ORIGINAL ARTICLE

Patients undergoing coronary revascularisation: a missed opportunity for secondary prevention?

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Background: This study tested the hypothesis that the opportunity to start secondary prevention therapy before discharge after coronary revascularisation is being missed. The study assessed current prescribing practice and identified discrepancies in prescribing for patients managed by surgeons (especially) and cardiologists.

Methods: 200 consecutive patients from the Manchester Heart Centre percutaneous coronary intervention (PCI) and coronary artery bypass (CABG) registries were identified (100 from each registry) and the notes analysed. All had undergone coronary revascularisation from February 2002 to March 2002. Data were analysed using SPSS for Windows, version 10.1.

Results: After exclusion of two patients with contraindications, 100% (98 of 98) of PCI patients and 92% (90 of 98) CABG patients were prescribed aspirin at discharge. Eight two per cent of eligible PCI patients and 70% of eligible CABG patients were prescribed β blockers at discharge. Ninety six per cent (96 of 100) of PCI patients and 73% (73 of 100) of CABG patients were prescribed statins of any dose at discharge, ($p < 0.001$). Sixty five per cent of PCI but only 26% of CABG patients were discharged prescribed ACE inhibitors (eligible patients based on HOPE, heart outcomes prevention evaluation trial), ($p < 0.001$).

Conclusions: Secondary prevention prescription after coronary revascularisation remains suboptimal in all but aspirin use. Patients in the PCI group were statistically more likely to be discharged prescribed a statin or an ACE inhibitor, or both, than patients after CABG. Both interventional cardiologists and (especially) cardiac surgeons must improve their use of secondary prevention therapy.

Cardiovascular disease is a leading cause of premature mortality and morbidity in the United Kingdom causing over 235 000 deaths due in the year 2000.¹ The improvement in symptoms achieved by both percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) is unequivocally proved. In addition, both techniques can improve prognosis in certain patient groups.² As a result, the number of these procedures has grown substantially in the UK, with the latest figures suggesting a ratio of 1.7:1 PCI to CABG. In terms of long term prognosis, however, clinical studies have shown important prognostic benefits from medical treatment in large subgroups of patients with coronary artery disease or left ventricular dysfunction.

In the case of statins, consistent prognostic benefit is shown in studies that include secondary prevention populations.^{3–7} Some of these data include specific subgroups who have undergone coronary revascularisation.⁵ Furthermore, any patient with left ventricular dysfunction^{8–9} or sharing the inclusion criteria of the HOPE study¹⁰ is expected to benefit prognostically from an ACE inhibitor. This would therefore include most patients undergoing coronary revascularisation. It has previously been shown that there is poor uptake of ACE inhibitor therapy after CABG.¹¹ The benefit of aspirin is already well established in patients with coronary disease^{12–13} as are the data favouring β blockers in those with previous myocardial infarction or ongoing ischaemia.^{14–16}

Thus, data suggest that most patients undergoing PCI or CABG will benefit in the long term from prescription of aspirin, statin, ACE inhibitor, and, in many cases, β blocker. The episode of the admission for revascularisation clearly represents an ideal opportunity to achieve this drug strategy. The responsibility for achieving this benefit would ideally lie with the consultant supervising the revascularisation: either

interventional cardiologist or cardiac surgeon. Many patients who undergo CABG are now only followed up by the cardiac surgical team, which makes it an important part of their responsibility, independent of the referring cardiologist.

The objectives of this study were therefore as follows:

- To identify total discharge prescriptions of four key confirmed secondary preventative drugs in 100 consecutive PCI and 100 consecutive CABG patients.
- To assess if prescribing of the four drugs is optimal in the two revascularisation groups.
- To analyse the differences, if any, between the two clinician groups in prescribing trends to see if coronary revascularisation patients are getting the same treatment from interventional cardiologists and cardiothoracic surgeons.

The hypothesis to be tested was therefore that the opportunity to provide optimal, evidence based secondary prevention after coronary revascularisation is not being taken.

METHODS

A retrospective study was performed analysing 100 consecutive notes for each group from the Manchester Heart Centre registries of PCI and CABG between February 2002 and March 2002. All patients referred for surgical revascularisation had previously been seen by a cardiologist. Case note analysis was undertaken to elicit secondary preventative drugs patients were taking before admission and at discharge after revascularisation. Demographic data were also recorded

Abbreviations: PCI, percutaneous coronary intervention; CABG, coronary artery bypass graft

Table 1 Percentage of eligible patients (no contraindications and meeting 2002 guidelines) admitted and subsequently discharged on the four assessed categories of secondary preventative drugs

		PCI group (%)	CABG group (%)	p Value
Aspirin	Before admission	82	87	NS
	Discharge	100	92	NS
Statin	Before admission	67	79	NS
	Discharge	96	73	<0.001
ACE inhibitor	Before admission	32	32	NS
	Discharge	65	26	<0.001
β Blocker	Before admission	60	72	NS
	Discharge	82	70	NS

as well as coronary risk factors, number of vessels revascularised via PCI or CABG, length of hospital stay, and any report of drug contraindication/reason for non-prescription.

All data was stored using EXCEL software and analysed using SPSS for Windows version 10.1 for statistical analysis. According to statistical advice, Fisher's exact test was used to compare results between PCI and CABG patients. Paired Student's *t* test was used to determine significant differences between the two groups (PCI and CABG).

RESULTS (SUMMARISED IN TABLE 1 AND FIGURE 1)

Seventy four of the PCI group and 82 of the CABG group were male. The mean age of the patients was 62 years for men and 64 years for women. The age range was from 40 to 81 years in the PCI group and 40 to 88 years in the CABG group.

Aspirin prescription

Eight two per cent of PCI patients and 87% of the CABG group were taking aspirin before admission.

At discharge 100% of all eligible (98 of 100) PCI patients but only 92% (90 of 98) of the eligible CABG patients were taking aspirin of any dose.

Statin prescription

Sixty seven per cent of PCI patients and 79% of the CABG patients were prescribed statins before admission ($p = 0.079$). At discharge 96% of the PCI patients were discharged prescribed a statin compared with 73% of CABG patients, ($p < 0.001$).

In this study serum cholesterol measurements were available in the notes for 175 patients (91 CABG patients

and 84 PCI patients). Many patients had had their cholesterol concentration reading taken before admission for coronary revascularisation. The mean cholesterol concentration for the CABG patient population was 4.7 mmol/l whereas the mean for the PCI group was 5.0 mmol/l. The median total cholesterol concentration for both groups was 4.7 mmol/l.

ACE inhibitor prescription

In all, 60 (30%) patients took ACE inhibitors before admission for revascularisation and 81 (40%) patients were discharged taking the same treatment. Twenty nine per cent of PCI patients and 31% of CABG patients were taking ACE inhibitor treatment at admission.

The proportion of patients discharged on ACE inhibitors was 56% in the PCI group compared with 25% in the CABG patients ($p < 0.001$), representing a reduction in discharge prescriptions of ACE inhibitors in the surgical group.

In keeping with the recent findings from the HOPE study, all patients with established CHD aged 55 years and over had an indication for an ACE inhibitor, regardless of left ventricular function. In our study population, there were 150 patients aged 55 years and over who were eligible for such treatment (68 of 150 PCI and 82 of 150 CABG). When this subgroup of patients was analysed, 48 of 150 (33%) patients were taking ACE inhibitors on admission. At discharge, this proportion doubled among the PCI patients, so that 65% (44 of 68) of patients were being treated with ACE inhibitors. By contrast, in the CABG group the proportion decreased to 26% (21 of 82). Specifically, 14

Figure 1 Results of the study summarised in a histogram.

CABG patients who had been taking ACE inhibitors before admission were discharged home without them.

β blocker prescription

After excluding eight patients who had contraindications to β blockers, 127 of the remaining 192 (66%) patients were taking these agents before admission to hospital. At discharge, this total increased to 146 of 192 (76%) patients. This included 60% (56 of 94) of eligible PCI patients admitted already prescribed β blockers and 72% (69 of 98) eligible CABG patients admitted taking β blockers.

In the PCI group, six patients had clear contraindications to β blockers. After they were excluded, 77 of the remaining 94 (82%) patients were discharged home prescribed β blockers. There were two CABG patients with contraindications to β blocker therapy. After excluding these patients, 71 of the remaining 98 (72%) patients were taking these agents before admission. This proportion decreased to 70% (69 of 98 eligible patients) at discharge. Therefore, at discharge 82% (77 of 94) of PCI patients were prescribed β blockers as compared with 70% (69 of 98) of CABG patients ($p = 0.153$).

DISCUSSION

We failed to disprove the null hypothesis that secondary prevention therapy after revascularisation remains suboptimal according to the contemporary evidence base. It has been well established in the literature that all patients should be taking aspirin¹²⁻¹³ and all patients after myocardial infarction or with significant left ventricular dysfunction should be taking a β blocker.¹⁴⁻¹⁶ In addition, according to CARE⁵ and the heart protection study,⁷ all such patients should be taking at least 40 mg of either simvastatin or pravastatin (or an equivalent). At the time the patients in this study underwent revascularisation the HOPE¹⁰ study suggested that as well as all patients with left ventricular dysfunction, all revascularisation patients over 55 years should be also be taking an ACE inhibitor. Since that time, the recently published EUROPA study¹⁸ suggests that all coronary artery disease patients, regardless of age, should be taking ACE inhibitor.

In our study, while aspirin prescription is satisfactory in both PCI and CABG patients at discharge, and comparable to the ASPIRE data,¹⁷ the discharge prescription of statin, ACE inhibitor, and β blocker remains suboptimal.

This study therefore shows that both cardiologists and surgeons are not making the most of this opportunity for secondary prevention. In particular, patients treated by CABG surgery have comparatively low discharge rates for statins and ACE inhibitors, and alarmingly there was a trend in statin, ACE inhibitor, and β blocker therapy for less patients in the CABG group to be discharged prescribed these drugs than were actually admitted to hospital taking them.

This highlights an important clinical issue: all clinicians who undertake revascularisation, including interventional cardiologists and cardiac surgeons, need to be trained to take responsibility for this secondary prevention as part of the revascularisation "package" that they provide. The traditional attitude that the cardiac surgeon does not get involved with the patient's drug treatment is now out of date and the current and next generation of trainees in this specialty should understand the importance of this aspect of the care that they provide. This philosophy has become particularly important because increasingly cardiologists (many of whom are performing higher volume revascularisation procedures in their own right) do not see post-CABG patients again themselves, so that all follow up is undertaken by the surgical team.

The timing of the introduction of these agents is likely to be important. The revascularisation episode itself represents a unique opportunity to capture the population who require

secondary prevention when they can be educated and, importantly, when they are well motivated. For example, Aronow *et al*¹⁹ showed that inpatient introduction of lipid lowering drugs was a strong, significant positive predictor of continued use at six months. This finding can almost certainly be extrapolated for all drug treatment started in hospital.

In conclusion this study highlights a missed opportunity for secondary prevention. Interventional cardiologists and cardiac surgeons alike should now be using these agents as a default at discharge to optimise the care that they provide for these patients.

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