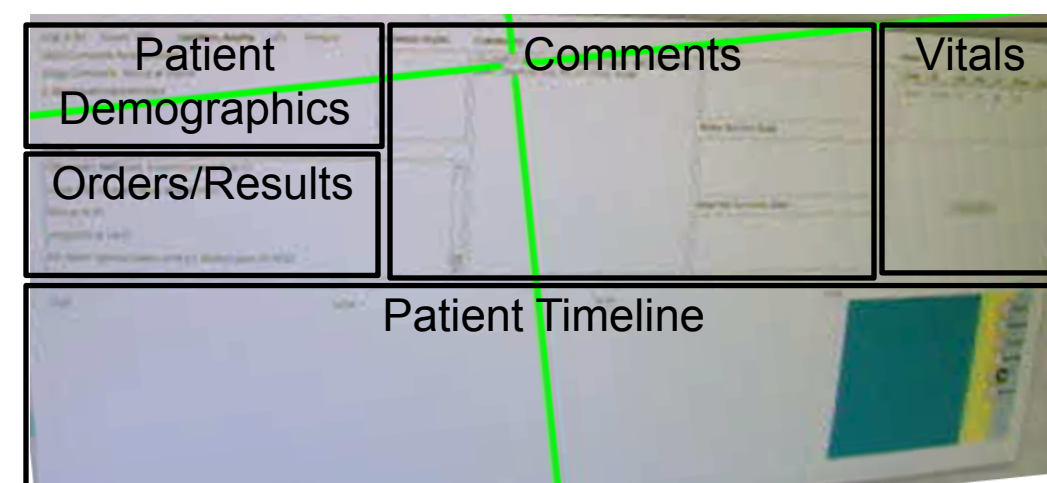
Methods

Figure 1
Wireframe of the UBSIM Specific Tracker Screen. Each outlined area is a defined AOI that is being tracked.

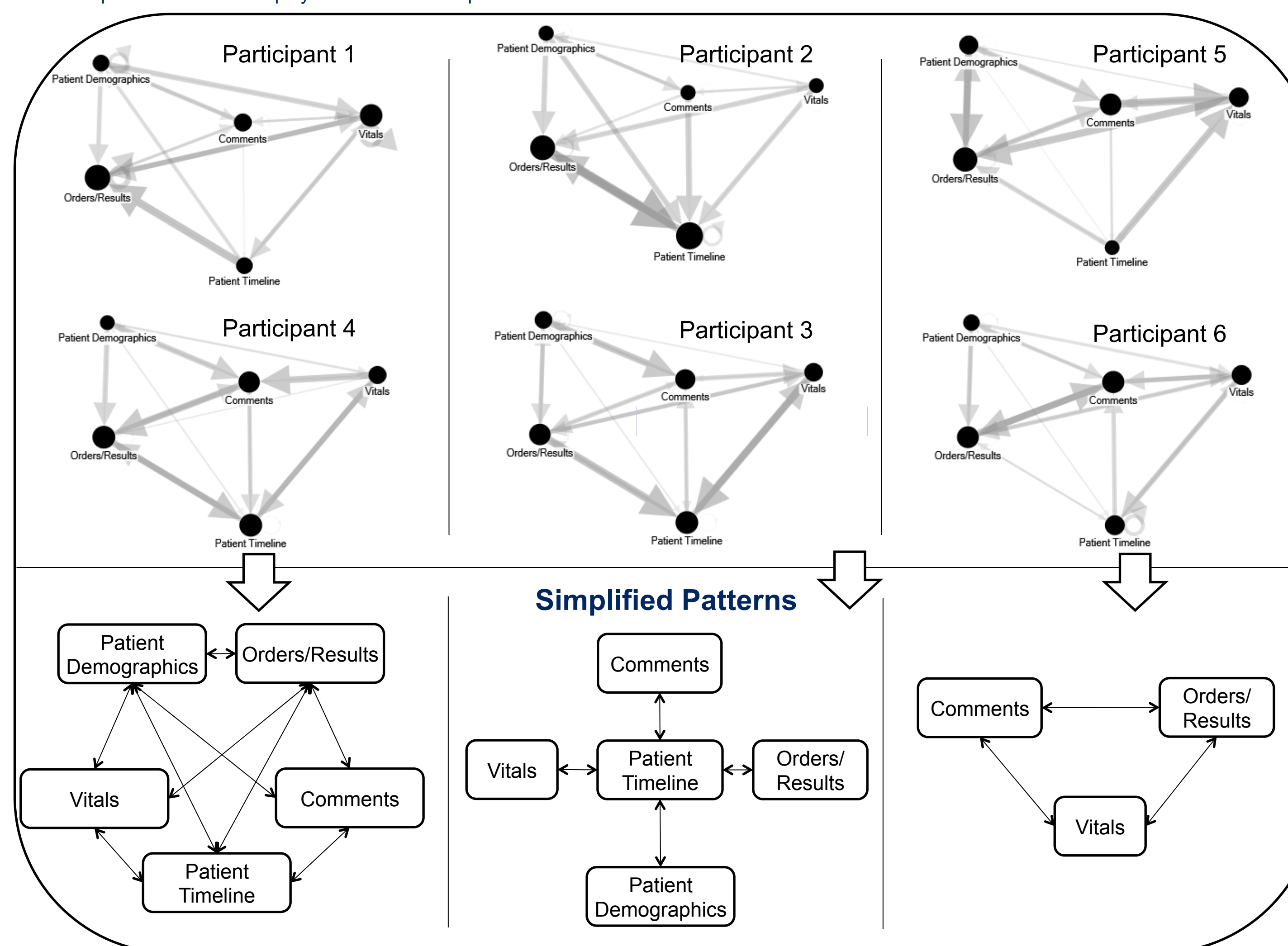**Figure 2**
Mobile Eye Tracker utilized.

1. **Participants**: Seven physician-nurse teams participated in a clinical simulation-based study, where they cared for mannequin and virtual patients
2. **Data**: The eye tracking data used was for physician participants using an interface containing detailed patient data
3. **Analysis**: Five distinct areas of interest (AOI's) were identified (Figure 1) on the detailed patient interface.
   - First order transitions between areas of interest (AOI's) were captured and used to build one VTN per participant using NodeXL

Results

- Usable video showed 40.36 minutes of use of the patient detail screen across 6 participants
  - Data from a seventh participant was not usable
- VTNs generated from the data indicated different strategies of use across participants. These strategies were taken from Figure 3, simplified, and displayed below.
  1. The first network transitioned about equally between all 5 AOI's (Figure 3 left)
  2. The second transitioned mostly to and from patient timeline (Figure 3 middle)
  3. The third transitioned almost equally among: orders/results, comments, and vitals (Figure 3 right)

Figure 3 (below)
Arrows represent eye gaze transitions between AOI's. The thicker the line the more frequent the transition. The circles represent the duration of time spent on each AOI, with the larger circle the more time spent. All 6 VTN's are shown above. Simplified model patterns are also displayed below their respective VTN's.

Simplified Patterns

Discussion

- The patterns exposed suggest that Patient Demographics is the least utilized AOI. This could be from initial familiarization of the patient
- VTN's suggest that Patient Demographics could be presented differently
- Frequent transitions could indicate information integration between two unique AOI's

Conclusions

- **Building a VTN per individual per interface could provide valuable information for interface designers and potentially be used to augment findings from other analysis**
- **Findings suggest that VTN's can be utilized to gain an initial understanding of what individuals find important in Health IT interfaces**
  - **The transitions and durations could help tailor more informative AOI location and type**

Limitations/Next Steps

Limitations:
- Investigated only first order transitions
- All time duration given the same weight

Next Steps:
- Redesign the interface based on VTN
- Build on first order transitions to encompass probabilities

Acknowledgments