The Enhancing Secondary Prevention in Coronary Artery Disease trial

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ABSTRACT

Background: Proven efficacious therapies are sometimes underused in patients with chronic cardiac conditions, resulting in suboptimal outcomes. We evaluated whether evidence summaries, which were either unsigned or signed by local opinion leaders, improved the quality of secondary prevention care delivered by primary care physicians of patients with coronary artery disease.

Methods: We performed a randomized trial, clustered at the level of the primary care physician, with 3 study arms: control, unsigned statements or opinion leader statements. The statements were faxed to primary care physicians of adults with coronary artery disease at the time of elective cardiac catheterization. The primary outcome was improvement in statin management (initiation or dose increase) 6 months after catheterization.

Results: We enrolled 480 adults from 252 practices. Although statin use was high at baseline ($n = 316$ [66%]), most patients were taking a low dose (mean 32% of the guideline-recommended dose), and their low-density lipoprotein (LDL) cholesterol levels were elevated (mean 3.09 mmol/L). Six months after catheterization, statin management had improved in 79 of 157 patients (50%) in the control arm, 85 of 158 (54%) patients in the unsigned statement group (adjusted odds ratio [OR] 1.18, 95% CI 0.71–1.94, $p = 0.52$) and 99 of 165 (60%) patients in the opinion leader statement group (adjusted OR 1.51, 95% CI 0.94–2.42, $p = 0.09$). The mean fasting LDL cholesterol levels after 6 months were similar in all 3 study arms: 2.35 (standard deviation [SD] 0.86) mmol/L in the control arm compared with 2.24 (SD 0.73) among those in the opinion leader group ($p = 0.48$) and 2.19 (SD 0.68) in the unsigned statement group ($p = 0.32$).

Interpretation: Faxed evidence reminders for primary care physicians, even when endorsed by local opinion leaders, were insufficient to optimize the quality of care for adults with coronary artery disease. ClinicalTrials.gov trial register no. NCT00175240.

Despite the abundant evidence base for the secondary prevention of coronary artery disease,[1] many of these therapies are underused in clinical practice.[1–4] These gaps between evidence and clinical reality are linked to poor outcomes for patients.[5] Improved uptake of secondary-prevention therapies would reduce cardiac morbidity and mortality.[6] However, most quality-improvement initiatives in coronary artery disease have focused on patients in hospital. Few studies have evaluated means of translating evidence into clinical practice for outpatients cared for by primary care physicians.[7]

Previously,[8] we developed and tested the Local Opinion Leader Statement (Appendix 1, available at www.cmaj.ca/cgi/content/full/cmaj.090917/DC1), a quality-improvement tool consisting of a 1-page summary of evidence with explicit treatment advice about secondary prevention of coronary artery disease. This summary was endorsed by local opinion leaders and was faxed to the primary care physicians of patients with coronary artery disease. Although this fax did not lead to a significant improvement in statin prescribing, our pilot trial was small (117 patients) and enrolled patients with chronic coronary artery disease at the time they presented to their community pharmacy for medication refills. We hypothesized that this was not a "teachable moment" and that if the intervention was given at a time when the diagnosis was made, it would be more influential on the primary care physician.

Thus, we designed this trial to test the impact of the opinion leader statement if it was sent to the primary physician at the time when patients were diagnosed with coronary artery disease. In addition, because local opinion leaders are not always self-evident and conducting surveys to identify them for each condition and in each locale would be time-consuming and expensive, we also evaluated the impact of an unsigned statement.

Methods

The protocol for the Enhancing Secondary Prevention in Coronary Artery Disease (ESP-CAD) trial, including details about the primary care physician survey that we conducted to identify local opinion leaders for coronary artery disease in

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Edmonton and Calgary, has been published.[1] In brief, we conducted a randomized clinical trial in these cities clustered at the level of the primary care physician to avoid contamination. We tested 3 interventions: usual care, opinion leader statements and unsigned statements (Figure 1). Patients were screened in all 3 cardiac catheterization laboratories in Alberta (total population about 3.3 million people) between June 2005 and January 2008 to identify adult patients with coronary artery disease ($\geq 50\%$ stenosis in at least 1 coronary vessel) detected by elective cardiac catheterization. We included patients who were eligible for but not already taking a statin or who were on a suboptimal regimen (e.g., taking a low-dose statin but whose low-density lipoprotein [LDL] cholesterol levels remained elevated) (Table 1). The exclusion criteria are listed in Figure 1.

Randomization (1:1:1) was performed after completion of the patient's angiogram. Patients were randomly assigned to groups by use of a computer-generated central randomization system with concealment of the randomization list. Although the primary care physicians were not blinded to the allocation status, both allocation concealment and blinding were achieved for investigators, patients, outcome assessors and analysts.

The institutional ethics review boards at the University of Alberta and the University of Calgary approved this study, and all patients provided written informed consent.

Interventions

The opinion leader statements were imprinted with the name of the participating patient, addressed directly to the patient's


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          Patients screened
          for eligibility
          n = 4546

                              Excluded  n = 4066
                              • Contraindication or prior intolerance to statin  n = 205
                              • Already taking a maximum statin dose  n = 306
                              • Taking a submaximal statin dose, but LDL level already below
                                guideline target  n = 830
                              • Not taking statin, but LDL ≤ 1.8 mmol/L  n = 93
                              • Received emergency CABG  n = 18
                              • Previously enrolled in the ESP-CAD trial  n = 10
                              • No lipid panel performed within the previous 6 weeks  n = 1429
                              • Less than 50% stenosis on current catheterization  n = 546
                              • Unknown primary care physician  n = 390
                              • Enrolled in another research protocol  n = 4
                              • Refused consent  n = 235

       Participants included in the study
                n = 480
       (from 252 primary care practices)

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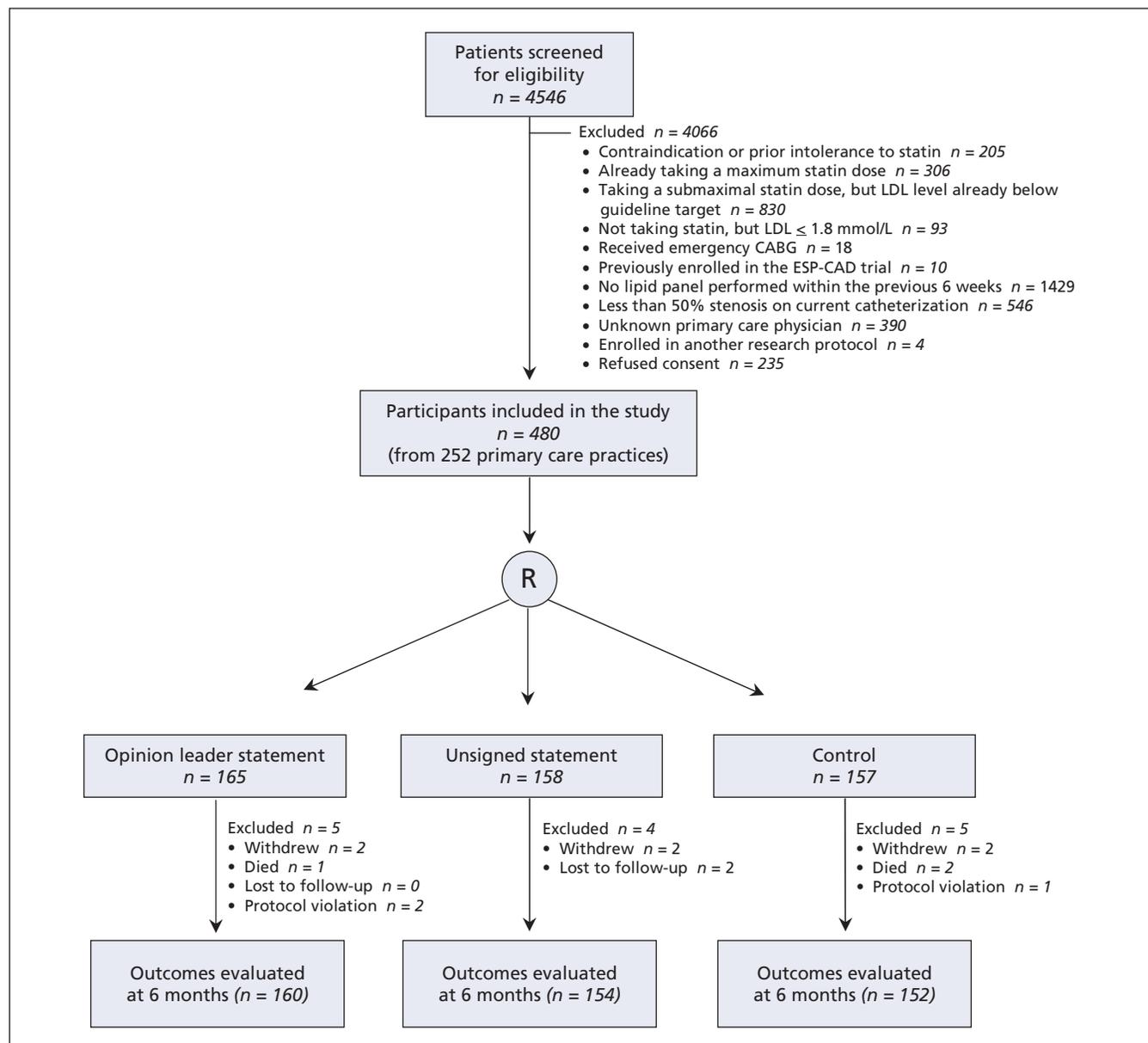| Opinion leader statement $n = 165$	Unsigned statement $n = 158$	Control $n = 157$
Excluded $n = 5$ • Withdrew $n = 2$ • Died $n = 1$ • Lost to follow-up $n = 0$ • Protocol violation $n = 2$	Excluded $n = 4$ • Withdrew $n = 2$ • Lost to follow-up $n = 2$	Excluded $n = 5$ • Withdrew $n = 2$ • Died $n = 2$ • Protocol violation $n = 1$
Outcomes evaluated at 6 months ($n = 160$)	Outcomes evaluated at 6 months ($n = 154$)	Outcomes evaluated at 6 months ($n = 152$)

Figure 1: Selection and randomization of patients included in the Enhancing Secondary Prevention in Coronary Artery Disease (ESP-CAD) trial. LDL = low-density lipoprotein, CABG = coronary artery bypass graft.

Table 1: Characteristics at the time of cardiac catheterization of patients included in the Enhancing Secondary Prevention in Coronary Artery Disease trial

Characteristic	All patients; no. (%) of patients* $n = 480$		Intervention; no. (%) of patients*		
			Opinion leader statement $n = 165$	Unsigned statement $n = 158$	Control $n = 157$
Age, yr, mean (SD)	63.9	(9.9)	64.5 (10.2)	62.9 (9.7)	64.4 (9.6)
Male	377	(78.5)	119 (72.1)	129 (81.7)	129 (82.1)
Family history of coronary artery disease	246	(51.3)	81 (49.1)	77 (48.7)	88 (56.1)
Prior myocardial infarction	120	(25.0)	37 (22.4)	42 (26.6)	41 (26.1)
Prior revascularization					
Coronary artery bypass graft	44	(9.2)	15 (9.1)	15 (9.5)	14 (8.9)
Percutaneous intervention	99	(20.6)	33 (20.0)	35 (22.2)	31 (19.8)
Comorbidities					
Hypertension	332	(69.2)	111 67.3)	115 (72.8)	106 (67.5)
Diabetes mellitus	113	(23.5)	42 (25.5)	33 (20.9)	38 (24.2)
Peripheral vascular disease	26	(5.4)	15 (9.1)	5 (3.2)	6 (3.8)
Cerebrovascular disease	25	(5.2)	10 (6.1)	8 (5.1)	7 (4.5)
Atrial fibrillation	15	(3.1)	7 (4.2)	3 (1.9)	5 (3.2)
Heart failure	19	(4.0)	3 (1.8)	9 (5.7)	7 (4.5)
Smoking history					
Current smoker	89	(18.5)	29 (17.6)	29 (18.4)	31 (19.6)
Ever smoked	324	(67.5)	107 (64.9)	107 (67.7)	110 (70.1)
Chronic lung disease	57	(11.9)	20 (12.1)	19 (12.0)	18 (11.5)
Fasting LDL cholesterol, μmol/L, mean (SD)	3.09	(0.80)	3.05 (0.76)	3.09 (0.81)	3.12 (0.80)
Fasting HDL cholesterol, μmol/L, mean (SD)	1.16	(0.28)	1.18 (0.25)	1.13 (0.29)	1.18 (0.29)
Fasting triglycerides, μmol/L, mean (SD)	1.76	(0.80)	1.76 (0.76)	1.82 (0.86)	1.71 (0.77)
Fasting total cholesterol, μmol/L, mean (SD)	5.04	(1.00)	5.00 (1.01)	5.05 (0.95)	5.06 (1.03)
Serum creatinine,† mmol/L, mean (SD)	91	(21)	89 (22)	92 (17)	94 (23)
Duke jeopardy score,‡ mean % (SD)	44	(33)	47 (31)	44 (34)	41 (33)
Medications at baseline					
Statin	316	(65.8)	111 (67.3)	101 (63.9)	104 (66.2)
Standardized statin dose,§ %, mean (SD)	32	(18)	31 (17)	31 (20)	32 (17)
Nonstatin lipid-lowering drug	34	(7.1)	12 (7.3)	14 (8.9)	8 (5.1)
Acetylsalicylic acid	405	(84.4)	134 (81.2)	138 (87.3)	133 (84.7)
Any antiplatelet agent (acetylsalicylic acid or thienopyridine)	420	(87.5)	140 (84.9)	141 (89.2)	139 (88.5)
Warfarin	30	(6.3)	11 (6.7)	9 (5.70)	10 (6.4)
ACE inhibitor	216	(45.0)	75 (45.5)	71 (44.9)	70 (44.6)
ACE inhibitor or ARB	258	(53.8)	89 (53.9)	85 (53.8)	84 (53.5)
β-Blocker	312	(65.0)	105 (63.6)	105 (66.5)	102 (65.0)
Triple therapy**	171	(35.6)	56 (33.9)	56 (35.4)	59 (37.6)

Note: ACE = angiotensin-converting enzyme, ARB = angiotensin-receptor blocker, LDL = low-density lipoprotein, HDL = high-density lipoprotein, SD = standard deviation.
*Unless stated otherwise.
†Serum creatinine data were available only for 274 patients (*n = 89, 86, 99* in the opinion leader, unsigned statement and control groups, respectively).
‡A measure of the proportion of the myocardium at risk from ischemia.
§Calculated for each statin individually as a percentage of the recommended dose (Canadian Cardiovascular Society guideline) and averaged across all patients taking statins.
**Statin, an antiplatelet agent and an ACE inhibitor.

physician, signed by the local opinion leaders for that city, and faxed automatically by a software program that was developed by the Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease (APPROACH) for this trial. Each physician received a fax containing objective evidence of the patient's coronary artery disease (in the form of a coronary artery diagram)[9] and either a signed or unsigned statement. These faxes were sent to physicians within a few days of the angiogram. The unsigned statements were identical to the opinion leader statements in content and form but did not contain the opinion leaders' signatures. The unsigned statements were faxed to physicians in the same manner as the opinion leader statements.

Controls

Physicians of the control patients received a fax containing the coronary artery diagram for their patient (this represents an enhancement over and above usual care in our province). This ensured that the physicians of all participants received the same number of faxes, with the only difference being the content.

Outcomes

The primary outcome was improved statin management, which we defined as initiation or increased dosage of a statin within the first 6 months after cardiac catheterization. To compare dosing across statins, we calculated the mean standardized statin dose for each prescribed statin as a percentage of the target dose specified for each agent in the guidelines.[10] We also collected data about a number of secondary outcomes (Table 2). Medication outcomes were based on patient self-report (with cross-referencing to pharmacy records), and laboratory data and clinical outcomes were extracted from medical records. Follow-up data were collected by independent assessors blinded to the groups. The clinical events were

Table 2: Outcomes 6 months after cardiac catheterization

	Intervention; no. (%) of people*			p value†		
Outcome	Opinion leader statement n = 165	Unsigned statement n = 158	Control n = 157	Opinion leader statement v. control	Unsigned statement v. control	Either statement v. control
Statin initiation or increase in dose	99 (60.0)	85 (54.0)	79 (50.0)	0.09	0.52	0.17
Taking a statin	138 (83.6)	139 (88.0)	129 (82.2)	0.99	0.43	0.62
Standardized statin dose, mean (SD)‡	43 (25)	42 (26)	42 (26)	0.82	0.91	1.0
Taking another lipid-lowering drug	20 (12.1)	22 (13.9)	19 (12.1)	0.99	0.63	0.78
Acetylsalicylic acid	140 (84.8)	136 (86.1)	135 (86.0)	0.72	0.90	0.78
Acetylsalicylic acid or thienopyridine	146 (88.5)	138 (87.3)	141 (89.8)	0.64	0.32	0.40
ACE inhibitor	90 (54.6)	74 (46.8)	79 (50.3)	0.52	0.58	0.94
ACE inhibitor or ARB	107 (64.8)	94 (59.5)	97 (61.8)	0.70	0.87	0.90
β-Blocker	126 (76.4)	126 (79.8)	108 (68.8)	0.08	0.03	0.03
Triple therapy§	91 (55.2)	85 (53.8)	86 (54.8)	0.93	0.94	0.93
Stopped smoking**	11 (37.9)	9 (31.0)	12 (38.7)	0.94	0.51	0.68
Received smoking cessation advice or were prescribed a smoking cessation product**	13 (44.8)	11 (37.9)	17 (54.8)	0.45	0.20	0.24
Deaths	1 (0.61)	(0)	2 (1.27)	0.62	0.25	0.25
No. of patients visiting the ED						
Total	31 (18.8)	36 (22.8)	25 (15.9)	0.43	0.14	0.24
For an atherosclerotic event††	2 (6.4)	(0)	1 (4.0)	1.0	0.41	0.98
No. of patients admitted to hospital						
Total	54 (32.7)	53 (33.5)	55 (35.0)	0.61	0.69	0.60
For an atherosclerotic event††	3 (5.6)	4 (7.6)	4 (7.3)	0.71	0.94	0.85

Note: ACE = angiotensin-converting enzyme, ARB = angiotensin-receptor blocker, ED = emergency department, SD = standard deviation.
*Unless otherwise stated.
†Adjusted for physician-level clustering. p values for statin initiation or dose increase were from generalized estimating equations that adjusted for physician-level clustering, patient age, sex, baseline low-density lipoprotein (LDL) cholesterol, and whether the patient saw a specialist in follow-up.
‡For those on statins, calculated for each statin individually as percentage of the Canadian Cardiovascular Society guideline-recommended dose, then averaged across all patients taking statins.
§Triple therapy defined as a statin, an antiplatelet agent and an ACE inhibitor.
**Of the 29 smokers in the opinion leader group, 29 smokers in the unsigned statement group and 31 smokers in the control group.
††Acute coronary syndrome, stroke or transient ischemic attack, or unplanned revascularization.

independently adjudicated by 2 blinded investigators (F.A.M. and S.R.M.) who then met to resolve discrepancies.

Statistical analysis

Statistical analyses were conducted by a statistician blinded to allocation status. Intention-to-treat analyses were carried out with patients as the unit of analysis and causal inference. We used the χ^2 test and subsequently generalized estimating equations to adjust for baseline covariables and clustering[11] to compare the attainment of our primary outcome within 6 months among patients in the control group versus those in the opinion leader statement group, the unsigned statement group and both the opinion leader and unsigned statement groups (because both are point-of-care evidence reminders). We also performed a limited number of posthoc exploratory subgroup analyses defined by the use of statins at baseline, the level of LDL at baseline and the involvement of a specialist after cardiac catheterization. Neither the ESP-CAD study protocol nor the faxed statements advocated for or against specialist involvement after catheterization, and the decision to involve a specialist was left to the discretion of the primary care physician.

We targeted a total sample size of 480 patients (160 patients per arm) to detect a 15% absolute difference in the primary outcome over control rates, with an α of 0.05 (2-sided) and 80% power.

Results

Patient characteristics

Of the 4546 patients screened, 715 were eligible, and 480 (67%) agreed to participate (Figure 1). These patients were drawn from 252 primary care practices. The average cluster size was 1.9 patients per practice and the intraclass correlation coefficient for statin prescribing at 6 months was 0.019. We evaluated the status of 466 patients (97%) after 6 months (2 patients were lost to follow-up, 6 withdrew consent, 3 died and 3 were excluded because of protocol violations [2 were ineligible at randomization and 1 underwent a lung transplant during follow-up]).

At baseline, there were no statistically significant differences between the groups (Table 1). Although 66% of patients were taking a statin at baseline, the dosing was relatively low (the mean standardized dose was 32% of the guideline-recommended therapeutic dose) with no appreciable differences between the treatment arms ($p = 0.87$ for statin use; $p = 0.84$ for statin dosing).

Improvement in statin therapy

At 6 months, statin therapy had improved in all 3 study arms (Table 2) with no statistically significant differences between the arms. Statin therapy had either been initiated or the dose increased in 79 of 157 (50%) control patients compared with 85 of 158 (54%) patients in the unsigned statement group (adjusted OR 1.18, 95% CI 0.71–1.94, $p = 0.52$) and 99 of 165 (60%) patients in the opinion leader statement group (adjusted OR 1.51, 95% CI 0.94–2.42, $p = 0.09$).

Improvements were larger among patients who were not taking a statin at baseline (129/164 [79%] started a statin compared to 134/316 [42%] taking a statin who had their dose increased) or who had higher baseline LDL cholesterol levels (Figure 2). Although both interventions led to more marked improvements in each subgroup compared with con-
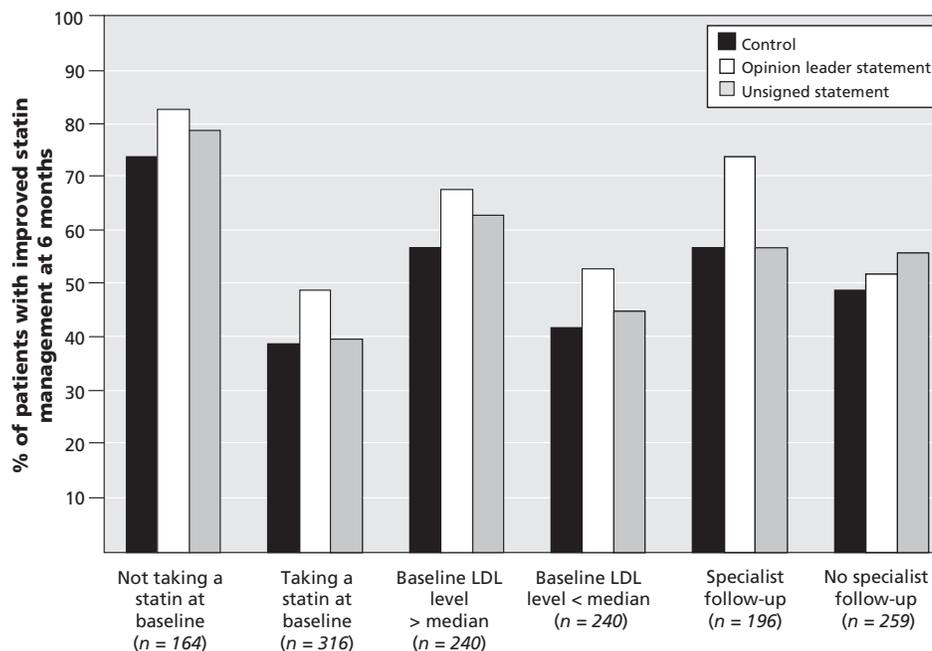

Figure 2: Improvement in statin management (initiation of a statin or doseage increase) 6 months after cardiac catheterization in subgroups. The median low-density lipoprotein (LDL) cholesterol level at baseline was 2.9 mmol/L.

trol, none of the comparisons were statistically significant (Figure 2). However, the opinion leader statement was associated with a statistically significant improvement over control in the group of patients who were followed by both a specialist and a primary care physician (74% v. 57%, $p = 0.04$, adjusted OR 2.41, 95% CI 1.12–5.18, $p = 0.02$).

In the multivariable analysis, only elevated LDL cholesterol at baseline (adjusted OR 1.86, 95% CI 1.29–2.69, $p = 0.001$, if baseline LDL was greater than median) and seeing a specialist during follow-up (adjusted OR 1.56, 95% CI 1.05–2.33, $p = 0.03$) were significantly associated with improved statin therapy. About 40% ($n = 196$) of the patients were seen by a specialist after cardiac catheterization with no appreciable difference among the groups (73/165 patients in the opinion leader statement arm, 63/158 in the unsigned statement arm, and 60/157 in the control arm; $p = 0.52$).

Secondary outcomes

Although we observed improvements in all of the secondary outcomes, none except the use of β-blockers differed significantly among the trial arms (Table 2). The mean fasting LDL cholesterol levels after 6 months were similar in all 3 study arms: 2.35 (standard deviation [SD] 0.86) mmol/L in the control arm compared with 2.24 (SD 0.73) mmol/L among those randomized to the opinion leader statement ($p = 0.48$) and 2.19 (SD 0.68) mmol/L among patients in the unsigned statement group ($p = 0.32$). However, less than half of the study participants had fasting LDL cholesterol levels of 2.0 mmol/L or less at 6 months (74/165 [45%] in the opinion leader statement group; 60/157 [38%] in the control group; 55/158 [35%] in the unsigned statement group). Just over half were taking all 3 recommended secondary-prevention therapies (a statin, an antiplatelet agent and an ACE inhibitor; 91/165 [55%] in the opinion leader group, 86/157 [55%] in the control group, and 85/158 [54%] in the unsigned statement group).

Interpretation

We observed substantial improvements in the quality of secondary-prevention care for patients with coronary artery disease within 6 months of elective diagnostic cardiac catheterization. Although both of our interventions led to marked improvements over control, neither achieved statistical significance, given the 50% absolute improvement in the control group.

The magnitude of improvements after cardiac catheterization in all groups was several fold larger than usually seen with quality-improvement strategies.[7] Thus, our results reinforce the importance of testing quality-improvement interventions in randomized trials[12] — an old message, but one that is sometimes forgotten in the quality-improvement literature.[13] Had we conducted our study using the popular before–after design, we would have erroneously concluded that both the opinion leader and unsigned statement were highly effective.

Despite the improvements in statin management that we observed in all 3 arms of our trial, there is still room for improvement. Six months after cardiac catheterization, only

half of the participants were taking triple therapy (statin, an antiplatelet agent and an angiotensin-converting-enzyme inhibitor), and, although over 80% were taking statins, their dosages were still low relative to the doses in clinical trials.[10,14] As a result, less than half of the participants had attained the guideline-recommended LDL targets. Thus, our inability to show a statistically significant benefit over control cannot merely be attributed to a ceiling effect.

Why were our interventions not more effective? Both the opinion leader and unsigned statements functioned as point-of-care reminders for physicians and mentioned a specific patient, contained explicit treatment recommendations and provided the underlying evidence. Although this strategy should theoretically be effective for quality improvement, the results of empiric studies have been mixed, even if multiple reminders are sent or the reminders are delivered electronically.[15–28] However, point-of-care evidence reminders such as the ones we used have been reported to have a more substantial effect when coupled with an alerting element that "pushes" the clinician to change prescribing.[26–28] For example, we were previously able to significantly improve bisphosphonate use among patients with osteoporosis by use of faxed opinion leader statements that were identical in format to those used in this study. However, that study included patient activation to "push" the evidence reminder (i.e., study nurses recommended to patients in the intervention group that they see their physician to discuss osteoporosis therapy).[28] This mirrors the results of our earlier study which showed that activation of patients via decision aids can induce short-term improvements in the quality of care for patients with atrial fibrillation.[29]

Strengths and limitations

Although we conducted a cluster randomized trial with blinded outcome ascertainment, there are some limitations to our study. First and most importantly, we underestimated the magnitude of the improvement that would occur in our control patients. Although the diagnosis of coronary disease at cardiac catheterization is a "teachable moment," which would be expected to precipitate changes in management, the greater than expected improvements in our controls may be partly explained by the fact that our control patients were not "usual care" controls. The primary care physicians of our control patients received a faxed coronary artery diagram, which likely served as a point-of-care reminder even in the control arm. Indeed, the 82% use of statins and 55% use of triple therapy in our control group 6 months after catheterization were substantially higher than the 63% and 29% observed in an analysis of patients who met the ESP-CAD criteria but who were enrolled in the APPROACH study in the 2 years before launch of our study.[30]

Second, we do not know whether the intervention patients' physicians saw the intervention materials nor their opinions of the content. Third, because we recorded medication use at 6 months by patient self-report (with cross-referencing with pharmacy records), we do not know the extent to which patient noncompliance may have led us to underestimate the efficacy of our intervention on the prescribing patterns of

their physicians. Fourth, our study was not designed to detect differences in health outcomes; however, the secondary-prevention therapies that we measured have been shown to be efficacious in reducing cardiovascular mortality.

Although our interventions might be considered "low-tech" given the advent of electronic health records with embedded computerized decision support, it should be noted that few primary care physicians currently use electronic records with such advanced functionality.[31] Prior studies[32] have shown that the modality of delivery of evidence prompts (computer-based v. paper-based) does not influence effectiveness. Although some may argue that unimodal interventions such as ours are too weak to influence practice, it is worth noting that several studies[26–28] have shown that relatively minimalist interventions can substantially affect practice and quality of care. Indeed, multifaceted interventions are not necessarily more effective than single interventions,[33] and to feasibly improve quality for common conditions dealt with largely in the outpatient setting (such as coronary artery disease), it is necessary to develop and evaluate minimalist interventions.

Finally, unlike prior studies of point-of-care reminders endorsed by specialists or local opinion leaders,[15–28] our inclusion of 2 intervention arms in the ESP-CAD study permits us to disentangle the effect of local opinion leaders from that of the evidence statements (i.e., to separate the messenger from the message). We observed a greater effect of evidence statements that were endorsed by local opinion leaders compared with the anonymous (but otherwise identical) unsigned statements, although the 6% absolute difference was not statistically significant.

Conclusion

Although evidence summaries endorsed by local opinion leaders led to improvements in the quality of statin management, which may have been clinically important (10% absolute difference), our study was underpowered to detect if this difference was statistically significant, given the higher than anticipated improvements in the control arm. Regardless, our results suggest that faxed evidence reminders to primary care physicians are insufficient on their own to optimize the quality of care for patients with chronic coronary artery disease in the outpatient setting. Some form of stimulus in addition to point-of-care reminders (e.g., patient activation,[28,29] involvement of allied health professionals[34]) appears to be needed to optimize the care, and hence outcomes, for patients.

This article has been peer reviewed.

REFERENCES

1. McAlister FA, Fradette M, Graham M, et al. A randomized trial to assess the impact of opinion leader endorsed evidence summaries on the use of secondary prevention strategies in patients with coronary artery disease: The ESP-CAD trial protocol (NCT00175240). *Implement Sci* 2006;1:11.
2. Bhatt DL, Steg PG, Ohman EM, et al. International prevalence, recognition, and treatment of cardiovascular risk factors in outpatients with atherothrombosis. *JAMA* 2006;295:180-9.
3. EUROASPIRE I and II Group. Clinical reality of coronary prevention guidelines: a comparison of EUROASPIRE I and II in nine countries. *Lancet* 2001;357:995-1001.
4. Pilote L, Beck CA, Karp I, et al. Secondary prevention after acute myocardial infarction in four Canadian provinces, 1997–2000. *Can J Cardiol* 2004;2:61-7.
5. Newby LK, Allen LaPointe NM, Chen AY, et al. Long-term adherence to evidence-based secondary prevention therapies in coronary artery disease. *Circulation* 2006;113:203-12.
6. Ford ES, Ajani UA, Croft JB, et al. Explaining the decrease in U.S. deaths from coronary disease, 1980–2000. *N Engl J Med* 2007;356:2388-98.
7. Majumdar SR, McAlister FA, Furberg CD. From publication to practice in chronic cardiovascular disease — the long and winding road. *J Am Coll Cardiol* 2004;43:1738-42.
8. Majumdar SR, Tsuyuki RT, McAlister FA. Impact of opinion leader endorsed evidence summaries on quality of prescribing for patients with cardiovascular disease: randomized controlled trial (ISRCTN26365328). *Am Heart J* 2007;153:22-9.
9. Ghali WA, Knudtson ML; for the Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease (APPROACH) Investigators. Overview of the Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease. *Can J Cardiol* 2000;16:1225-30.
10. McPherson R, Frohlich J, Fodor G, et al. Canadian Cardiovascular Society position statement — recommendations for the diagnosis and treatment of dyslipidemia and prevention of cardiovascular disease. *Can J Cardiol* 2006;22:913-27.
11. Diggle PJ, Liang KY, Zeger SL. *Analysis of longitudinal data*. New York (NY): Oxford University Press; 1996.
12. Sacks H, Chalmers TC, Smith H. Randomized versus historical controls for clinical trials. *Am J Med* 1982;72:233-40.
13. Auerbach AD, Landefeld CS, Shojania JG. The tension between needing to improve care and knowing how to do it. *N Engl J Med* 2007;357:608-13.
14. Josan K, Majumdar SR, McAlister FA. The efficacy and safety of intensive statin therapy: a meta-analysis of randomized trials. *CMAJ* 2008;178:576-84.
15. Grimshaw JM, Shirran L, Thomas R, et al. Changing provider behavior. An overview of systematic reviews of interventions. *Med Care* 2001;39:II2-45.
16. Guadagnoli E, Normand SLT, DiSalvo TG, et al. Effects of treatment recommendations and specialist intervention on care provided by primary care physicians to patients with myocardial infarction or heart failure. *Am J Med* 2004;117:371-9.
17. Derose SF, Dudl JR, Benson VM, et al. Point of service reminders for prescribing cardiovascular medications. *Am J Manag Care* 2005;11:298-304.

18. Feder G, Griffiths C, Eldridge S, et al. Effect of postal prompts to patients and general practitioners on the quality of primary care after a coronary event (POST): randomised controlled trial. *BMJ* 1999;318:1522-6.
19. Eccles M, McColl E, Steen N, et al. Effect of computerized evidence based guidelines on management of asthma and angina in adults in primary care: cluster randomized controlled trial. *BMJ* 2002;325:941-7.
20. Tierney WM, Overhage JM, Murray MD, et al. Effects of computerized guidelines for managing heart disease in primary care. *J Gen Intern Med* 2003;18:967-76.
21. Demakis JG, Beauchamp C, Cull WL, et al. Improving residents' compliance with standards of ambulatory care. Results from the VA Cooperative Study on Computerized Reminders. *JAMA* 2000;284:1411-6.
22. Lester WT, Grant RW, Barnett GO, et al. Randomized controlled trial of an informatics-based intervention to increase statin prescription for secondary prevention of coronary disease. *J Gen Intern Med* 2006;21:22-9.
23. Sequist TD, Gandhi TK, Karson AS, et al. A randomized trial of electronic clinical reminders to improve quality of care for diabetes and coronary artery disease. *J Am Med Inform Assoc* 2005;12:431-7.
24. van Wyk JT, van Wijk MAM, Sturkenboom MCJM, et al. Electronic alerts versus on-demand decision support to improve dyslipidemia treatment. A cluster randomized controlled trial. *Circulation* 2008;117:371-8.
25. Sales A, Helfrich C, Ho PM, et al. Implementing electronic clinical reminders for lipid management in patients with ischemic heart disease in the Veterans Health Administration: QUERI Series. *Implement Sci* 2008;3:28.
26. Thomas RE, Croal BL, Ramsay C, et al. Effect of enhanced feedback and brief educational reminder messages on laboratory test requesting in primary care: a cluster randomised trial. *Lancet* 2006;367:1990-6.
27. Eccles M, Steen N, Grimshaw J, et al. Effect of audit and feedback, and reminder messages on primary-care radiology referrals: a randomised trial. *Lancet* 2001;357:1406-9.
28. Majumdar SR, Johnson JA, McAlister FA, et al. Multifaceted intervention to improve diagnosis and treatment of osteoporosis in patients with recent wrist fracture: a randomized controlled trial. *CMAJ* 2008;178:569-75.
29. McAlister FA, Man-Son-Hing M, Straus SE, et al.; DAAFI Investigators. The impact of patient decision aids on care in patients with atrial fibrillation: a cluster randomized trial. *CMAJ* 2005;173:496-501.
30. McAlister FA, Oreopoulos A, Norris CM, et al; for the Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease (APPROACH) Investigators. Exploring the treatment-risk paradox in coronary disease. *Arch Intern Med* 2007;167:1019-25.
31. DesRoches CM, Campbell EG, Sowmya RR, et al. Electronic health records in ambulatory care: a national survey of physicians. *N Engl J Med* 2008;359:50-60.
32. Balas EA, Weingarten S, Garb CT, et al. Improving preventive care by prompting physicians. *Arch Intern Med* 2000;160:301-8.
33. Grimshaw JM, Thomas RE, MacLennan G, et al. Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technol Assess* 2004;8:iii-iv, 1-72.
34. McLean DL, McAlister FA, Johnson JA, et al. A randomized trial of the effect of community pharmacist and nurse care on improving blood pressure management in patients with diabetes: SCRIP-HTN (NCT00374270). *Arch Intern Med* 2008;168:2355-61.

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