ORIGINAL RESEARCH

Computer networking to enhance pharmacist-physician communication:

A pilot demonstration project in community settings

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Background: The use of technology to enhance communication about patients' drug therapy has been advocated by physician and pharmacist associations in Canada. The objective of this pilot study was to demonstrate the proof of concept for an electronic network linking pharmacists and community family physicians in order to exchange information about patients 65 years of age or older who were taking five or more medications regularly.

Methods: Three community family physicians, 40 of their patients, and three community-based pharmacists with whom the patients most frequently filled their prescriptions participated in the study. Pharmacist-physician pairs were connected through a secure dial-up electronic network. Patients met with the pharmacist to review their medications, including over-the-counter (OTC) products, and the pharmacist generated an electronic profile for the physician. The physician could respond electronically to the pharmacist with edits in order to arrive at a consensus profile for each patient and to discuss discrepancies or drug-related problems. Electronic communication was followed for four months, after which interviews were conducted with the pharmacists and physicians.

Results: Patients were mostly female (65%) and were 74.9 years of age on average. Physicians and pharmacists accessed the network a total of 144 times and 96 times, for an average duration of 7 minutes and 41 minutes, respectively. Physicians noted the benefit of learning about their patients' OTC medication use and about issues such as lack of compliance. The most common barrier to using the electronic communication system was lack of time.

Conclusion: The electronic linkage was found to be useful. Further evaluation of the effectiveness of this communication system is needed. Patients' access to their electronic medication profile should also be considered for future projects of this type.

The application of telecommunications in the practices of pharmacy and medicine is in the initial stages of development.[1-5] Pharmacists and physicians could optimize their use of existing electronic transfer technologies to create a more integrated communication system.

Secure Internet- or Intranet-based systems have the potential to replace much of the present phone and fax correspondence regarding prescription initiations, prescription renewals, and questions on prescribing.[2,6,7] Furthermore, disjointed or discontinuous communication between pharmacists and physicians can increase adverse drug events.[8] It has been suggested that pharmacists and physicians should optimize the use of technology and should collaborate in the development of technology to enhance communication and efficiency between the two professions.[9] One example of this would be shared patient databases pertaining to drug therapy.

The integration of information technology at the "grassroots" interface of community pharmacy and family medicine might enhance communication, knowledge acquisition, and the accuracy of patient medical records. These improvements may in turn result in better care for patients.

This project, the Seniors Medication Assessment Research Trial–Electronic Networking (SMART-EN), was a demonstration project that linked community pharmacies with family physicians using an existing firewall-protected Internet service known as the Hamilton Public and Private Information Network (HappIN).

The main objective of this pilot project was to determine the feasibility of and the proof of concept for establishing an electronic network between community pharmacists and family physicians to exchange information about their common patients.

Methods

The study included a convenience sample of three family physicians having some previous relationship with the investigators and varying degrees of computer literacy:

- One physician was capable of doing his own programming and maintaining a paperless office.
- The second did not use the computer but delegated to his receptionist, who responded with his comments.
- The third had intermediate computer skills.

All of the pharmacists were comfortable using the software in their pharmacies. Three pharmacies, each serving the majority of a particular physician's patients, were selected so that three pharmacist-physician pairs were created.

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The study was conducted from May 1998 to September 1998. Each physician or physician designate invited 30 patients to participate. Patients had to be at least 65 years of age, taking five or more medications, clients of that physician's linked pharmacy (and only that pharmacy), and not cognitively impaired (as judged by their physician).

Consent

An information script was provided to physicians to assist in recruiting patients. Physicians faxed the signed consent forms to the participating pharmacies so the pharmacists could initiate follow-up with the patients. All participants provided informed consent, and the study was approved by the Ethics Review Board of St. Joseph's Healthcare, Hamilton, Ontario.

Patient profile

Upon receipt of a signed consent form, the pharmacist telephoned the patient to arrange a personal interview in the pharmacy. Patients were asked to bring in all of their prescription and OTC medications. The pharmacist created an electronic medication profile (including all prescription, OTC, and herbal medications) for each patient, with a new profile being created each time the patient obtained a new medication. Patients were asked to inform the pharmacist of subsequent purchases of OTC medications as well as prescriptions filled at another pharmacy.

Database

The profiles generated by the pharmacist were uploaded to the SMART-EN medication record database web server along with any messages explaining discrepancies revealed in the interview. The patient's physician could access these profiles and messages at his convenience. The physician could send messages back to the pharmacist to indicate changes that should be made to the profile and to communicate other therapeutic information, such as differences between how a patient reported taking a medication and how it had been prescribed.

Communications were accomplished through the use of the HappIN web server, which was located behind a firewall at McMaster University. Any web browser could be used to access the database. Data were accessible only via the modem pool and not from any Internet service providers. Interaction of the pharmacist-physician pairs was followed for four months.

Software

All of the pharmacies used Propharm dispensary software (Drug Trading Co., Toronto, ON). One site was equipped with what was then the newest version, known as the Nexxys dispensary system, which is a Windows-based (Microsoft, Redmond, WA) interactive system. An information technologist visited each physician and pharmacy to assess the hardware and telecommunication capabilities of each pharmacist-physician pair. Hardware and/or software were supplied as required. Connectivity was established through HappIN. Hardware and technical support were provided to the pharmacies by RxCanada (Toronto, ON) and to the physicians by HappIN. Software was developed to extract the medication profile from the existing dispensary software.

KEY POINTS

- Demonstration project linked pharmacists and physicians electronically
- Objective was to determine whether an electronic network between community pharmacists and family physicians could enhance communication about patients' drug therapy
- 3 pharmacists, 3 physicians, 40 patients
- Self-reporting by pharmacists and physicians was positive
- Concept warrants further development and research.

— The Editors

Access

The medication profiles of the patients were accessible only by the physician and the pharmacist who generated the record. Data encryption and a password protocol were used to maintain patient confidentiality. An electronic log of all transactions was kept throughout the project. One of the investigators (DC) periodically audited the log to confirm that there were no security violations.

Monitoring

Activity on the network was monitored to determine the number of medication profiles created by the pharmacists and sent to physicians, the number of communications between physicians and pharmacists, and the duration of each encounter. A research assistant with experience in qualitative research interviewed the physicians and pharmacists using a semi-structured interview guide. Questions pertained to the usefulness of the network, how to improve it, and which patients would benefit most from it. The taped qualitative interviews were transcribed and analyzed by the interviewer and one investigator to identify themes regarding the acceptability and feasibility of the network.

Results

Forty patients were recruited at the three sites (N = 21, 4, and 15). (The physician who recruited four patients had been on vacation during part of the recruitment period.) Sixty-five percent of the participants were female. The average age was 74.9 years (range 62–95, SD = 7.7) and 42% were over 75 years of age. On average, the patients were taking 7.4 (SD = 4.3) prescribed medications and 2.5 (SD = 2.0) OTC medications at the time the medication profile was generated by the pharmacist. The three

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physicians were all full-time, solo, male practitioners, who practised in an urban setting.

To begin the process of creating a complete and accurate medication profile for each patient, the pharmacists sent an initial profile to the physician. For 36 of the 40 patients, physicians made corrections to the profile based on the patient's medical record. Over the four months of the study, the pharmacists generated 99 updates to the profiles in response to patient encounters at the pharmacy and correspondence with the physician. Physicians replied to the pharmacists a total of 100 times regarding either initial or modified medication profiles. The most active pharmacist-physician pair accounted for 57% (43/76) of the profiles created, 67% (65/99) of the updates, and 65% (65/100) of the profiles returned to the pharmacist. In one practice, the receptionist sent the physician's comments. A sample of a medication profile communication between a physician and a pharmacist is shown on the right.

The physicians accessed the SMART-EN site 144 times, either to view a profile or to send a message, for an average duration of seven minutes. For the most active pharmacist-physician pair, the physician spent, on average, twice as long per encounter as the other two physicians. This physician accessed the site more frequently outside normal business hours (i.e., not between 9 am and 5 pm on weekdays). The pharmacists accessed the SMART-EN site a total of 96 times for an average duration of 41 minutes. There were three instances in which technical assistance was required.

Sample communication between pharmacist and physician

Pharmacist:	Patient X is feeling very tired and lightheaded. Her glucose readings have been fine, between 6 and 7. She thinks it may be her thyroid and would like to see you to have it reviewed.
Physician:	TSH, normal; HbA1C, normal.
Pharmacist:	Should patient Y still be taking her levothyroxine? She did not mention using it in her interview. Her profile shows it has not been filled since March.
Physician:	She should be taking L-thyroxine, 0.1 mg OD.

Themes identified in interviews

Important themes that were identified in the interviews (see next page) include:

- Physicians reported that it was possible to gain previously unknown information about their patients from the pharmacists.
- Pharmacists appreciated being able to interact on a different level with patients.
- Generally, the pharmacists felt that the advantage of the network was that it allowed them direct access to the physician, rather than communicating through the receptionist or nurse by telephone.
- Physicians also appreciated the timely dialogue with pharmacists.
- All of the physicians and pharmacists agreed that the senior population would benefit from the new communication. It was also suggested that seniors with caregivers be included.
- The physicians felt that the time taken to review the profiles was a barrier to their use. They suggested that the electronic profile should integrate with the electronic medical record, if such existed, and that computer linkage would be helpful when on house calls. Lack of time was also an issue for the pharmacists. One pharmacy only accessed the SMART-EN site in the evenings since their telephone fax line was busy during the day.
- Two of the physicians were not sure if they would use the linkage in its present form.
- Two of the physicians noted that with software changes and integration into the pharmacy dispensary system the interaction would be very useful. The interaction needs to be simplified and less time consuming. It was noted by one pharmacist that it was difficult to pick up changes to a patient's medication profile as the present dispensary systems make it difficult to flag such cases.
- Ideally, the linkage would be a direct real-time linkage so that messages could be received and responded to throughout the day at the physicians' and pharmacists' convenience. It was also noted that the interaction could be used for other purposes, such as drug formulary administration, pharmaceutical care consultations, e-mail messages, and transmission of prescription information from specialist physicians.

Discussion

The results of this pilot proof-of-concept study suggest that it is possible to link family physicians and pharmacists with shared data records. The messages exchanged were largely found to be useful and accurate, and time and technical constraints were the most common detractors.

Other research has shown that using a computerized drug utilization review was successful in altering inappropriate prescribing practices.[1] In that study, by triggering contact with a family physician, a pharmacist was able to modify the prescribing in approximately one-quarter of cases.

It is clear that information and communication technology will be prominent in the practices of physicians and pharmacists in the future.[7,10,11] Sophisticated computer programs are being developed to improve prescribing practices and enhance the monitoring of chronic diseases.[2] Before these programs can become useful tools, it will be necessary for clinicians to perceive a benefit. Research is needed to determine how such software can best be integrated into present-day clinical practices.

Once a link is established and an ongoing profile can be shared, several extensions are seen as both logical and desirable enhancements:

1. Electronic prescribing is desired by both physicians and pharmacists to increase the efficiencies of prescribing and dispensing; however, it has not been implemented in Canada. The federal government has a committee examining the use of computer-to-computer transactions, including electronic prescriptions.
2. Information on medical conditions would be a valuable resource to pharmacists that would further enable collaboration with the physicians to optimize drug therapy.
3. Use of drug interaction software would enhance the benefits of collaboration.[1,2]
4. Online consultation could be provided to family physicians by a remote pharmacist and then be imported into an existing electronic medical record, if such existed.

The exchange of patient information between physicians and pharmacists is common; however, it is often incomplete and the two professionals seldom communicate directly. All of the pharmacists and physicians involved in this study believed that they would use this exchange if it were more integrated into their computer systems. For example, a shortcoming of the software used in this study was the inability to modify the electronic profile at the pharmacy point of care.

The longer time spent by pharmacists accessing the network compared to physicians is explained by the time required for the pharmacist to create the first medication profile, to recreate updated profiles, and, sometimes, to download information from one computer to another. To protect patient confidentiality, our project adopted a conservative strategy for its security architecture. Had a virtual private network been in place, the project could have used the Internet to connect pharmacists and physicians, thus eliminating the need for the time-consuming dial-up to a secure server.

In the future, although not included in this project, it would be possible for other pharmacists and physicians to have access to the medication profiles, as long as permission was obtained from the patients. Consideration of providing patients access to their electronic medication profile was given but not possible for this project. It would be possible if so desired.

Limitations

There are several limitations to this pilot project. The sample size was small and a single physician accounted for the majority of the interaction; therefore, the results cannot be generalized to other settings, and we cannot be certain how feasible this model would be in the larger community. The technology used in this project would have to be modified. This was not done since we did not want to interfere with the

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Interview themes

Physician and pharmacist themes and quotes

All of the physicians and pharmacists agreed that the senior population would benefit from the new communication.

"*…especially the elderly, there's always confusion with what medications they're taking. So I think it eliminates a lot of confusion over what medications they are taking; so, both the pharmacist, the patient, and I are on the same page...*"

Both physicians and pharmacists felt that the time taken to create and review the profiles was a barrier to their use.

Pharmacist themes and quotes

Pharmacists appreciated being able to interact on a different level with patients.

"*I also found that people were really pleased that we took the time to talk to them … most of them enjoyed the interview process and being able to sit down and have somebody spend that much time with them, just listening to them and talking to them.*"

Pharmacists felt that the advantage of the network was that it allowed them direct access to the physician.

"*…how easy it is to have miscommunication between pharmacists and physicians as far as what people are taking and what we understand them to be taking as opposed to what the doctor understands them to be taking.*"

Physician themes and quotes

Physicians reported that it was possible to gain information they did not previously have about their patients from the pharmacists.

"*I learned that my patients do take a lot of medications over-the-counter. Ones that do the same thing, [such as] antacids and H_2 antagonists.*"

Physicians also appreciated the timely dialogue with pharmacists.

"*…better relations with the pharmacist because we're actually talking, typing to each other as opposed to me sending a slip of paper [prescription] off and having no feedback … it's just a start of a closer interaction between the pharmacist and the physician. I think it gives the patients a sense that people are working together.*"

Two of the physicians were not sure if they would use the linkage in its present form.

"*I think it [the project] was a great start. I mean, I think it will start out this way, and eventually, you get all hooked up online. We're all connected — pharmacies, labs.*"

Two of the physicians noted that with software changes and integration into the pharmacy dispensary system, the interaction would be very useful.

"*Unless it's fairly simple, it won't be used.*"

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pharmacies' computer systems for the purposes of this project.

The use of electronic medical records technology has been expanding, and a pharmacist-physician electronic interaction would require a user-friendly integration into the systems currently being implemented through primary care reform in Ontario, for example, and the software used in pharmacies.

This small proof-of-concept study suggests that pharmacists and physicians can communicate important patient drug therapy information by a secure electronic method. Based on this study and the findings of a recent randomized trial evaluating a pharmacist consultation program in family physicians' offices,[12] we are optimistic that family physicians will consider this new model of enhanced communication. Further research is needed to learn more about the effects of this enhanced communication on medication changes, pharmacist-physician relationships, and patient health outcomes. ■

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