

graphic design students

collaborate with

medical researchers

to establish design principles for preprinted chemotherapy order forms

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PROBLEM  
Errors in filling out and reading pre-printed chemotherapy order forms cause adverse patient reactions

This project was in keeping with OCAD's emphasis on research and on social responsibility, which emphasizes six fundamental principles:

- interdisciplinarity
- new technologies
- sustainability
- diversity
- wellness
- contemporary ethics

## Context

**Background** Healthcare Human Factors Group, Centre Global eHealth Innovation, University Health Network (UHN) initiated a 20-month research study in 2008, *Improving the Safety of Ambulatory Intravenous Chemotherapy in Canada*, sponsored by the Canadian Patient Safety Institute (CPSI), Canadian Association of Provincial Cancer Agencies (CAPCA) and individual provincial cancer agencies across Canada.

**Need** A central factor leading to adverse patient reactions was found to be errors in filling out and reading pre-printed chemotherapy order forms

**Initiation** As a result the Human Factors Group approached the graphic design department in the Ontario College of Art and Design (OCAD) in November 2008 to undertake a secondary study. A group of eight student volunteers was recruited on the basis of their interests and good academic standing, supervised by three OCAD faculty members. This project fit in well with OCAD's emphasis on socially responsibility and research.

**The research problem**  
Develop graphic design principles for clinical use and design prototypes illustrating implementation of those principles

## Design Research

**Students briefed** The graphic design students divided into three groups, according to their schedules. Each group spent a day on the chemotherapy treatment site, shadowing nurses in the clinical environment and interviewing nurses, pharmacists and oncologists. After group analysis, reviewing existing literature and framing, the students broke into three groups; each group designed three versions of a relatively simple pre-preprinted chemotherapy order form (PPO).

**Initial ideation** Students considered not only factors such as Gestalt theory, typographical principles, logical hierarchies and research, and other usability factors, but also how the design decisions could be distilled into principles and then communicated to users at clinics with different systems and requirements so that PPO creators at clinics will be able to use and alter templates to accommodate their particular requirements.

**Design methodology** An iterative user-centered design<sup>1</sup> method was used for developing example designs and for developing graphic design requirements for PPOs. The method consisted of four iterations of i) analysis of user requirements, ii) designing & prototyping iii) evaluation and iv) refinements based on user feedback. Members of the PPO working group from the second iteration served as expert users and provided guidance and feedback throughout the design iterations.

The students recognized that this project had some unique design constraints. Most importantly, the forms would need to be highly adaptable such that different cancer care providers can adapt the redesigned forms in a manner that is compatible with their own processes. Also, only very common typefaces could be used on the forms since chemotherapy PPOs are often developed by health-care professionals. Furthermore, the forms would need to be developed using unsophisticated graphics programs and printed using low-resolution printers.

## Outcomes

**The result** The collaboration between the human factors researchers and the design students resulted in a paper prepared by the lead Human Factors Group researcher given at the three day conference. Canada's Forum on Patient Safety and Quality Improvement, 2010: *Draft recommendations for improving preprinted orders.*<sup>2</sup>

Document includes:

- design recommendations that address graphic design and typographical principles in the context of form design
- design process recommendations to aid clinics in the process of designing forms for their own specific needs, as different clinics have different systems.

## RECOMMENDATIONS

graphic design principles for form design



design process recommendations to aid clinics in the process of designing forms for their own specific needs,

## Analysis / conclusions

The methodology for investigating this project was a qualitative case study, based on direct observation by the authors, and unstructured interviews with students, human factors researchers, and other participating faculty. It took place from November 2009 to March 2010.

Students were eager to work on this project, both because it involved a "real-world" design project, and because it was clearly something that was important and could make people's lives better. Though not insurmountable there were cultural differences between the two groups.

Human factors experts and the clinicians have an essentially analytical, empirical, and positivist training. The design students have a creative, cultural, aesthetic and user-oriented education. The students found the

cultural differences interesting, if occasionally frustrating.

Another potential source of difficulty was available time. The students involved were in their last year of their four-year degree program, with many demands on their time and the medical researchers were largely dedicating their time to this particular and the overall project.

The project was generally successful from the point of view of students, medical researchers and faculty: the students gained experience working collaboratively with practitioners from other fields, the medical researchers benefited from expertise in an area in which they had little, and the faculty recognized the value of student engagement and the value of working outside an environment peopled by graphic design students and faculty.<sup>3</sup>

- Stone, Deborah L. *User interface design and evaluation*. (San Francisco: Kaufmann, 2005), p. 15.
- Jeon, Jennifer. "Improving the Safety of Ambulatory Intravenous Chemotherapy in Canada: Draft recommendations for improving preprinted orders." Paper given at the conference, Canada's Forum on Patient Safety and Quality Improvement 2010. Toronto, April 12-14, 2010.
- Interviews with Joel Derkson, Symon Oliver (OCAD students), Patricio Davila, Richard Hunt (OCAD faculty), Jennifer Jeon, (UHN). Toronto, April 12-14, 2010.