

DEVELOPING GUIDELINES FOR IMPROVING AMBULATORY CHEMOTHERAPY PREPRINTED ORDERS

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INTRODUCTION

Errors with chemotherapy can be fatal given the toxicity and narrow therapeutic margins of chemotherapy agents. The death of a patient in Alberta due to a chemotherapy agent overdose has highlighted the safety risks associated with chemotherapy.[1]

To address safety risks associated with intravenous (IV) ambulatory chemotherapy, a pan-Canadian study was conducted by a multi-jurisdictional and multi-disciplinary research team from 2008 to 2010.[2] The study involved a national survey of cancer care providers and ethnographic field studies at six cancer centres across Canada. The survey results showed that preprinted orders are the primary communication tool used by Canadian cancer care providers. Preprinted orders (PPOs) are paper order forms with standard order information pre-filled such that the prescriber needs to write in only patient-specific information. Nevertheless, the field study observations revealed that existing PPOs vary widely in format and layout and that they do not incorporate the flexibility required for the dynamic needs of oncology ordering practices.

This paper describes the efforts undertaken to create guidelines and supportive tools for developing ambulatory chemotherapy PPOs, and their implications for the clinical engineering community and patient safety in general.

METHODS

Literature review and environmental scan

Multiple search strategies were used to identify articles relevant to PPOs and form design in general. Journal databases searched included Ovid MEDLINE, Ovid HealthSTAR, all

EBM reviews, EMBASE, CINAHL, IngentaConnect, and Engineering Village 2. In addition, websites of key medication safety organizations as well as the Internet were searched. A total of 45 relevant articles were found.

Field study observation analysis

Workflows of PPO users (i.e., pharmacists, pharmacy technicians, nurses, physicians, and administrative staff) and chemotherapy order communication processes were analyzed by developing an order information flow map for each cancer care facility studied. In addition, a human factors professional evaluated sample PPOs from the field study sites in terms of their usability and utility. Whenever available, incident reports related to the use of PPOs were analyzed in the context of each field study site's workflows and communication processes. Finally, potential PPO issues identified were analyzed in the context of other patient safety risks identified.

Formation and review of draft PPO guidelines

The issues and best practices related to PPOs identified from the literature review, the environmental scan, and the field study observation analyses were translated into a set of PPO content and design guidelines by a human factors professional. For each guideline, benefits, examples, and issues were documented. Those guidelines from the literature that conflicted with human factors principles, field study observations, or with each other, were noted.

Three oncology pharmacists, an oncology nurse, two medical oncologists and one radiation oncologist formed a clinical advisory group. They participated in an online survey and two focus group sessions on the design and

content guidelines, respectively. The objective was to achieve a unanimous decision on the retention or rejection of each draft guideline.

Sample PPO development and design guideline refinement

Seven senior graphic design students and two faculty members from the Graphic Design Department at the Ontario College of Art and Design (OCADU) then joined the group to contribute their expertise in typography, visual arts, and page layout. The interdisciplinary group collaborated on five iterations of designing, prototyping, and evaluating three commonly used chemotherapy protocols. The graphic designers developed sample PPOs by establishing effective information hierarchy, maximizing legibility, establishing effective page layout, and considering user perceptions. In the fourth iteration, a group of 20 oncologists, oncology pharmacists, pharmacy technicians, clerks, and oncology nurses from across Canada provided feedback on the prototypes. The fifth and final revision included an update based on the newly released guidelines for standard order sets by the Institute for Safe Medication Practices (ISMP).[3]

RESULTS

The literature review, environmental scan, field study observation analysis, formation and review of draft guidelines, and collaboration of human factors professionals, graphic designers, and oncology clinicians led to the *Guidelines for Developing Ambulatory Chemotherapy Preprinted Orders*. [4] The document consists of three main sections: (a) Design Process, (b) Content Guidelines, and (c) Design Guidelines. The Design Process section introduces an iterative design method with multidisciplinary involvement for developing PPOs, which can be employed by those wishing to develop or refine PPOs for their clinical context. The Content Guidelines section consists of 28 guidelines that describe content that should and should not be included, expressions, and nomenclature. The Design Guidelines section consists of 52 guidelines on content organization, page layout, and formatting-related topics. Throughout the document, the three sample PPOs developed in

collaboration with the graphic designers are used to demonstrate how the guidelines might be implemented. The sample PPOs are also made available to download from the Internet as modifiable PPO templates.

DISCUSSION

Most guidelines or standards for visual communication mechanisms in healthcare tend to focus on their content rather than their design. For chemotherapy orders, a number of guidelines and studies exist that advise what information should be displayed and which expressions/nomenclature should be used (or avoided) to reduce the risk of medication errors.[3, 5-12] The only set of guidelines that addresses how the design of physician orders can affect clear order communication is the *Guidelines for Standard Order Sets* published by the ISMP in 2010.[3] The document provides guidance on layout, typeface style, type, symbols, abbreviations, dose designations, and punctuation. Nevertheless, the document shares the common limitations of many guidelines in healthcare. First, the document does not provide the rationale behind most of its guidelines, which makes it difficult for users to understand their significance. Second, the document does not provide any tangible examples, although a bulk of the guidelines are concerned with formatting of standard order sets.

In comparison, the *Guidelines for Developing Ambulatory Chemotherapy Preprinted Orders* is unique in that each issue and the corresponding guideline are visually illustrated as shown in Figure 1. The illustrations allow users to easily understand the purposes and significance of the guidelines. In addition, the three sample PPOs provide tangible examples of how the guidelines could be implemented.

Clinical engineers are often responsible for developing guidelines about using medical devices for healthcare professionals. The user-centered and multi-disciplinary approach used in this study may also help clinical engineers design guidelines that are more intuitive and easy to apply, and thus, as a consequence, lead to improved patient and staff safety. Further research is necessary to explore applicability of

All text on PPOs *should* be aligned flush left with a ragged right margin.

Multiple lines of text are more readable when flush left with a ragged right margin than centered or justified.

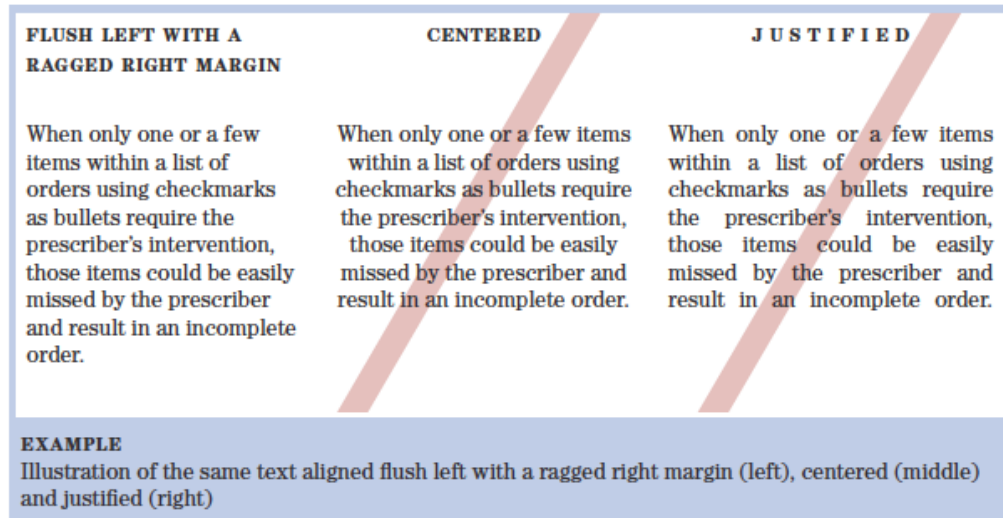


Figure 1: Sample PPO design guideline

this design method beyond ambulatory chemotherapy PPOs.

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