Integration of a Pharmacist into a Stroke Prevention Clinic Team

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INTRODUCTION

Stroke is the fourth leading cause of death in Canada, accounting for 14 000 deaths annually. Between 40 000 and 50 000 strokes occur every year, 75% of which result in some type of impairment or disability.[1] Stroke survivors have a 20% risk of another stroke within 2 years of the initial event, and 33% of all strokes are thought to be repeat episodes.[1,2] The use of antiplatelet agents and the management of risk factors, such as smoking, diabetes, atrial fibrillation, physical inactivity, excessive alcohol intake, hypertension, and dyslipidemias, are key to preventing recurrent stroke.[2,3]

Although numerous studies have demonstrated that patient outcomes improve when pharmacists are involved in cardiovascular risk reduction and anticoagulation management, few publications have outlined pharmacists' involvement in secondary stroke prevention.[4] The purposes of this paper are to describe the rationale for pharmacist involvement in a stroke prevention clinic, to outline the role of the pharmacist in the clinic, and to retrospectively evaluate the pharmacist's workload, to determine the number and nature of the patient care interventions performed.

RATIONALE FOR PHARMACIST INVOLVEMENT

The participation of pharmacists in patient care may improve quality of life and medication adherence, while decreasing prescribing errors, morbidity, and mortality.[4-6] Studies have also demonstrated consistent benefits of pharmacist involvement in the management of hypertension and dyslipidemia, 2 of the major modifiable risk factors targeted in stroke prevention.[3] In one study, comanagement of hypertension by pharmacists and physicians (whereby the pharmacist was responsible for patient education and for recommending drug therapy changes to the physicians) resulted in significant reductions in blood pressure and increases in the number of patients who reached their blood pressure targets relative to physician management alone (60% versus 43%, $p = 0.02$).[7] In another study, which was conducted in a multidisciplinary primary care unit, pharmacists provided patient education and made drug therapy recommendations to physicians, which resulted in significant decreases in blood pressure levels and led to more patients achieving target blood pressure readings relative to patients who received no pharmacist care (61% versus 41%, $p = 0.017$).[8] In a smaller study, significantly more of the patients who were randomly assigned to attend monthly meetings with a clinical pharmacist (who changed medications and doses and provided hypertension education) experienced blood pressure control than patients with physician management alone (81% versus 30%, $p < 0.0001$).[9] Similar results have also been obtained in community pharmacy settings.[10,11]

Several retrospective studies have highlighted the benefits of pharmacist involvement in cholesterol management.[12-14] Cording and others[15] found that 77% of patients achieved their low-density lipoprotein (LDL) goal after participation in a pharmacist-managed lipid clinic, compared to 44% at baseline. Till and others[16] found that serum concentrations of LDL declined by an average of 18.5% when patients were followed in a pharmacist-managed lipid clinic; the mean reduction observed in the control group was 6.5%.

Prospective studies have also demonstrated the benefit of pharmacist interventions in cholesterol management. The Study of Cardiovascular Risk Intervention by Pharmacists (SCRIP) was a randomized controlled trial of 675 patients at high risk for cardiovascular events, who received either an intervention by a community pharmacist or usual care.[17] Patients in the intervention arm received point-of-care cholesterol testing and standardized education about their cardiovascular risk factors. The pharmacist then made recommendations to the patient's family physician. The primary composite endpoint of a complete fasting cholesterol panel (ordered by the patient's physician), a new prescription for a cholesterol-lowering medication, or a change in dose of

cholesterol-lowering medication was reached for 57% of patients in the intervention group and 31% in the usual-care group ($p < 0.001$).[17]

SCRIP-plus was a before–after study of the effect of a community pharmacist management program on serum cholesterol concentrations among patients considered to be at high risk for cardiovascular events. A 13% reduction in LDL levels was observed at 6 months ($p < 0.0001$), and 27% of the participants achieved their target LDL levels (95% confidence interval 23% to 32%).[18]

Overall, the evidence for pharmacist involvement in cholesterol and blood pressure management is substantial. Therefore, the impact that a pharmacist could have on modifiable risk factors for stroke in a stroke prevention clinic would be significant. This impact might translate into a reduction in rates of recurrent stroke.

CLINIC INFORMATION

The David Thompson Health Region (DTHR) serves about 300 000 people in central Alberta. Within the DTHR, pharmacists are members of the acute stroke team and had participated in the Acute Stroke Management Working Group at the primary referral hospital. Neurologists, nurses, and other members of the stroke team have welcomed the addition of a pharmacist to each of these areas of stroke management.

In 2005, the DTHR opened a Stroke Prevention Clinic to provide treatment and education for residents of central Alberta who have had a cerebrovascular event. The objectives of the clinic are to aggressively manage risk factors and lifestyle behaviours with the ultimate goal of reducing the risk of recurrent stroke, as outlined in the Alberta Provincial Stroke Strategy. Anticoagulation management is not performed in the clinic; instead, patients needing this type of therapy are referred elsewhere in the region.

Any patient who experiences a cerebrovascular event within the DTHR is eligible for follow-up at the clinic by physician referral. Patients who have been treated for a cerebrovascular event at the DTHR's primary referral hospital are placed on an appropriate management protocol within the hospital (e.g., the DTHR Transient Ischemic Attack Protocol or the DTHR Stroke Protocol). Each of these protocols suggests that patients be referred to the Stroke Prevention Clinic. Physicians may also refer to the clinic patients who have experienced a cerebrovascular event outside the hospital. At the time of this study, patients were followed by clinic staff for 6 months, although the number of visits varied between patients. If a patient experiences another event, he or she may be followed for longer than 6 months. Patients are not seen in the clinic if they refuse follow-up or if they have significant residual morbidities from the stroke that would prevent them from participating, such as severe deficit requiring long-term care.

Initially, neurologists, registered nurses, a social worker, a dietitian, and an administrative assistant staffed the clinic, with later addition of a pharmacist. The clinic nurses expressed concern over their ability to fully educate patients about the safe and appropriate use of medications. They requested educational presentations by the acute stroke pharmacists on the medications used in stroke management and prevention. They also consulted the acute stroke pharmacists about various pharmacotherapy issues.

The proposal to add a pharmacist to the clinic team was seen as a way to ensure the availability of someone who could fully educate patients about their medications while assisting clinic staff in their educational endeavours and providing pharmaceutical care to patients.[19] Integration of a pharmacist into the Stroke Prevention Clinic team represented a natural progression of the stroke services offered by clinical pharmacists within the DTHR.

PROGRAM GOALS

The main objective of integrating a clinical pharmacist into the Stroke Prevention Clinic team was to further decrease morbidity and mortality by preventing recurrent stroke. This goal was to be accomplished by attaining the following short-term goals related to modification of risk factors and education of both patients and staff:

- increasing the percentage of patients who adhere to their treatment plans and medications
- increasing the percentage of patients whose blood pressure is controlled
- increasing the number of patients who achieve target cholesterol levels
- increasing the percentage of patients who are receiving appropriate antiplatelet therapy
- increasing the percentage of patients who are tobacco-free
- increasing the number of patients receiving education from a pharmacist

RESOURCE REQUIREMENTS

A 0.4 full-time equivalent pharmacist (A.J.L.) was transferred from the acute stroke unit to the clinic.

PHARMACIST ACTIVITIES

Patients were seen on "clinic days" 2 afternoons per week. Besides direct patient care activities, the pharmacist participated in ad hoc team education sessions, answered drug information questions from the staff, provided consultations about other patients to the team, and provided telephone follow-up with patients when required.

All patients referred to the clinic were eligible for assessment by the pharmacist. A referral from another health care

provider was not required for the pharmacist to become involved with individual patients. Before the patient's appointment at the clinic, the pharmacist systematically reviewed any available medical records, diagnostic, and laboratory information for patients with appointments that day.

The pharmacist performed an assessment after the nurse had assessed the patient, but before the physician did so. The pharmacist used the same examination room as the nurse and had about 15 min for the initial assessment. Using the pharmaceutical care process, the pharmacist completed a medication history with the patient and discussed the patient's medication experience. The focus of the pharmacist's activities was on risk-factor modification, such as lipid and blood pressure control, diabetes management, smoking cessation, and optimization of antiplatelet and antithrombotic medications. Any drug-related issues identified and any relevant laboratory parameters were discussed with the patient. Suggestions for changes in drug therapy or monitoring (or both) were then provided to the neurologist and nurse verbally or in writing (in the patient's medical record). After the physician's assessment was complete, the pharmacist discussed with the patient any changes that had been made to the treatment plan and provided education about new medications. The patient was referred to the social worker or dietitian as needed.

EXPERIENCE TO DATE

The pharmacist was added to the clinic team in January 2006. The direct patient care activities carried out by the pharmacist were quantified and qualified from January to June 2006 as a preliminary determination of the benefits of adding a pharmacist to the Stroke Prevention Clinic team.

Methods

DTHR pharmacists document their patient care activities electronically in the Meditech computer system (Client/Server 5.5 SR2, Meditech, Westwood, Massachusetts). A paper copy of this documentation is placed in the patient's chart. The pharmacist's Workload is documented in the Meditech "Clinical Interventions" module at the time that chart notes are written.[20] Workload is documented using a numeric code, according to the nature of the drug-related issue and the proposed patient outcome or outcomes associated with the intervention (Table 1). Monthly reports on the nature and number of interventions are created in Microsoft Excel for assessment of workload. Some of the pharmacist's activities, such as completing insurance forms, answering drug information questions for clinic staff, and providing non-patient-specific education, were not included in this analysis. The pharmacist did not assess every patient at all visits, so the number of patient encounters was determined from a running tally of pharmacist–patient encounters in the clinic. The primary outcomes of this study were the number of interventions made by the pharmacist, the nature of the interventions according to category of drug-related issue, and the average number of interventions per patient encounter. Secondary outcomes were the proportion of suggested interventions accepted

Table 1. Coding System for Recording the Medical Workload of Pharmacists*

General Format for Entries

Acceptance (1 character) / **Date** (DD-MMM-YYYY) / **Drug-related problem** (2 characters) / **Pharmacist identification** (6 characters) / **Time spent, in minutes** (3 characters) / **Outcomes** (2 characters; many may be selected)

Example: 1/08-JUN-2005/01/999999/060/1A/2A/3B

Content	Numeric Code
Acceptance of recommendation by prescriber	
Accepted	1
Rejected	2
Unknown, waiting for response, unable to follow up	3
Not applicable	4
Patient's drug-related problem	
Needing pharmacotherapy but not receiving it	01
Taking or receiving the wrong drug or wrong form of drug	02
Taking or receiving too little of the correct drug	03
Taking or receiving too much of the correct drug	04
Experiencing (or at risk of experiencing) an adverse drug reaction	05
Experiencing (or at risk of experiencing) a drug–drug, drug–herb, or drug–food interaction	06
Not taking or receiving drug as prescribed	07
Taking or receiving a drug for which there is no valid medical indication (may include duplication)	08
Requiring medication counselling (education) but not receiving it	09
Requiring discharge counselling or preparation but not receiving it	10
No drug-related issues identified; follow-up only	11
Anticipated outcomes	
Clinical	
Cure a disease	1A
Eliminate or reduce signs or symptoms	1B
Arrest or slow a disease process	1C
Prevent a disease or symptom	1D
Achieve desired alterations in physiologic processes	1E
Humanistic	
Improve physical, mental, or social function or satisfaction with care (feeling better)	2A
Economic	
Drug cost savings of $1 or more/day	3A
Drug cost increases of $1 or more/day	3B

*Reproduced, with permission, from *Can J Hosp Pharm* 2007; 60(5):295-301.

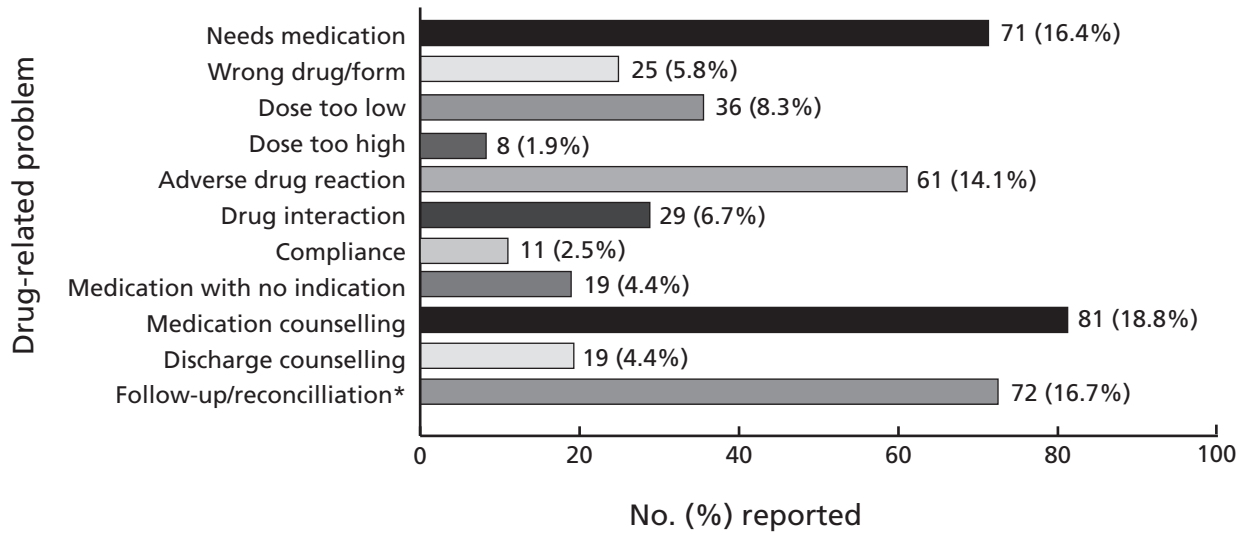

Figure 1. Number of pharmacist interventions according to nature of drug-related problem. *Reconciliation included medication reconciliation activities.

Table 2. Outcomes Targeted by Pharmacist Interventions

Outcome	No. (%) of Outcomes
Clinical	
Cure a disease	2 (0.2)
Eliminate or reduce signs or symptoms	37 (4.4)
Arrest or slow a disease process	9 (1.1)
Prevent a disease or symptom	390 (46.7)
Achieve desired alterations in physiologic processes (e.g., normalized electrolytes)	110 (13.2)
Humanistic	
Improvement in physical, mental, or social function or satisfaction with care	286 (34.3)

or rejected by the neurologists and the number of proposed patient outcomes associated with the intervention.

Results

During the study period, the pharmacist initiated 432 interventions during 153 patient encounters, which represented an average of 2.8 interventions per encounter. The most common interventions were medication counselling, medication reconciliation or follow-up, recommending initiation of pharmacotherapy, and preventing or resolving adverse drug reactions (Figure 1).

A total of 835 proposed patient outcomes were associated with the pharmacist's interventions, representing an average of 1.9 outcomes per intervention. The main outcome type targeted by the pharmacist was prevention of a disease or symptom (Table 2). The physicians accepted most of the pharmacist's suggestions (Figure 2). No significant trend in the rejection rate was noted during the study period.

Patient flow in the clinic was reappraised during the study period, and usual practice was altered early in the study period. Rather then being followed for 6 months, patients are now seen for an initial appointment with limited follow-up (usually one visit). This change reflected typical neurology practice in the DTHR, whereby the patient has an initial consultation for diagnosis, with management of chronic diseases and risk factors being performed by general practitioners. However, the number of pharmacist activities continued to increase over the study period (data not shown).

DISCUSSION

This study demonstrated that ambulatory stroke patients experience numerous actual and potential drug-related problems and that pharmacists may be in a key position to identify and resolve these problems. A large number of the pharmacist's interventions during the study period were related to lack of appropriate pharmacotherapy. Previous research has indicated that 3-hydroxy-3-methylglutaryl-coenzyme A reductase inhibitors are often underutilized in patients with a history of heart disease and stroke.[21,22] As well, blood pressure is adequately controlled in only 13% of patients with hypertension.[23] Pharmacists may be in an ideal position to review a patient's risk factors for stroke and to initiate or recommend appropriate pharmacotherapy where indicated.

The American Stroke Association has recommended community education as a method of improving the quality of

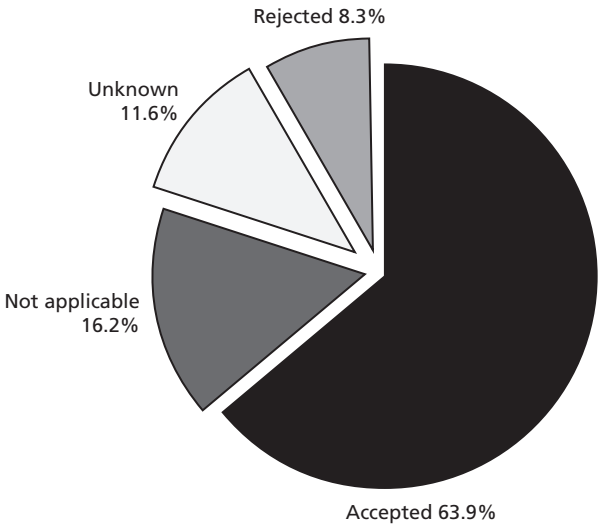

Figure 2. Proportion of pharmacist interventions accepted by prescriber. Interventions that did not require physician acceptance were classified as "not applicable".

stroke care.[24] The pharmacist in the DTHR Stroke Prevention Clinic provided 100 private educational sessions to clinic patients. Increased knowledge of stroke risk factors may lead to improved adherence to risk reduction strategies.[24] Adherence may also be affected by an understanding of patients' medication experiences, the way they "feel, react and think about medications".[25] Because a person's medication experience can influence his or her decisions regarding drug therapy, the pharmacist in this study tried to ascertain the patient's medication experience with every medication reconciliation activity.[19]

In this study, the pharmacist helped to identify and resolve issues related to drug interactions, dosing problems, and adverse reactions. Preventing and resolving such issues is required to ensure that the pharmacist's interventions yield positive patient outcomes.[26] In this study, the main outcomes targeted by the pharmacist were clinical and humanistic in nature. Although economic outcomes are also important, they were not assessed in this study, as the current workload management system evaluates only direct drug costs. The collection of further information on economic outcomes is warranted.[27]

Targeted patient outcomes can only be achieved if the prescriber accepts and implements the intervention. In this study, workload data were sometimes entered into the workload management system before an issue had been discussed with the prescriber. As a result, the prescriber's decision was unknown for 11.6% of the interventions at the time of data entry. Interestingly, about 8% of pharmacists' recommended interventions were rejected. This value is higher than the 1% to 2% reported in previous research[28,29] and higher than the 3.2% reported previously from the authors' institution.[20] One reason for this difference may be the timing of the pharmacist's assessment of patients, before the neurologist's assessment, with recommendations being made on the assumption of a stroke-related diagnosis. Thus, for example, the pharmacist might have made recommendations for drug therapy that became irrelevant if the eventual diagnosis was a nonstroke event; this would have increased the number of rejected interventions. In addition, this was a new program for both the pharmacist and the physicians. The proportion of accepted recommendations is expected to increase as team relationships strengthen.

This study had a few limitations. Although the pharmacist intended to assess all patients, this aim could not always be achieved because of time constraints. The pharmacist had to prioritize the list of patients on the basis of a chart review. As such, the pharmacist might not have assessed patients with fewer drug-related issues. As well, the pharmacist made suggestions for changes in drug therapy before the neurologist had assessed the patient, and it is possible that some of the suggestions would have been implemented regardless of the pharmacist's recommendation. Finally, this retrospective study might have been subject to other, unknown confounders.

In the future, the staff pharmacists working on the acute stroke team hope to incorporate shifts in the Stroke Prevention Clinic into their clinical practice to allow for continuity of care for stroke survivors who are admitted to hospital. In addition to the duties outlined here, they will continue to maintain a file of evidence-based stroke literature to share with clinic staff. Group teaching sessions for patients and their families are being considered. Consideration is also being given to academic detailing for general practitioners, to provide information about secondary stroke prevention strategies. In addition, studies of actual patient outcomes are warranted, such as achievement of target lipid levels.

CONCLUSIONS

The integration of a pharmacist into an interdisciplinary secondary stroke prevention clinic is supported by the literature on hypertension and dyslipidemia management. Pharmacists are in a key position to provide pharmaceutical care to ambulatory stroke survivors and to identify, prevent, and resolve drug-related issues. The stroke clinic pharmacist in this study initiated 2.8 drug-related interventions per patient encounter. Although this study has outlined the goals of therapy that the pharmacist tries to achieve while caring for patients, further research is needed to determine the effects of pharmacist involvement on patient and team satisfaction with pharmacist services, as well as on stroke risk factors, morbidity, and mortality.

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