

Design of a Clinical Collaboration System for Complex Care

Peter Weinstein¹, Fatima Kanji², Christopher Flewwelling¹, Wayne Ho³, Diane De Sousa³, Kevin Armour³, Amna Husain⁴, Trevor Jamieson⁵, Rob Wu⁶, Irfan Dhalla⁵, Joseph Cafazzo³

¹ Institute of Biomaterials and Biomedical Engineering, University of Toronto, Toronto, ON; ² Mechanical and Industrial Engineering, University of Toronto, Toronto, ON; ³ Centre for Global eHealth Innovation, Toronto General Hospital, Toronto, ON; ⁴ Mount Sinai Hospital, Toronto, ON; ⁵ St. Michael's Hospital, Toronto, ON; ⁶ Centre for Innovation in Complex Care, University Health Network, Toronto, ON

Introduction

Poor communication is one of the most common underlying causes of medical error^{1,2}. Beyond communication alone, better *collaboration* across a spectrum of healthcare settings and among a diversity of healthcare providers is essential to reducing errors and improving continuity of care. This is particularly true for complex care patients who are more vulnerable to adverse medical events due to the lack of a systemized approach to clinical collaboration³.

In order to address this coordination gap, the development of a secure, mobile, device-agnostic, clinical messaging system for the collaborative care of complex patients was undertaken. The system allows the patient's entire healthcare team, which can be interdisciplinary, cross-institutional and cross-setting, to communicate with each other in a timely and asynchronous manner.

Methodology

Three phase iterative user-centered design conducted by a team of clinicians, designers, and human factors engineers.

Analysis

- Ethnography of physicians, nurses, pharmacists, and community care coordinators in the community setting
- Analyzed collaboration needs, work context, and communication with group affinity diagramming⁴

Design

- Engaged clinicians with participatory techniques⁵: cooperative prototyping and dramatic simulation
- Produced realistic testing scenarios and interactive prototypes

Evaluation

- 2 rounds of cognitive walkthroughs (CW) with 10 users
- Evaluated role and usability of prototype to further develop the design

Results

Analysis: Key themes that emerged from ethnographic analysis were used to formulate design principles. These design principles were further refined through the design and evaluation phases.

Situational Awareness

- Awareness of patient's changing circumstances and of everyone involved in patient's care
- Open sharing of information
- Knowledge of source and recency of information
- Awareness of received communication

Usability/Adaptability

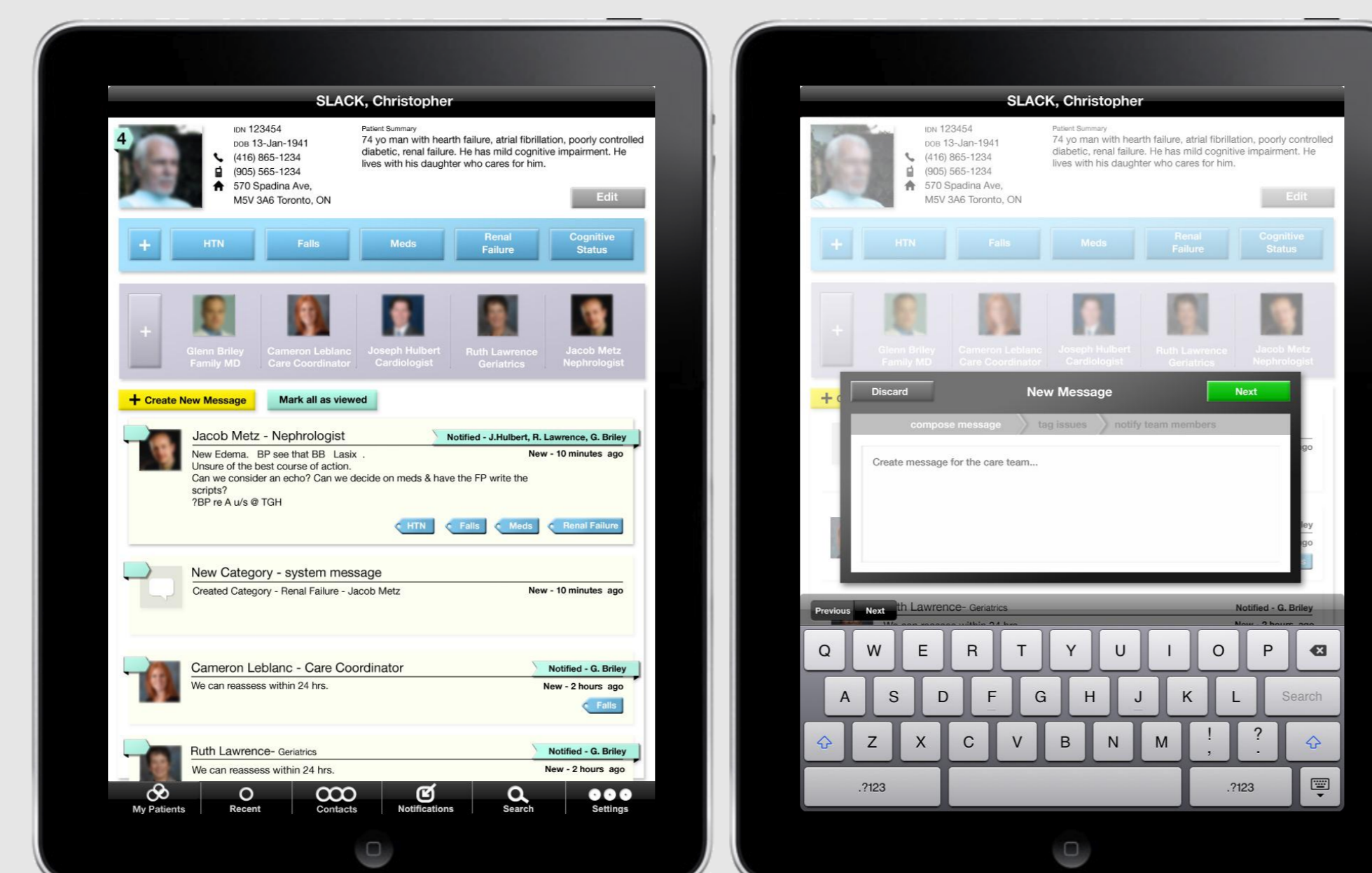
- Adapt to a wide variety of complex care circumstances
- Ensure information systems are cross-platform and account for the different communication preferences of users
- Ensure technology is intuitive and usable in a variety of environments

Efficiency

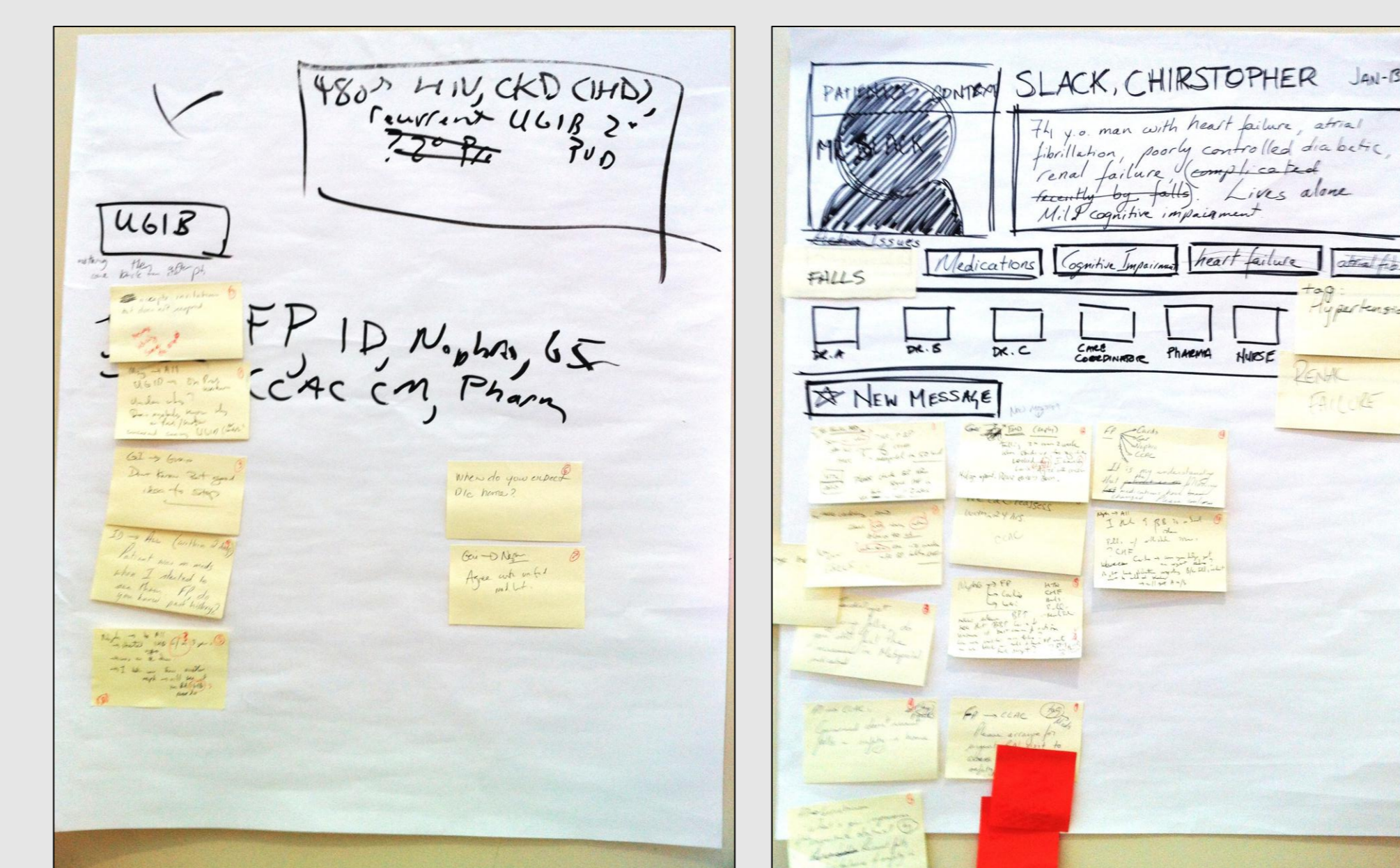
- Minimize time spent reviewing communications
- Ensure timely access to information
- Limit interruptions
- Recover from interruptions in workflow
- Reduce duplication of work

Values

- Patient safety and quality of care
- Enhanced collaboration and better care team relationships
- Accessibility for all members of a patient's circle of care



Evaluation: This iPad interface was used for the 2nd round of CW. Feedback from CW was positive; users were particularly pleased with the flat structure and the simple messaging system that encourages the use of clear and concise messages.



Design: Communication artifacts generated from the participatory design phase, modeled on real patient scenarios were used to further define the structure of the clinical collaboration system and to generate the high-fidelity prototype.

Conclusions and Future Work

The current design of the system allows for open collaboration and discussion of patient issues through brief messages, which can be filtered or directed towards certain providers. Basic patient and provider information is also available. Leveraging concepts from Enterprise Web 2.0, the system promotes informal and less hierarchical relationships which are vital to encouraging interdisciplinary teamwork.

Future work will include:

- Further refinement to incorporate message threading and archiving, simple message flagging, and alerting.
- Design of a patient interface that will allow patients to be collaborators in their own care
- Investigation of how collaboration can be enhanced between groups of care providers
- Randomized controlled trial (RCT) to evaluate impact on the patient, clinician and health care utilization outcomes

If successful, the collaboration tool should lead to improved care coordination and clinician efficiency as well as reductions in emergency department visits, hospital admission rates, and adverse events.

Literature Cited

1. Joint Commission on Accreditation of Healthcare Organizations. Poor communication is common cause of errors. *Healthcare Benchmarks Qual Improv.* 2002 Aug;1(2):18-9.
2. Wilson RM, Runciman WB, Gibberd RW, Harrison BT, Newby L, Hamilton JD. The Quality in Australian Health Care Study. *Med J Aust.* 1995 Nov 6;163(9):458-71.
3. Ministry of Health and Long-term Care. Preventing and managing chronic disease: Ontario's framework [Internet]. 2007.
4. Holtzblatt K, Wood S, Wendell J. Rapid contextual design: a how-to guide to key techniques for user-centered design. San Diego, CA: Elsevier Science & Technology Books; 2005.
5. Muller MJ. The human-computer interaction handbook. In: Jacko JA, Sears A, editors. Hillsdale, NJ, USA: L. Erlbaum Associates Inc.; 2003 p. 1051-1068