

## The Evolution and Uptake of a Drug Information System: the Case of a Small Canadian Province

Naomi Mensink, Grace Paterson

*Medical Informatics, Faculty of Medicine, Dalhousie University, Halifax, Canada*

### Abstract

*In 2008 the province of PEI, Canada implemented a province-wide, web-based drug information system for the purpose of improving patient safety. An evaluation study using grounded theory examined the human and workflow impact. Results indicated a need for great attention to the details of change management during implementation, including: ensuring application quality of all informational and technical elements, just-in-time training and technical support, on-site preparation for changed workflow processes, and collaboration among all stakeholders throughout.*

### Keywords:

Drug information systems, Cost-benefit analysis, Community pharmacy services, Clinical pharmacy information systems, Drug utilization review

### Introduction

Prince Edward Island (PEI), the smallest province in Canada, implemented a system in 2008 for sharing information among pharmacies on prescribing and pharmaceutical dispensing. Implementation of DIS in PEI pharmacies began in March 2008. Following 10 years of planning and preparation in PEI and a ground-swell of national attention to the general process, PEI set a provincial government body in place to create a digital system and network; passed legislation to require compliance; and watched the results unfold. Principles of change management and adoption were actively planned into the process as part of an investment program initiative of Canada Health Infoway [1].

Our study was conducted as a cost-benefit analysis of implementation. The aspects noted in this report are those where we reviewed the results to determine the possible influencing factors around change management that would create differences in efficiency and effectiveness of workflow processes in pharmacies between those which had implemented; those in the process of implementing; and those which had already implemented and become relatively proficient.

### Research Objectives

This research initiative was conducted by two members of the faculty of Dalhousie University, at the request of the National

e-Pharmacy Task Force. The overall objective was to examine costs and benefits of the Drug Information System (DIS) as it was being implemented so that comparisons could be made among those locations which had already implemented, those that were in the process of implementing and those that had not yet implemented. It encompassed a number of specific objectives. The objective of this paper is to look at the outcomes of the implementation process for three of the objectives of the study and how those can be related to change management processes and uptake of innovations (adoption) that were applied to the implementation process. The three objectives that will be used relate to examining the impact of implementation of the DIS in a) workflow changes; b) acceptance of the DIS by stakeholders, especially practicing pharmacists; and c) observed or recorded patient safety issues including patient education, flags, adverse events and documentation processes [2].

### Methods

This study used qualitative methods to gather data for the change management side of the study. Evaluation of costing and the programming was also conducted but is not part of this report. We conducted a review of the history of development and application of the DIS in this province as told by persons directly involved in the process. We observed workflow in 30 of the 43 community pharmacies in the province for at least 1 hour. In each of the pharmacies we prepared sketches of the dispensing area layout and equipment with the physical movement patterns and workflow noted. Following observations, we interviewed community pharmacists (in all instances), pharmacy technicians (in some instances) and with pharmacy managers and/or owners (in a few instances). We held focus groups with pharmacists and managers together. Input from all these sources was then text analyzed and sorted into major themes.

The qualitative research method applied to the objectives of the study was based on grounded theory,[4] or theory generated from the ground up. It explores the social processes of how people interact, take action, and engage in response to a particular phenomenon. In this research, the phenomenon is implementing the DIS in the community pharmacies in a relatively small province that functioned as an excellent living

laboratory. As part of using a grounded theory approach, the researcher guided interviews and focus groups with a series of open questions that were designed to allow the participant to guide the contents of the interview/focus group from that point on. Extensive notes were taken during each interview and focus group, noting direct quotes using the participants' own words. These were shared with the interviewee to ensure that the words and the tone were reflected accurately. Each focus group and interview was preceded by an introduction to the scope and purpose of the research.

The model provided a basis for measurement of factors such as system quality, information quality, service quality, and user satisfaction, which have an impact on benefits realization.

**Results**

Based on interviews using 30 semi-structured interviews with observations and 2 focus groups, the following common or important themes were brought out by participants:

*Table 1-Themes reported by participants*

Themes	Frequency of mention in interviews and focus groups
There was near universal commitment by participants to the objectives of DIS: - reduction of medication errors - reduction of drug abuse through double doctoring or poly-pharmacying - prevention of adverse events due to adverse drug interactions	32 or 100%
The province was starting to realize benefits from the DIS	26/32 or 81%
There was a desire for access to the full patient profile and participation by others in the health care system (hospitals, clinics, physicians' offices)	26/32 or 81%
The system generated multiple unimportant alerts that caused concern: - that they may be missing an important alert in the midst of the many unimportant - that it takes precious time to "manage" each unimportant alert, that would better be spent on other things during peak busy times	24/32 or 75%
A perceived lack of collaboration among software providers	
Insufficient preparation for implementation	21/32 or 66%
Need for better clinical information support on drug utilization review (DUR) alerts	5/32 or 16%
Allergy notation related to drug use is too rigid and standards-bound to be useful.	5/32 or 16%
System down-time is a major issue.	27/32 or 84%

**The History of the Project around Change Management**

Based on several interviews we were able to determine the history of the project. This showed that there was a 10 year period of planning for implementation, with the original ideas for the concept coming from the PEI Pharmacists Association. Between the Association, the government planners, the software developers and the national e-health body there was collaboration on a well-developed change management plan. This included participatory planning by members of the above groups, and support from change management consultants at several levels.

Using Kotter's model of organization development through change management [3], there was an emphasis on such aspects as creating a powerful coalition, that convinced all that change was necessary to the point where legislation was passed to require the change to take place.

There was careful planning around the details of the drug information system software to ensure that all safety issues were adequately addressed. There was a concerted effort to bring all vendors of software that served the individual pharmacies to the table. There was one pharmacy in an urban setting that was designated as a pilot site where the drug information system software was tested and refined.

**Commitment to the Change**

The findings of the study showed that there was universal commitment on the part of all participants in the process to the objectives of DIS and that the implementation of the system was starting to realize benefits outlined in the objectives, such as improved patient safety in preventing potential drug interactions or duplicate therapies; and recognizing and preventing customers from getting the same prescription filled at multiple pharmacies, as well as preventing customers from using prescriptions for the same medication from multiple doctors. At the point of our study, only community pharmacies were universally expected to be on the Drug Information System, and to share prescribing information across all pharmacies. One major finding was that participants expressed a desire that all stakeholders be on the system, including hospitals, emergency departments, outpatient clinics and all physicians in private practice: that greater benefits could be achieved if that were the case.

**Nature of the System for the Purpose**

The nature of the system was such that, to be most effective, information on prescriptions for each customer had to be on the system in order to be shared with all other pharmacies. The decision was made to start with no history, so that only new prescriptions were entered on the system. This meant that the usefulness of working with information from the full scope of other pharmacies across the province was not evident in the early days, and that the "costs" in terms of irritation with learning new processes in the middle of a busy work process, was not compensated for, yet, by the "benefits" of being able to see a fuller prescription history for each customer.

From a technology and software programming perspective: observations showed, and participants noted, that there were

multiple unimportant “alerts” (indications of potential patient safety hazards) that were too sensitive. For example, early renewal of a prescription resulted in an alert for “duplicate therapy”, or an address that had a different version of a person’s name was alerted as an error that had to be corrected before continuing.

Another aspect of the system was that the provincial DIS provided information that was fed into and integrated into the existing pharmacy software that already managed their dispensing processes. For some stores, this made the transition relatively easy, as the learning curve was focused on the information and processes related to the DIS that supplemented their pharmacy software system. In these stores, there might have been some irritation with the multiple alerts, but the transition to using a shared information base was relatively easy and required marginal new learning.

It was discovered that some of these individual pharmacy systems were incompatible with the provincial DIS, so that several groups of stores were required to implement entirely new pharmacy software systems, some of which had lesser functionality than what they had originally. This meant not only a steep learning curve as a totally new software system had to be learned, but also irritation with loss of functions that staff had become accustomed to. This also meant that these pharmacies had to re-enter data about prescribing history in their own stores, which meant a large investment of data entry time. These things had not been planned for in the original change management plan, as it was expected that individual pharmacy software vendors would manage that part of the transition. The researchers heard from participants that there was strong dissatisfaction with the introduction process as a result. This included a perception of insufficient collaboration among the following key stakeholders prior to implementation: the vendor community, the government representatives who were responsible for planning and implementing the DIS, and the DIS system software developer.

#### **Preparation at the Individual Pharmacy Level**

One area of importance to participants was a perception of insufficient preparation with the individual pharmacies for introduction of the system in the individual stores. Participants noted lack of on-site training. They noted, and we observed, that pharmacies were very busy places and that there was little time available for training with on-the-job kinds of tools. Since this tool was integral to the primary function of the pharmacy – to dispense medications according to valid prescriptions – and once the system was installed its usefulness was dependent on everyone using it immediately, there was no period of time during which a pharmacist or pharmacy technician could take time away from dispensing medications to learn the new system, because it was the only way available to dispense medications once it was installed. There was no opportunity for parallel systems.

Of the three dispensary software vendors used in the province, we observed only one that sent a training team to work with the dispensary staff to introduce the new system, to enter any background data that was needed, to train staff and to work with them in using the system during the changeover. However, we observed that several of the chains organized for an

er, we observed that several of the chains organized for an active help desk person from the parent organization, other than the DIS software system team, to be available for sorting out issues. Many participants expressed appreciation for these functions.

#### **Training**

There was also a perception of lack of training. In preparation for implementation, the implementation planning group held a teleconference introduction and training session for all pharmacists, that all were required to attend (there was 97% participation). This made it possible for all participating pharmacists to get an introduction to the new processes as well as information on how to resolve issues. The perception of lack of information was thus more likely due to the nature and timing of the teleconference. For many participants, it would have occurred several months prior to implementation, thus any learning from the call would have been lost. For others who may not have been auditory learners, they did not have reinforcing information in other formats to support retention of their learning. As a learning tool, it was likely sadly insufficient to meet the needs. It might have been better to have an on-line support function with help for learning particular processes when the participant actually started to learn how to use the system.

#### **Help and Support**

Many noted a lack of information on how to resolve issues and of consistent help desk support from either the provincial DIS provider or from the pharmacy’s software provider in the early days. It was not always clear which help function was needed, and participants noted instances where each help desk would suggest that the other would be the better one to call for support.

#### **Discussion**

We could find no clearly accepted framework internationally for evaluating the comparative effectiveness of change management processes for eHealth projects [5]. The major model for benefit evaluation in use for Canadian e-health projects through Canada Health Infoway includes user satisfaction and ease of use as a central component of its framework [6]. For purposes of examining the change management process, this study accepts the premise that, for professional healthcare providers (pharmacists and pharmacist/managers), user satisfaction gives an indication of the quality of the system as well as the quality of the implementation process, since their professional interest is in information quality and outcomes for their patients.

Those who have examined the value of an integrated drug information system after its implementation have shown that there is value for prescribing clinicians in having access to a complete drug profile in combination with a clinical decision support system that allows for indications of interactions with other medications in the profile, with health condition or with allergies, and indications of appropriateness of quantities and other factors [7]. A study from an inpatient facility in Taipei [8] that looked at nurses’ use of an integrated drug information

system found that it helped to reduce medication errors to a certain extent, except for errors in time of administration. One could speculate that a change management approach that included examining the workflow and perspectives of the nurses might have made a difference to that factor.

## Conclusions

There were many valuable lessons to be learned about how to do effective change management around complex system changes to be derived from this study. The principal one appears to be that the process of introduction to users must be as carefully planned in all its details, and prepared for, as the shape of the technology itself. In addition, it seems that the preparations for change must also be focused on each individual workplace or store, since there was significant variation among the ability of each workplace to adopt the changes, and in the perceptions of the store personnel about its effectiveness. Differences included the kind of technology currently in use in the store, and the level of technical expertise of the users. It is the people who are affected most by the change, namely the system users at the interaction point with customers, who are most important. Preparation for the details of the change, support for on-the-spot training, support for technical issues and opportunities to learn in a time and place where the customer will not be affected, are all important aspects that came out in this study.

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## Address for correspondence

Naomi Mensink, Medical Informatics, Division of Medical Education, Faculty of Medicine, Dalhousie University, 5849 University Avenue, Halifax, NS Canada B3H 4H7