Original Research

Physician-Pharmacist Collaborative Care for Dyslipidemia Patients: Knowledge and Skills of Community Pharmacists

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Introduction: *In a physician-pharmacist collaborative-care (PPCC) intervention, community pharmacists were responsible for initiating lipid-lowering pharmacotherapy and adjusting the medication dosage. They attended a 1-day interactive workshop supported by a treatment protocol and clinical and communication tools. Afterwards, changes in pharmacists' knowledge, their skills, and their satisfaction with the workshop were evaluated.*

Methods: *In a descriptive study nested in a clinical trial, pharmacists assigned to the PPCC intervention (*n *= 58) completed a knowledge questionnaire before and after the workshop. Their theoretical skills were evaluated with the use of a vignette approach (*n *= 58) after the workshop and their practical skills were assessed by direct observation with study patients (*n *= 28).*

Results: *The mean (SD) overall knowledge score was 45.8% (12.1%) before the workshop; it increased significantly to 89.3% (8.3%) afterwards (mean difference: 43.5%; 95% CI: 40.3%–46.7%). All the pharmacists had an overall theoretical-skill score of at least 80%, the minimum required to apply the PPCC in the trial. From 92.9% to 100% of the pharmacists' interventions with study patients complied with the treatment protocol.*

Discussion: *In primary care, a short continuing-education program based on a specific treatment protocol and clinical tools is necessary and probably sufficient to prepare pharmacists to provide advanced pharmaceutical care.*

Key Words: *pharmacy practice, pharmacy education, lipids, community pharmacy, cardiovascular disease prevention*

Introduction

In primary care, the management of dyslipidemia is not always optimal; adherence to and persistence with pharmacotherapy are low and physicians tend not to titrate statin dosages.[1–6] Physician-pharmacist collaborative-care (PPCC) can improve dyslipidemia treatment.[7–15] Worldwide, legislative changes increasingly support this type of practice.[16–19]

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In Quebec (Canada) and in the United States, pharmacists may initiate and adjust pharmacotherapy under the terms of a collaboration agreement.[20,21] PPCC is not yet widely applied, though, and it is challenging to provide continuing education (CE) programs to prepare community pharmacists to administer advanced pharmaceutical care.[22–28]

CE programs improve pharmacists' knowledge[29–35] and clinical skills.[35–37] Olson et al[32] showed that pharmacists' knowledge of dyslipidemia was limited but improved after a Web-based course. A 1-day interactive workshop was more efficient than a 2-hour lecture in preparing pharmacists to recommend options for optimizing cardiovascular-risk-reduction therapies.[38] Spruill et al[39] reported high pharmacist satisfaction with a dyslipidemia-certification program that included lectures, written assignments, Internet-based examinations, case studies, and real patient-care applications in the pharmacy. No studies have been conducted of PPCC and advanced pharmaceutical care.

In a descriptive study nested in a clinical trial, pharmacists assigned to a PPCC dyslipidemia intervention attended a workshop to prepare them to provide advanced pharmaceutical care. This report describes the change in the pharmacists' knowledge, their theoretical skills measured after the workshop, their practical skills observed during the study, and their satisfaction with the workshop.

Methods

The methods used in this study are described in the following sections.

Study Design

In a cluster randomized controlled trial (trial to evaluate an ambulatory primary-care management program for patients with dyslipidemia: TEAM study), PPCC pharmacists were responsible for providing advanced care, including the adjustment of the dyslipidemia-medication dosage. The intervention was developed by a team of physicians, pharmacists, and researchers, and involved a specific treatment protocol supported by clinical and communication tools, a 1-day workshop, and a meeting between physicians and pharmacists. Nested within this trial, a descriptive study was conducted to evaluate the change in the PPCC pharmacists' knowledge, their theoretical and practical skills, and their satisfaction with the workshop.

TEAM Study

The TEAM study[40] evaluates the efficacy of a PPCC intervention for patients initiating a 3-hydroxy-3-methyl-glutaryl-CoA reductase inhibitor (statin) monotherapy or who are currently on a statin monotherapy but are inadequately controlled. The study was approved by local research ethics boards, and participants signed an informed-consent form.

Clusters of family physicians and community pharmacists from the same area were randomly assigned to PPCC or to the usual-care group. A pharmacy was eligible if at least 2 pharmacists were willing to participate and to attend the workshop if assigned to the PPCC group.

PPCC Intervention

PPCC is a multifaceted intervention designed to replicate the key characteristics of a cohesive health-care team.[27,40,41] It was developed by pharmacists, physicians, and researchers, and includes a treatment protocol, clinical and communication tools, a workshop for pharmacists, and a meeting between physicians and pharmacists.

The treatment protocol[40] includes a treatment algorithm. Briefly, physicians make the diagnosis and prescribe statin treatment, and pharmacists provide systematic follow-up. At the *initial visit*, the pharmacists give the patient counseling, the statin, and a laboratory-test requisition, and they schedule a *titration visit* for 2 months later. At the titration visit, statin tolerance, efficacy, and adherence are evaluated and the dosage is adjusted accordingly. An *adherence visit* is provided if needed. When target lipid levels are achieved, a *follow-up visit* for confirmation purposes is scheduled for 3 months later, before the patient is transferred to the physician for lipid management.

Clinical tools[42] include algorithms for managing muscular pain and liver-enzyme elevation, an interview guide to manage adherence problems, a patient decision aid,[43] and a booklet summarizing the treatment protocol. Communication tools include a prescription form to provide information on the patient's risk factors, latest laboratory-test results, recommended lifestyle changes, and statin treatment. Pharmacists used a periodic report form to keep the physician informed.

The workshop was prepared and presented by pharmacists, family physicians, and a cardiologist, and it was accredited by the Quebec Order of Pharmacists. It incorporated key elements of an effective CE activity, including a prior-needs assessment,[44] interactivity,[45] and educational material.[46] The objectives were to update dyslipidemia and pharmacotherapy knowledge, present the treatment protocol, and allow pharmacists to acquire the clinical skills they need to provide advanced pharmaceutical care. The Canadian treatment recommendations,[47] the pharmacotherapy, the treatment protocol, and communication strategies for optimizing adherence were thus presented through formal lectures, role playing, and interactive exercises. Subsequently, physicians and pharmacists from the same area were invited to meet each other and discuss their respective roles in a 2-hour session.

Outcomes

The primary outcome was the change in the PPCC pharmacists' knowledge based on pre- and postworkshop evaluations. Secondary outcomes included evaluations of their

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theoretical and practical skills and their satisfaction with the workshop. Usual-care pharmacists were not subject to these evaluations.

Knowledge. One month before the workshop, pharmacists completed a knowledge questionnaire without consulting any reference materials. Their answers were used for a prior-needs assessment to prepare the workshop. After finishing the program, they completed the same questionnaire, using the workshop material to evaluate their knowledge and their ability to apply the treatment protocol and use the clinical and communication tools. Knowledge was expected to improve after the workshop.

The questionnaire developed by the research team tests the knowledge deemed essential to providing advanced pharmaceutical care to dyslipidemia patients. Questions cover the Canadian treatment guidelines[47] (7 questions) and pharmacotherapy management (17 questions). A pretest with 3 community pharmacists and 4 graduate pharmacy students resulted in minor modifications to the questionnaire. The percentage of pharmacists answering correctly was computed for each question. An overall and 2 specific scores (for treatment recommendations and pharmacotherapy management) were calculated with the use of the percentage of correct answers.

Theoretical Skills. At the end of the workshop, pharmacists completed a 30-minute evaluation. The questionnaire[42] was pretested by 2 pharmacists and included a vignette with 10 questions involving situations that might arise during follow-up. Each question was worth 5 or 10 points and the overall score was the sum of the individual scores (maximum of 100 points). A minimum score of 80% was mandatory to apply the PPCC in the TEAM study.

Practical Skills. To evaluate the pharmacists' ability to apply the treatment protocol in their practice, the initial and first titration visits of the first patient followed by each PPCC pharmacist were evaluated retrospectively. The concordance between the intervention and the treatment protocol was assessed with the use of information from the copies of laboratory-test requests, periodic report forms, pharmacy dispensing charts, and the log of pharmacist visits. Rare and clinically minor discordances between the treatment protocol and the actual interventions with study patients were expected.

Satisfaction. At the end of the workshop, pharmacists were asked to report their overall opinion of the presentations, the presenters and the educational materials with the use of a 5-point Likert-scale questionnaire developed by the Quebec Order of Pharmacists.

Other Variables. At study entrance, pharmacists and pharmacy owners completed a questionnaire to document their sociodemographic and professional characteristics.

Statistical Analyses

Pharmacist and pharmacy characteristics were described. The percentage of pharmacists answering each question correctly was compared before and after the workshop with the use of paired chi-square tests. Overall and specific mean knowledge scores pre- and postworkshop were compared with the use of paired *t* tests, and the mean difference (95% confidence interval [CI]) was computed. For each pharmacist, a theoretical-skills score and a mean overall score (SD) were calculated. For the practical-skills evaluation, the proportion of interventions concordant with the treatment protocol was determined for each task. Pharmacist satisfaction was evaluated by reporting the proportion of answers in each response category. Analyses were conducted with the use of SPSS© for Windows© 14.0 (SPSS Inc., Chicago, IL).

Results

One hundred eighty-seven pharmacists were approached; 53 (28%) refused to take part, and 26 (14%) were ineligible (16 worked in a pharmacy where fewer than 2 pharmacists were willing to participate, and 10 could not attend the workshop). A total of 108 pharmacists (58%) agreed to participate and were randomly assigned to the PPCC group (60) or to the usual-care group (48). Fifty-eight (97%) PPCC pharmacists attended the workshop and completed the questionnaires to evaluate their pre- and postworkshop knowledge and their theoretical skills. Twenty-eight trained PPCC pharmacists (48%) took part in the practical-skills evaluation. Fifty-three (91%) pharmacists who attended the workshop completed the satisfaction questionnaire.

As TABLE 1 indicates, 72.4% of all the pharmacists were women, and 77.6% graduated before 2001. The pharmacists had a mean 5.4 years' experience in the participating pharmacy, and relatively few of them owned it (32.8%). More than half (58.6%) had attended a CE activity on dyslipidemia since the 2003 publication of the Canadian guidelines.[47] In comparison, more of the pharmacists who followed at least 1 study patient were women (85.7%), fewer owned their pharmacy (25.0%), and more had attended a CE session on dyslipidemia since 2003 (71.4%).

Knowledge

As TABLE 2 shows, the mean (standard deviation [SD]) overall knowledge score was 45.8% (12.1%) before the workshop and rose significantly to 89.3% (8.3%) afterwards (mean difference: 43.5%; 95% CI: 40.3%–46.7%). Significant improvements were observed on both the treatment-recommendations and pharmacotherapy-management scales, with a mean difference (95% CI) of 29.3% (23.9%–34.7%) and 49.4% (46.0%–52.8%), respectively. On the treatment-recommendations scale, a major improvement (46.6%–98.3%; $P < .05$) occurred on the item regarding estimation of the

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TABLE 1. Characteristics of Pharmacists and Pharmacies

	n (%)	All Pharmacists Who Followed at Least 1 Patient *n* (%)
Characteristics of pharmacists		
Pharmacists, *n*	58	28
Women, *n* (%)	42 (72.4)	24 (85.7)
Pharmacy owners, *n* (%)	19 (32.8)	7 (25.0)
Graduation year, *n* (%)		
Before 1990	21 (36.2)	8 (28.6)
1991–2000	24 (41.4)	11 (39.3)
After 2001	13 (22.4)	9 (32.1)
Years since graduation, mean (SD)	14.3 (9.3)	11.9 (7.9)
Years of experience in the participating pharmacy, mean (SD)	5.4 (5.6)	5.1 (4.8)
Weekly working hours, mean (SD)	36.3 (8.1)[a]	37.2 (7.6)[b]
Hours of continuing education in 2005, mean (SD)	24.0 (22.2)	26.0 (21.0)
Attended a continuing education activity on dyslipidemia since 2003, *n* (%)	34 (58.6)	20 (71.4)
Characteristics of pharmacies		
Pharmacies, *n*	30	20
Franchise, *n* (%)	30 (100)	20 (100)
Number of pharmacist-hours per week, mean (SD)	99.7 (37.9)	112.7 (35.4)
Number of prescriptions per pharmacist per hour, mean (SD)	18.3 (7.6)	19.5 (7.7)

[a]Thirteen missing data.

[b]Eight missing data.

10-year coronary heart disease risk category. Pharmacists were also more familiar with the recommended target lipid levels (39.7%–79.3%; $P < .05$). On the pharmacotherapy-management scale, significant improvements in knowledge emerged on several items, including statin-dosage adjustment upon occurrence of myalgia (12.1%–67.2%), the time interval between dosage adjustments (12.1%–94.8%), the laboratory tests to request upon occurrence of muscular pain (1.7%–98.3%), and the choice of statin for patients taking digoxin (5.2%–94.8%). The proportion of pharmacists answering correctly increased significantly for each question, except for the one on statin–macrolide interaction (Q8).

Theoretical Skills

All the pharmacists ($n = 58$) had an overall score of at least 80%, the minimum needed to apply the PPCC in the TEAM study. Their mean (SD) score was 91.2% (9.2%) (TABLE 3). Some pharmacists had difficulty requesting the appropriate laboratory tests for assessing statin tolerance and efficacy (Q4, 67.2%) and upon the achievement of target lipid levels (Q8, 79.3%).

Practical Skills

From 92.9% to 100% of the pharmacists' interventions complied with the treatment protocol at the initial and first titration visits (TABLE 4). At the initial visit, 2 pharmacists forgot to enter the date for the next laboratory tests on the periodic report form. At the first titration visit, 1 pharmacist did not request alanine aminotransferase (ALT), another did not specify the date of the next pharmacist visit on the periodic report form, and 1 transferred a patient's lipid management to the physician before the follow-up visit. The observed discordances were thus rare and clinically insignificant.

Satisfaction

As TABLE 5 shows, pharmacist satisfaction was high. All respondents ($n = 53$) were satisfied with the content of the workshop and found it useful and relevant in their day-to-day practice.

Discussion

Providing community pharmacists with a specific treatment protocol, clinical and communication tools, and a workshop

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TABLE 2. Individual, Specific, and Overall Knowledge Scores

	Preworkshop Evaluation ($n = 58$)	Postworkshop Evaluation ($n = 58$)	Mean Difference Between Pre- and Postworkshop Scores Mean ± SD (95% CI)
Treatment recommendations:			
Individual scores, *n* (%)			
Q1 Ten-year CHD[a] risk for a diabetic patient	48 (82.8)	56 (96.6)[b]	
Q2 Optimal triglyceride level	42 (72.4)	58 (100)[b]	
Q3 Ten-year CHD-risk categories	27 (46.6)	57 (98.3)[b]	
Q4 Definition of target lipid levels	23 (39.7)	46 (79.3)[b]	
Q5 Patient characteristics needed to estimate the 10-year CHD risk	36 (62.1)	52 (89.7)[b]	
Q6 CHD risk for a patient with past myocardial infarction	47 (81.0)	58 (100)[b]	
Q7 LDL-C target for a patient at high CHD risk	42 (72.4)	57 (98.3)[b]	
Specific score, mean (SD)	65.3 (20.4)	94.6 (8.8)[b]	29.3 ± 20.5 (23.9–34.7)
Pharmacotherapy management:			
Individual scores, *n* (%)			
Q8 Statin–macrolide interaction	39 (67.2)	33 (56.9)	
Q9 Effect of a meal on statin efficacy	36 (62.1)	46 (79.3)[b]	
Q10 Statin equipotency	25 (43.1)	45 (77.6)[b]	
Q11 Statin metabolism	12 (20.7)	48 (82.8)[b]	
Q12 Time to take statin	24 (41.4)	58 (100)[b]	
Q13 Statin dosage adjustment upon occurrence of myalgia	7 (12.1)	39 (67.2)[b]	
Q14 Statin–warfarin interaction	25 (43.1)	58 (100)[b]	
Q15 Time interval between dosage adjustments	7 (12.1)	55 (94.8)[b]	
Q16 Characteristics of statin-induced myalgia	19 (32.8)	40 (69.0)[b]	
Q17 Statin dosage adjustment when lipid target levels are not reached	51 (87.9)	58 (100)[b]	
Q18 Laboratory tests to request upon occurrence of muscular pain	1 (1.7)	57 (98.3)[b]	
Q19 Choice of statin for patient taking digoxin	3 (5.2)	55 (94.8)[b]	
Q20 Statin dosage adjustment with liver enzyme elevation	24 (41.4)	55 (94.8)[b]	
Q21 Time for lipid equilibrium after statin initiation	27 (46.6)	57 (98.3)[b]	
Q22 Choice of statin for patient taking clopidogrel	39 (67.2)	51 (87.9)[b]	
Q23 Identification of lipophilic statins	18 (31.0)	58 (100)[b]	
Q24 Predisposing factors for myalgia or rhabdomyolysis	15 (25.9)	46 (79.3)[b]	
Specific score, mean (SD)	37.7 (12.3)	87.1 (9.6)[c]	49.4 ± 13.1 (46.0–52.8)
Overall score, mean (SD)	45.8 (12.1)	89.3 (8.3)[c]	43.5 ± 12.1 (40.3–46.7)

[a]CHD, coronary heart disease.

[b]P value $< .05$ with a paired chi-square test between pre- and postworkshop proportions.

[c]P value $< .05$ with a paired t test between pre- and postworkshop scores.

was associated with significant improvements in dyslipidemia knowledge. Their mean overall score rose from 45.8% to 89.3%. All the pharmacists had a minimum theoretical-skills score of 80% and were therefore deemed qualified to apply the PPCC in the TEAM study. Furthermore, only rare and clinically insignificant discordances were observed between their actual interventions in the TEAM study and the treatment protocol. Finally, they reported a high level of satisfaction with the workshop. These results underscore the need to support community pharmacists in the implementation of new professional cognitive services adequately. They also suggest that a 1-day workshop supported by a treatment protocol and clinical and communication tools is probably sufficient to prepare them to provide advanced pharmaceutical care to dyslipidemia patients.

The pharmacists' low knowledge score before the workshop suggests they are presently unfamiliar with the clinical tasks entailed in laboratory tests and statin-dosage

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TABLE 3. Theoretical-Skills Evaluation

		Pharmacists (n = 58)
Individual scores, n (%)		
Q1	Estimate a patient's 10-year CHD[a] risk	53 (94.1)
Q2	Determine target lipid levels	55 (94.8)
Q3	Identify the patient's readiness to quit smoking	52 (89.7)
Q4	Request appropriate laboratory tests to assess statin tolerance and efficacy	39 (67.2)
Q5	Complete a periodic report form	53 (91.4)
Q6	Manage drug interaction between grapefruit and a statin	58 (100)
Q7	Request appropriate laboratory tests and adjust statin treatment in care of a muscular pain	58 (100)
Q8	Requests appropriate laboratory tests once target lipid levels are reached	46 (79.3)
Q9	Schedule a pharmacist visit when target lipid levels are reached	57 (98.3)
Q10	Select a statin less interactive with warfarin	58 (100)
Overall score %, mean (SD)		91.2 (9.2)

[a]CHD, coronary heart disease.

TABLE 4. Practical-Skills Evaluation

Competence	n	Pharmacists n (%)
Individual scores, n (%)		
Initial visit	28	
Request appropriate laboratory tests		28 (100)
Complete a periodic report form adequately		26 (92.9)
Schedule the next pharmacist visit		28 (100)
First titration visit	23[a]	
Request appropriate laboratory tests		22 (95.7)
Complete a periodic report form adequately		22 (95.7)
Proper statin dosage adjustment when applicable		23 (100)
Schedule the next pharmacist visit		22 (95.7)

[a]Five patients did not attend their first titration visit (3 had their statin stopped by the physician before the titration visit, and 2 refused to attend).

adjustment. Olson et al[32] similarly report a 36.8% mean baseline dyslipidema-knowledge score. In the Fjortoft and Schwartz study,[31] pharmacists self-rated their baseline level of knowledge about dyslipidemia treatment as average. These findings highlight the need for pharmacists to update their knowledge before they can offer advanced care. Inadequate knowledge is indeed perceived as one of the most significant barriers to their providing it.[48]

The skills-evaluation results suggest that a short CE intervention is probably sufficient to prepare pharmacists to give dyslipidemia patients advanced pharmaceutical care. These positive findings may be attributed to such features of the workshop as the prior-needs assessment and the availability of a detailed treatment protocol and clinical tools.

This study has potentially important implications for pharmacists, faculties of pharmacy, and decision makers on professionnal boards of physicians and pharmacists. The results suggest that adequate training is important to support the introduction of advanced pharmaceutical care. Time, effort, and money will consequently have to be invested in developing these services, and it is essential that treatment protocols and clinical tools be disseminated to facilitate implementation of collaborative care. Some colleges of pharmacists have therefore created a virtual Web community[49,50] to share treatment protocols and inform pharmacists about the availability of advanced training programs. Quebec's nurses' corporation has developed a similar initiative to spur implementation of advanced nursing care.[51] Pharmacists and stakeholders may draw inspiration from these programs.

TABLE 5. Pharmacist Satisfaction With the Workshop

Criteria, n (%)	Excellent	Good	Fair	Poor	Not Applicable
The content of the workshop was useful and pertinent to day-to-day pharmacy practice	45 (84.9)	8 (15.1)	0	0	0
The workshop addressed the learning objectives stated at the outset	44 (83.0)	8 (15.1)	1 (1.9)	0	0
The methods used allowed for effective presentation and integration of knowledge	34 (64.2)	18 (34.0)	1 (1.9)	0	0
Presenters gave clear information	40 (75.5)	12 (22.6)	1 (1.9)	0	0
Presenters interacted with the participants	43 (81.1)	9 (17.0)	1 (1.9)	0	0
Pedagogical material provided will be useful in my practice	47 (88.7)	5 (9.4)	1 (1.9)	0	0
General organization of the activity was excellent	39 (73.6)	12 (22.6)	1 (1.9)	1 (1.9)	0
The overall quality of the workshop	41 (77.4)	11 (20.8)	1 (1.9)	0	0

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Lessons for Practice

- Prior to providing advanced pharmaceutical care to dyslipidemia patients including medication-dosage adjustment, a short workshop supported by a treatment protocol and appropriate tools is necessary and probably sufficient to enable pharmacists to acquire the knowledge and skills they need.
- Pharmacists are highly motivated to receive training to provide pharmaceutical care; the participation rate at the workshop was very high (97%).
- Effective dissemination mechanisms may be important to speed up the implementation of advanced pharmaceutical care.

Strengths and Limitations

The workshop was prepared by experienced physicians and pharmacists and combined key elements of an effective CE program. Theoretical and practical skills were evaluated to measure the pharmacists' ability to incorporate what they learned into their practice. Moreover, the participation rate in the workshop was very high (97%).

However, no data on the knowledge and skills of the usual-care pharmacists were collected, making interpretation of the results more difficult. Nor do we have any validated questionnaires for measuring dyslipidemia knowledge and skills, although the questionnaires we used were developed by experienced clinicians and were pretested. The practical-skills evaluation was restricted to the first 2 pharmacist visits, was conducted with only a small sample of pharmacists and patients, and was performed as part of a clinical trial. Our results, therefore, cannot be generalized to long-term application of the PPCC in real-life conditions.

Conclusion

Collaborative care between physicians and pharmacists is an avenue to optimizing medication use and therapeutic outcomes. Our results suggest that, in primary care, a short continuing education program based on a specific treatment protocol and clinical and communication tools is necessary and probably sufficient to prepare pharmacists to assume their new professional roles and provide advanced pharmaceutical care.

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References

1. Huser MA, Evans TS, Berger V. Medication adherence trends with statins. *Adv Ther*. 2005;22(2):163–171.
2. Jackevicius CA, Mamdani M, Tu JV. Adherence with statin therapy in elderly patients with and without acute coronary syndromes. *JAMA*. 2002;288(4):462–467.
3. Perreault S, Blais L, Lamarre D, et al. Persistence and determinants of statin therapy among middle-aged patients for primary and secondary prevention. *Br J Clin Pharmacol*. 2005;59(5):564–573.
4. Catalan VS, LeLorier J. Predictors of long-term persistence on statins in a subsidized clinical population. *Value Health*. 2000;3(6):417–426.
5. Simons LA, Levis G, Simons J. Apparent discontinuation rates in patients prescribed lipid-lowering drugs. *Med J Aust*. 1996;164:208–211.
6. Pearson TA. The undertreatment of LDL-cholesterol: addressing the challenge. *Int J Cardiol*. 2000;74(Suppl 1):S23–S28.
7. Ibrahim OM, Catania PN, Mergener MA, Supernaw RB. Outcome of cholesterol screening in a community pharmacy. *DICP*. 1990;24(9):817–821.
8. Shibley MC, Pugh CB. Implementation of pharmaceutical care services for patients with hyperlipidemias by independent community pharmacy practitioners. *Ann Pharmacother*. 1997;31(6):713–719.
9. Bluml B, McKenney J, Cziraky M. Pharmaceutical care service and results in project ImPACT: hyperlipidemia. *J Am Pharm Assoc*. 2000;40(2):157–165.
10. Nola KM, Gourley DR, Portner TS, Gourley GK, Solomon DK, Elam M, Regel B. Clinical and humanistic outcomes of a lipid management program in the community pharmacy setting. *J Am Pharm Assoc (Wash)*. 2000;40(2):166–173.
11. Tsuyuki RT, Johnson JA, Teo KK, et al. A randomized trial of the effect of community pharmacist intervention on cholesterol risk management: the study of cardiovascular risk intervention by pharmacists (SCRIP). *Arch Intern Med*. 2002;162(10):1149–1155.
12. Ali F, Laurin MY, Lariviere C, Tremblay D, Cloutier D. The effect of pharmacist intervention and patient education on lipid-lowering medication compliance and plasma cholesterol levels. *Can J Clin Pharmacol*. 2003;10(3):101–106.
13. Peterson GM, Fitzmaurice KD, Naunton M, Vial JH, Stewart K, Krum H. Impact of pharmacist-conducted home visits on the outcomes of lipid-lowering drug therapy. *J Clin Pharm Ther*. 2004;29(1):23–30.
14. Paulos CP, Nygren CE, Celedon C, Carcamo CA. Impact of a pharmaceutical care program in a community pharmacy on patients with dyslipidemia. *Ann Pharmacother*. 2005;39(5):939–943.
15. Community Pharmacy Medicines Management Project Evaluation Team. The MEDMAN study: a randomized controlled trial of community pharmacy-led medicines management for patients with coronary heart disease. *Fam Pract*. 2007;24(2):189–200.
16. Emmerton L, Marriott J, Bessell T, Nissen L, Dean L. Pharmacists and prescribing rights: review of international developments. *J Pharm Pharm Sci*. 2005;8(2):217–225.
17. Jones EJ, Mackinnon NJ, Tsuyuki RT. Pharmaceutical care in community pharmacies: practice and research in Canada. *Ann Pharmacother*. 2005;39(9):1527–1533.
18. Guillaume L, Cooper R, Avery A, et al. Supplementary prescribing by community and primary care pharmacists: an analysis of PACT data, 2004–2006. *J Clin Pharm Ther*. 2008;33(1):11–16.

DOI: 10.1002/chp

19. Anderson C, Blenkinsopp A, Armstrong M. The contribution of community pharmacy to improving the public's health: literature review update 2004–7. http://www.pharmacyhealthlink.org.uk/. Accessed June 10, 2008.
20. Assemblée Nationale du Québec. Loi modifiant le Code des professions et d'autres dispositions législatives dans le domaine de la santé. http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=5&file=2002C33F.PDF. Accessed October 10, 2008.
21. Alliance for Pharmaceutical Care. Collaborative drug therapy management: a coordinated approach to patient care. http://www.pswi.org/professional/patient/drugtherapy.pdf. Accessed February 12, 2009.
22. Winslade NE, Tamblyn RM, Taylor LK, Schuwirth LW, Van der Vleuten CP. Integrating performance assessment, maintenance of competence, and continuing professional development of community pharmacists. *Am J Pharm Educ*. 2007;71(1):15.
23. Hogan S, Lundquist LM. The impact of problem-based learning on students' perceptions of preparedness for advanced pharmacy practice experiences. *Am J Pharm Educ*. 2006;70(4):82.
24. Lal LS, Rao PG. Clinical pharmacy education in India. *Am J Health Syst Pharm*. 2005;62(14):1510–1511.
25. Eickhoff C, Schulz M. Pharmaceutical care in community pharmacies: practice and research in Germany. *Ann Pharmacother*. 2006;40(4):729–735.
26. Gilbert JH. Abraham Flexner and the roots of interprofessional education. *J Contin Educ Health Prof*. 2008;28(Suppl 1):S11–S14.
27. Sargeant J, Loney E, Murphy G. Effective interprofessional teams: "contact is not enough" to build a team. *J Contin Educ Health Prof*. 2008;28(4):228–234.
28. de Castro MS, Correr CJ. Pharmaceutical care in community pharmacies: practice and research in Brazil. *Ann Pharmacother*. 2007;41(9):1486–1493.
29. Maio V, Belazi D, Goldfarb NI, Phillips AL, Crawford AG. Use and effectiveness of pharmacy continuing-education materials. *Am J Health Syst Pharm*. 2003;60(16):1644–1649.
30. Chen HY, Lee TY, Huang WT, Chang CI, Chen CM. The short-term impact of a continuing education program on pharmacists' knowledge and attitudes toward diabetes. *Am J Pharm Educ*. 2004;68:1–6.
31. Fjortoft NF, Schwartz AH. Evaluation of a pharmacy continuing education program: long-term learning outcomes and changes in practice behaviors. *Am J Pharm Educ*. 2003;67:1–11.
32. Olson KL, Schindel T, Geissler C, Tsuyuki RT. The development of an Internet-based course on dyslipidemias: a new form of continuing education for pharmacists. *Am J Pharm Educ*. 2001;65:13–19.
33. Mehra IV, Wuller CA. Evaluation of a pilot clinical skills workshop series for community pharmacists. *Am J Pharm Educ*. 1998;62:136–141.
34. Nona DA, Kenny F, Johnson DK. The effectiveness of continuing education as reflected in the literature of the health professions. *Am J Pharm Educ*. 1988;52:111–117.
35. Rouleau R, Beauchesne MF, Laurier C. Impact of a continuing education program on community pharmacists' interventions and asthma medication use: a pilot study. *Ann Pharmacother*. 2007;41(4):574–580.
36. Saini B, Smith L, Armour C, Krass I. An educational intervention to train community pharmacists in providing specialized asthma care. *Am J Pharm Educ*. 2006;70(5):118.
37. Dolovich L, Sabharwal M, Agro K, Foster G, Lee A, McCarthy L, Willan AR. The effect of pharmacist education on asthma treatment plans for simulated patients. *Pharm World Sci*. 2007;29(3):228–239.
38. Taylor J, Semchuck W, Deschamps M, Sulz L, Tsuyuki RT, Duffy P, Wilson T. Pharmacist intervention in risk reduction study in high-risk cardiac patients: the effect of 2 methods of pharmacist training. *Can Pharm J*. 2007;140(2):116–123.
39. Spruill WJ, Wade WE, Leslie RB, Brooks PJ. Description and evaluation of a hypercholesterolemia certification program. *Pharm Educ*. 2002;2(4):199–203.
40. Villeneuve J, Vanier MC, Lussier MT, et al. How to help patients manage their dyslipidemia: a primary care physician–pharmacist team intervention. *Can Pharm J*. 2007;140(5):300–305.
41. Grumbach K, Bodenheimer T. Can health care teams improve primary care practice? *JAMA*. 2004;291(10):1246–1251.
42. Équipe de recherche en soins de première ligne. TEAM study tools. http://www.recherchepl.ca/autres-productions-scientifiques.php#cat2. Accessed August 25, 2008.
43. Ottawa Health Research Institute. Patient decision aids. http://www.ohri.ca/decisionaid. Accessed October 10, 2008.
44. Norman GR, Shannon SI, Marrin ML. The need for needs assessment in continuing medical education. *Br Med J*. 2004;328(7446):999–1001.
45. Thomson O'Brien MA, Freemantle N, Oxman AD, Wolf F, Davis DA, Herrin J. Continuing education meetings and workshops: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*. 2001;(2):CD003030.
46. Davis D, O'Brien MA, Freemantle N, Wolf FM, Mazmanian P, Taylor-Vaisey A. Impact of formal continuing medical education: do conferences, workshops, rounds, and other traditional continuing education activities change physician behavior or health care outcomes? *JAMA*. 1999;282(9):867–874.
47. Genest J, Frohlich J, Fodor G, McPherson R. Recommendations for the management of dyslipidemia and the prevention of cardiovascular disease: summary of the 2003 update. *CMAJ*. 2003;169(9):921–924.
48. O'Loughlin J, Masson P, Dery V, Fagnan D. The role of community pharmacists in health education and disease prevention: a survey of their interests and needs in relation to cardiovascular disease. *Prev Med*. 1999;28(3):324–331.
49. The Pharmacy Guild of Australia. Professional pharmacy services. http://www.guild.org.au/pps/. Accessed August 25, 2008.
50. Alberta College of Pharmacists. Safe effective responsible pharmacist practice. https://pharmacists.ab.ca/nPharmacistResources/default.aspx. Accessed August 25, 2008.
51. Ordre des infirmières et infirmiers du Québec. Liste des publications électroniques. http://www.oiiq.org/publications/liste.asp. Accessed January 30, 2007.