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Many high-quality pharmacist interventions addressing cardiovascular risk factors have been plagued by low enrollment. We wanted to determine how widely these interventions could be applied within a given medical clinic if pharmacists assumed responsibility for identifying all at-risk patients as well as delivering the intervention.

De nombreuses interventions de qualité mises de l'avant par des pharmaciens pour contrôler les facteurs de risque cardiovasculaire sont compromises par les difficultés encourues lors du recrutement des patients. Nous souhaitons donc déterminer dans quelle mesure ces interventions pourraient être appliquées au sein d'une clinique médicale si les pharmaciens assumaient la responsabilité d'identifier les patients à risque et de prodiguer l'intervention.

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Collaborative Cardiovascular Risk Reduction in Primary Care II (CCARP II): Implementation of a systematic case-finding process for patients with uncontrolled risk factors

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ABSTRACT

Background: Previous pharmacist interventions to reduce cardiovascular (CV) risk have been limited by low patient enrolment. The primary aim of this study was to implement a collaborative pharmacist intervention that used a systematic case-finding procedure to identify and manage patients with uncontrolled CV risk factors.

Methods: This was an uncontrolled, program implementation study. We implemented a collaborative pharmacist intervention in a primary care clinic. All adults presenting for an appointment with a participating physician were systematically screened and assessed for CV risk factor control by the pharmacist. Recommendations for risk factor management were communicated on a standardized form, and the level of pharmacist follow-up was determined on a case-by-case basis. We recorded the proportion of adults exhibiting a moderate to high Framingham risk score and at least 1

uncontrolled risk factor. In addition, we assessed before-after changes in CV risk factors.

Results: Of the 566 patients who were screened prior to visiting a participating physician, 186 (32.9%) exhibited moderate or high CV risk along with at least 1 uncontrolled risk factor. Physicians requested pharmacist follow-up for 60.8% (113/186) of these patients. Of the patients receiving the pharmacist intervention, 65.5% (74/113) were at least 50% closer to 1 or more of their risk factor targets by the end of the study period. Significant risk factor improvements from baseline were also observed.

Discussion: Through implementation of a systematic case-finding approach that was carried out by the pharmacist on behalf of the clinic team, a large number of patients with uncontrolled risk factors were identified, assessed and managed with a collaborative intervention.

Conclusion: Systematic case finding appears to be an important part of a successful intervention to identify and manage individuals exhibiting uncontrolled CV risk factors in a primary care setting. *Can Pharm J (Ott)* 2013;146:284-292.

Numerous studies have demonstrated benefits associated with incorporating pharmacists onto primary care teams to facilitate cardiovascular

(CV) risk reduction.¹⁻¹⁶ However, many such interventions are carried out in small numbers of patients.^{2,6,13-16}

Considering the high volume of patients seen by family physicians along with the high prevalence of CV risk factors among Canadian adults,¹⁷ interventions need to focus on targeting entire populations of at-risk patients and maximizing efficiency to address treatment gaps in CV care at the clinic level.¹⁸

In our view, the responsibilities underlying pharmaceutical care should require pharmacists to address the needs of high-risk patient groups.¹⁸ One major barrier to this objective is the process used for patient identification. For instance, the majority of pharmacist CV intervention studies rely on physicians to identify patients eligible for the intervention.^{2,7,12,14,15,18,19} Although this process can result in the optimization of drug therapy in selected patients, there is no way of knowing whether these individuals represent the entire at-risk population or those at the highest risk. Indeed, the missing link in many chronic disease management programs is the identification of patients who could potentially benefit from the intervention.²⁰

The primary aim of this study was to implement a collaborative pharmacist intervention that used a systematic case-finding procedure within an existing family medicine practice to identify and manage patients with uncontrolled CV risk factors.

Methods

The intervention was carried out in a family medicine practice in Saskatoon, Saskatchewan. After a brief presentation to all clinic staff, 4 physicians (out of 12) volunteered to be involved in the intervention. These physicians provided clinical service for a total weekly time of 2.5 full-time equivalents (FTE).

Participating physicians were provided with treatment algorithms that were developed to guide pharmacist recommendations. Physicians confirmed that the recognized CV risk factor targets for cholesterol,²¹ blood pressure²² and blood glucose²³ were relevant and applicable to their practice, based on the general demographics of their patient population. In addition, physicians were asked to help finalize a CV risk profile form that would be used to communicate information between the pharmacist and physician. Finally, physicians were asked for any other suggestions

KNOWLEDGE INTO PRACTICE

- Published cardiovascular risk reduction interventions by pharmacists have shown benefits in clinical trials but are typically plagued by low patient enrolment.
- Pharmacist interventions in a collaborative primary care setting can be implemented widely if a systematic case-finding process is used to identify target patients.
- Pharmacist interventions need to include a systematic case-finding approach to ensure all eligible patients can benefit from the high standard of care in a given collaborative practice.

to streamline the process, activities or proposed documentation.

Case finding and recommendations

Clinic patients were informed about the pharmacist clinical services through posters at the check-in counter. In addition, medical receptionists gave a letter to all patients of the participating physicians at every appointment that highlighted the activities of the pharmacist, the nature of the collaboration and an opportunity to opt out.

The pharmacist used HEALTHSuite, the electronic appointment booking software at the clinic, to identify all adult patients (men ≥ 40 years and women ≥ 50 years) who were scheduled to visit a collaborating physician for any reason. The pharmacist then obtained the charts for these patients prior to their appointment in order to undertake the CV risk assessment. The assessment involved risk stratification (calculation of a 10-year Framingham risk score or identification of coronary heart disease [CHD] risk equivalent) and determining if the levels of low-density lipoprotein cholesterol (LDL-C), total cholesterol/high-density lipoprotein (TC/HDL) ratio, blood pressure or hemoglobin A1c (HbA1c, for patients with diabetes) met guideline-recommended targets. If laboratory or clinical information was unavailable, the pharmacist notified the physician and arranged for the information to be collected after the appointment. To streamline the process, cholesterol levels measured within 12 months and HbA1c levels measured within 6 months prior to the cardiovascular assessment were used to stratify risk or assess target achievement. In keeping with usual clinical procedures of the clinic staff, all blood pressure measurements

MISE EN PRATIQUE DES CONNAISSANCES

- Des essais cliniques publiés ont démontrés les bénéfices des interventions des pharmaciens pour réduire les risques cardiovasculaires. Cependant, ces bénéfices sont limités par un faible taux de recrutement de patients.
- Dans les établissements de soins primaires collaboratifs, les pharmaciens pourraient intervenir à grande échelle si l'on appliquait un processus de recherche de cas systématique afin d'identifier les patients ciblés.
- Les interventions de pharmaciens doivent employer une méthode de recherche de cas systématique pour que tous les patients potentiellement concernés puissent bénéficier de soins de haute qualité dans tous les établissements offrant des soins en collaboration interprofessionnels.

were completed by clinic nurses at the beginning of each patient's appointment.

All patients at moderate (10%-19%) or high risk of cardiovascular events ($\geq 20\%$ Framingham score or CHD equivalent) were targeted for pharmacist follow-up if they had at least 1 uncontrolled CV risk factor. For targeted patients, the pharmacist prepared a CV Risk Profile form to be placed on the patient's chart before the scheduled appointment (Appendix 1, available online at cph.sagepub.com/supplemental). This form included the patient's 10-year risk; current and target levels for blood pressure, cholesterol and HbA1c; and algorithm-guided recommendations to facilitate target achievement.

During the patient's appointment, the physician discussed the pharmacist's recommendations with the patient and communicated the level of pharmacist follow-up required on the CV Risk Profile Form. The options provided were A) pharmacist follow-up with drug therapy recommendations to be implemented by the physician, B) pharmacist follow-up with collaborative prescribing by pharmacist, or C) no pharmacist follow-up.

Option "B" above was made possible by a collaborative prescribing agreement established between the pharmacist and the physicians prior to the implementation of the project. In Saskatchewan, level II prescriptive authority enables a physician to delegate prescribing authority to a pharmacist for select patients or disease states in a collaborative prescribing agreement.²⁴ Consequently, on a case-by-case

basis, physicians could delegate authority for the pharmacist to titrate, substitute, or initiate medications using the preapproved algorithms as a guide. However, prescriptive authority legislation was not approved in Saskatchewan until 2 months prior to the end of the intervention's case-finding component, so there was little opportunity to evaluate the effects of this activity.

In contrast to the protocol-driven activities regarding case finding, documentation and recommendations, the frequency and content of patient follow-up was left to the professional discretion of the pharmacist. Follow-up activities could include education on CV risk and the importance of controlling risk factors, lifestyle changes to reduce CV risk, providing medication information, assessing and promoting medication adherence, as well as monitoring for target achievement. Patients who were current smokers were counselled on the importance of quitting and offered support in this regard if interested. In all cases, the pharmacist was responsible for following clinical response, laboratory values and making additional recommendations regarding drug therapy changes. Patient follow-ups were scheduled at the pharmacist's discretion. When patients returned to their physicians for follow-up visits, the CV Risk Profile Form was updated along with any noted recommendations to achieve CV targets if necessary.

Data analysis

The primary objective was to describe the proportion of all adults exhibiting a moderate (10-year risk of 10%-19%) to high ($\geq 20\%$) Framingham risk score and at least 1 uncontrolled risk factor. In addition, paired *t* tests were used to assess changes in clinical end points from baseline to the end of the study (LDL-C, systolic blood pressure [SBP], HbA1c, TC/HDL ratio). To detect overall improvements in CV risk factors, we developed a global CV risk end point, the Cardiovascular Risk Improvement index (CRI), which is a binary outcome that indicates an improvement in at least one of the following risk factors (SBP, LDL-C, or HbA1c) that were above target at baseline. The CRI effect size can be modified. For example, CRI-20 refers to a minimum of 20% reduction in at least 1 uncontrolled risk factor (relative to target), CRI-50 indicates the risk factor has improved by 50% relative to the goal and 100% means the goal has

been met. To be conservative in our estimate of the benefit of the intervention, we used the patient's last observation carried forward for those who did not have repeat measurements throughout the study period.²⁵ All analyses were conducted using SPSS Version 19 for Windows (SPSS, Inc., an IBM Company, Chicago, IL). The Biomedical Research Ethics board at the University of Saskatchewan approved the study protocol on the requirement that clinic patients were made aware of the collaborative nature of each physician's practice through posted notices at the front desk as well as information letters provided to patients on registration.

Results

The total study duration was 9 months. The pharmacist began CV risk assessments October 21, 2010, and continued until May 13, 2011. The intervention was concluded on June 17, 2011; thus, patients enrolled on the final day could be followed for at least 1 month following their initial visit to the medical clinic to receive follow-up from the pharmacist if necessary.

During the study period, 566 patients were screened prior to visiting a participating physician for any reason. Of these, 390 (69%) were classified as moderate to high risk for a coronary heart disease (CHD) event and 186 (32.9%) were moderate or high risk and exhibited at least one uncontrolled cardiovascular risk factor (blood pressure, cholesterol levels or HbA1c). Of the remaining 380 patients who were not targeted by this intervention, 176 (46.3%) were at low CV risk, and 204 (53.7%) were already meeting guideline-recommended targets for all risk factors.

Overall, physicians requested follow-up for 60.8% (113/186) of the patients identified as at moderate to high CV risk. Of the 73 patients not enrolled for pharmacist follow-up, 37 (50.7%) were excluded because they were deemed not to be candidates for aggressive cardiovascular risk reduction (dementia or terminal illness) or did not arrive for their physician appointment (Figure 1). The remaining 36 (49.3%) patients were excluded because no pharmacist follow-up was requested either by the patient or physician or for unknown reasons.

The baseline characteristics of the 113 patients enrolled for pharmacist follow-up are outlined in Table 1. The mean (SD) age was 66.9 (11.0) years, 52.2% (59/113) were female and 15.9% (18/113) were current smokers. In addition,

42.5% (48/113) of patients were identified as having uncontrolled risk factors not previously documented in their medical charts. Four of these patients were subsequently diagnosed with hypertension and 44 with dyslipidemia.

Of all the patients followed by the pharmacist (i.e., individuals exhibiting uncontrolled risk factors), 65.5% (74/113) were at least 50% closer to target levels in ≥ 1 risk factor by the end of the study period (i.e., the CRI-50 end point) (Figure 2). However, many patients were classified as "nonresponders" solely because they had not received follow-up testing before the end of the study period (i.e., last observation carried forward). In a *post hoc* subgroup analysis conducted among patients who had at least 1 follow-up measurement in their uncontrolled risk factor(s) identified at baseline, the percentage of subjects achieving the CRI-50 end point increased to 88.1% (52/59). Significant changes were also observed in individual risk factors for those who were uncontrolled at baseline (Table 2).

Discussion

The purpose of Collaborative Cardiovascular Risk Reduction in Primary Care II (CCARP II) was to implement and evaluate a pharmacist-led collaboration to identify and reduce uncontrolled CV risk factors in a family medicine setting. The pharmacist undertook assessments on 566 consecutive adult patients presenting for a physician appointment and identified 390 (69%) exhibiting moderate to high risk for a coronary heart disease (CHD) event. Of this subgroup of individuals with moderate or high risk, 47.7% (186/390) exhibited ≥ 1 above-target risk factor. This patient subgroup represented 32.9% (186/566) of all patients presenting for a physician appointment over the study period. At the end of the study period, we found statistically significant reductions in SBP, LDL-C, and TC/HDL compared with baseline. The reduction in SBP seen in our study is similar to what has been reported previously in the literature.^{3,5,19,26,27} Reductions in LDL-C observed in our study were similar⁷ to slightly less^{3,12} than other studies previously reported. Thus, we believe this initial pilot implementation project was successful in systematically identifying patients with uncontrolled CV risk factors and reducing the CV risk associated with these risk factors.

Of the 186 patients identified by the pharmacist, 113 (60.8%) received ongoing

FIGURE 1 Patient screening results

pharmacist follow-up at the request of the physicians. Of those patients who did not receive pharmacist follow up, 24.7% were not candidates for aggressive CV risk reduction (18/73) and 26% (19/73) did not arrive for their physician appointment. In addition, physicians indicated that general CV risk targets were not appropriate in only 12 (6.5%) of these patients. Thus, participating physicians appeared to carry out their responsibilities in the collaboration very consistently.

To our knowledge, this is the first pharmacist intervention for CV reduction that incorporates systematic case finding for CV risk factors in all patients presenting to a family medicine clinic. In a previous study conducted by our group that relied on physician referral to identify patients,

we observed slower accrual of patients despite broader inclusion criteria and a longer period of patient enrolment.¹⁸ In the current project, the responsibility for case finding was given to the pharmacist to ensure a systematic process was carried out. The high number of patients identified confirms our hypothesis that there is still a need for a systematic approach to identify patients with uncontrolled CV risk factors. Additionally, a strength of this approach was that patients were screened prior to a physician appointment for any reason; thus, even patients who are not diligent about seeing their physician for regular preventive care would receive a CV assessment as a standard of care provided in this collaborative setting.²⁸ Furthermore, physicians were provided with the relevant information

TABLE 1 Baseline characteristics of enrolled patients

Characteristic	Measurement (n = 113)
Age, mean (SD), years	66.9 (11.03)
Female sex, No. (%)	59 (52.2)
Current smoker,* No. (%)	18 (15.9)
10-year cardiovascular risk,^ No. (%)	
Moderate (10%-19%)	29 (25.7)
High (≥20%)	80 (70.8)
Unable to calculate	4 (3.5)
Hypertension,* No. (%)	99 (77.9)
Diabetes mellitus,* No. (%)	25 (22.1)
Chronic kidney disease,* No. (%)	10 (8.8)
Previous myocardial infarction,* No. (%)	4 (3.5)
History of CAD,* No. (%)	8 (7.1)
Previous stroke,* No. (%)	6 (5.3)
Antiplatelet use,* No. (%)	28 (24.8)
Anticoagulant use,* No. (%)	7 (6.2)
Blood pressure,† mean (SD), mmHg	
Systolic	140.3 (17.62)
Diastolic	77.9 (13.5)
Cholesterol levels,‡ mean (SD), mmol/L	
TC	5.33 (1.1)
HDL	1.26 (0.38)
TG	1.87 (1.03)
LDL	3.26 (0.98)
Ratio (TC/HDL)	4.45 (1.23)
Hemoglobin A1c (diabetics),‡ mean (SD), %	6.68 (0.81)
Duration of follow-up, months	
Mean (SD)	4.69 (1.8)
Range	1-8.5

* As documented in the patient's chart.

^ Per Framingham risk score (72).

† Baseline blood pressure at first physician visit following pharmacist screening.

‡ Most recent values as documented in patient chart (cholesterol level was measured at baseline or most recent measurement within 1 year of screening date was used; hemoglobin A1c was measured at baseline or the most recent measurement within 6 months prior to screening date was used).

CAD = coronary artery disease; HDL = high-density lipoprotein; LDL = low-density lipoprotein; SD = standard deviation; TC = total cholesterol; TG = triglycerides.

at the time of an existing appointment so appropriate treatment plans could be established without delay.

We believe the rate of uncontrolled risk factors may actually be higher in other family medicine clinics in Saskatchewan. The clinic

FIGURE 2 Proportion of patients achieving the Cardiovascular Risk Improvement (CRI) index end point*

*CRI refers to a minimum percentage reduction (in this case, 20% or 50%) relative to target in an uncontrolled risk factor from baseline. Alternatively, CRI is considered achieved if the patient met his or her predetermined target for a risk factor that was uncontrolled at baseline. Note: 4 patients (3.5%) did not have sufficient baseline data to be included in the analysis.

TABLE 2 Pre/post changes in risk factors among patients who were uncontrolled at baseline

Parameter	n	Baseline mean (SD)	Follow-up mean (SD)	Mean difference (95% CI)	p-value
Systolic blood pressure (mmHg)	71	150.0 (12.5)	137.3 (11.6)	12.7 (9.22-16.08)	0.017
LDL-C (mmol/L)	96	3.39 (0.93)	3.03 (0.96)	0.36 (0.23-0.50)	<0.001
TC/HDL ratio	54	5.28 (1.06)	4.91 (1.18)	0.37 (0.16-0.58)	<0.001
HbA1c (%)	8	7.51 (0.69)	7.16 (1.36)	0.35 (1.12-1.82)	0.33

HDL = high-density lipoprotein; LDL-C = low-density lipoprotein cholesterol; SD = standard deviation; TC = total cholesterol.

involved in this study had already implemented a quality improvement initiative to improve care for patients with established CAD or diabetes. Additionally, physicians employed by the clinic were paid by salary rather than fee for service, which is considered more appropriate to achieving optimal care of patients with chronic diseases.²⁹ Despite the existence of these quality improvement systems, our intervention appeared to provide additional benefits to the overall control of CV risk among clinic patients.

Despite the short time available to evaluate our level II prescriptive authority, preliminary data from our study suggest this strategy was well accepted by collaborating physicians. Of the 23 patients screened after pharmacist prescribing

was an option, 10 (43.5%) were referred for this service. Considering the relatively short duration of our program, we believe this response is strongly suggestive of a highly effective collaboration that was incorporated effectively. We believe the success of the collaboration was due, in part, to the steps undertaken prior to starting the intervention. Each participating physician was consulted to provide input on the proposition for a collaborative prescribing agreement as well as input on prescribing algorithms. Finally, we ensured that 2-way communication would occur so that responsibilities were clarified for each patient.

There are a few important limitations of our initiative that warrant further discussion. First,

the follow-up period was short, so the evaluation of attainment of risk factor improvements may have been confounded. Furthermore, the risk factor improvements in our study may have been overestimated as a result of our study design. If we had incorporated a usual care control group, it is likely that some CV risk improvements may have been observed due to regression to the mean or by the actions of the physicians independent of the pharmacist. Second, due to ethical reasons, we did not allow the pharmacist to follow up with patients with uncontrolled risk factors who did not present for their scheduled physician appointment. However, this intervention identified another source of patients requiring care who would need follow-up. Finally, the generalizability of our finding is limited, as CCARP II was a single-centre pilot study conducted by a single pharmacist co-locating with 4 salaried family physicians who volunteered to participate in the project. As a result, the intervention cannot be generalized to traditional community pharmacy practice. However, more opportunities will become available to implement collaborative interventions such as these as some provinces

introduce funding for medication reviews and other clinical pharmacy services.²⁹ In addition, the principles of proactive case finding can (and should) be applied to community pharmacy practice to find patients with suboptimal cardiovascular risk factor management. Finally, the primary investigator had to serve all major roles to carry out this study. Ideally, different, blinded individuals would have performed these roles to minimize the risk of bias.

Conclusion

In this pilot study, a systematic case-finding strategy was successfully incorporated into a pharmacist intervention focused on identifying and managing patients with above-target CV risk factors in a family medicine office. Thus, despite improvements in CV risk factor identification and management over the past 2 decades,^{30,31} there are still opportunities for pharmacists to contribute to the care of patients with CVD or its risk factors. Further study is warranted to determine if the benefits observed in our pilot study can be reproduced with a multicentre, randomized controlled trial involving multiple pharmacists. ■

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