The one-stop coronary cholesterol clinic: a multidisciplinary approach to implementing evidence-based treatment


Summary
We describe a ‘one-stop’ cholesterol clinic implementing a regime based on the Scandinavian Simvastatin Survival Study (4S) in patients with established coronary heart disease in a district general hospital. The clinic has been established in collaboration with the cardiac rehabilitation centre. It was commissioned as an audit project by the purchasing authority, Walsall Health, a need having been shown in a previous audit. In the new clinic, audit is inbuilt, rather than being carried out as a separate retrospective exercise, and undertaken prospectively for all patients. Central to this is a database, used for routine correspondence and administration, as well as monitoring outcome. This application of information technology has improved clinical practice. Attendance at the clinic has been excellent. Half the consultations have resulted in therapeutic interventions, many of which may otherwise have been missed. Over 50% of patients were eligible for lipid-lowering medication under the protocol. Cholesterol targets based on 4S were achieved but with much lower drug doses, which may have major cost implications. Cholesterol levels measured within 24 hours of admission for myocardial infarction were poor predictors of results obtained after convalescence. After the clinic visit, most patients were taking aspirin plus one or two other secondary prevention treatments. Guidelines have been issued to primary care. Future plans for audit links with general practitioners, integration of the metabolic and cardiological assessment of survivors of myocardial infarction, and for long-term monitoring of clinical events in treated patients are discussed.

Keywords: cholesterol, audit, coronary heart disease

Implementation, rather than discovery, may limit improvement in healthcare. Recently, an approach to increase the use of drugs of proven value for secondary prevention after myocardial infarction has been reported but lipid-lowering medication was not considered. The Scandinavian Simvastatin Survival Study (4S) provided compelling evidence that outcome in patients with coronary heart disease may be substantially improved by cholesterol reduction with drugs. The value of cholesterol-lowering medication in coronary heart disease is increasingly accepted and strategies are being proposed for choosing combinations of secondary prevention measures (including cholesterol reduction) for individual patients.

Reduction in coronary deaths is a priority in Walsall. The district includes areas of urban deprivation and about 8% of the population of 263 000 are of Asian extraction. Most acute services are provided by the Manor Hospital, a non-teaching National Health Service (NHS) trust. Following the publication of 4S in November 1994, copies of cholesterol results obtained within 24 hours of patients’ admission to the Manor Hospital coronary care unit were sent directly to general practitioners. Each report was accompanied by a letter summarising 4S and asking general practitioners to check their patients’ lipids two to three months later, when many uncomplicated myocardial infarction cases would already have been discharged from hospital follow-up. When compliance with this recommendation was assessed during early 1995, it was found that the retest rate was disappointingly low. If patients were not being retested, there seemed little chance that their lipids would be treated unless a new approach were taken.

Methods
Three-quarters of Walsall myocardial infarction survivors embark on a 12-week cardiac rehabilitation course, ‘Heartcare’. As a new initiative it was decided to offer lipid testing to Heartcare patients towards the end of their course and to discuss the results with each patient in a ‘one-stop’ Coronary Cholesterol Clinic. Where appropriate, treatment would be initiated using a 4S-based protocol (see below). Subsequently the opportunity to attend the clinic has been extended to other coronary heart disease patients.

Steps have been taken to gain the support of general practitioners. The protocol was submitted to the Local Medical Committee and discussed with Walsall Medical Audit Advisory Group. Follow-up guidelines have been distributed to all Walsall general practitioners as a poster. An explanatory article has been published in Walsall Health’s general practitioner...
Third, patients in their early seventies are occasionally seen in the one-stop clinic. Lipid-lowering drugs are recommended in a few of these cases where general health (apart from coronary disease) is good; otherwise dietary advice is reinforced (subgroup analysis of 4S showed benefit in patients aged over 60 years but the trial did not recruit patients over 70).

Lipid analyses were performed on a Beckman CX5 analyser, using the manufacturer’s reagents. Paired data were compared by the Wilcoxon matched-pairs signed ranks test. Microsoft Works for Windows (version 3) was used to form the database.

Results

ACTIVITY AND TREATMENT DECISIONS
Between 15 May 1995 and 31 January 1996, 19 clinics were held, in which 267 patients were seen. In addition, one patient declined to attend the clinic in advance and two other patients failed to attend their appointments without explanation. The basic characteristics of the 267 patients are shown in the table.

Lipid-lowering medication was started in 107 patients (40%) and (adjusted by dose or type) in 21(8%). Five patients declined treatment. In addition, lipid-lowering medication was stopped in one patient and continued without alteration in 22 (8%). In the remaining 111 patients (42%) dietary advice was reinforced.

The number of patients taking lipid therapy before their visit to the one-stop clinic was 44 (16.5%), whereas the number after the visit was 150 (56%). In 129 of the 267 consultations (48%) a change in lipid therapy was implemented. After the one-stop review, most patients were taking aspirin plus one or two other secondary prevention measures (table).

POST-CLINIC FOLLOW-UP TESTS: RESPONSE TO TREATMENT
Of the 172 patients due for post-clinic retesting by 31 January 1996, 161(94%) had attended. These cases comprised a mixture of patients in whom lipid-lowering medication was either started, or changed in dose or type, at the one-stop clinic, and other patients whose lipid treatment was not altered at the clinic but who had cholesterol levels over 5 mmol/l.

Of these 161 patients, 95 (59%) had retest cholesterol levels of 5.2 mmol/l or less, as compared with 20 (12.4%) of them at the one-stop clinic. The mean reduction in cholesterol was 1.01 mmol/l (CI 0.85-1.17), p<0.0001.

Seventy-five of the 161 retested patients had been started on 10 mg simvastatin at the clinic (no lipid-lowering drugs having been given previously). The mean cholesterol reduction was 1.71 mmol/l (CI 1.55-1.87) (26%), p<0.0001. The cholesterol was reduced to 5.2 mmol/l or less in 62/75 (83%) of these patients, all of whom had pre-treatment cholesterol levels of 5.5 mmol/l or more. A decrease in cholesterol was recorded in all except two patients in this group, both of whom reported that they had stopped treatment because of apparent side-effects.
Table Characteristics of patients attending one-stop coronary cholesterol clinic (n=267)

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years (SD)</td>
<td>60.7 (10.2)</td>
</tr>
<tr>
<td>Body mass index (kg/m²)(SD)</td>
<td>26.8 (4.1)</td>
</tr>
<tr>
<td>Male/female</td>
<td>205/62 (77%/23%)</td>
</tr>
</tbody>
</table>

**Pre-clinic events**
- Myocardial infarction: 35 (90%)
- Angioplasty: 5 (2%)
- Cerebrovascular disease: 3 (1%)

**Current symptoms**
- Angina: 72 (46%)
- Peripheral vascular disease: 30 (21%)
- Heart failure (NYHA) Grade 1: 188 (70%)
  - Grade 2: 67 (25%)
  - Grade 3: 12 (5%)

**Smoking habits**
- Current smokers: 21 (8%)
- Recent ex-smokers: 40 (15%)
- Long term ex-smokers: 128 (48%)
- Never smoked: 72 (27%)
- Pipe/cigar smokers: 6 (2%)

**Significant family history**
- First degree: 94 (35%)
- Second degree: 30 (11%)

**Other risk factors**
- Hypertension: 59 (22%)
- Diabetes: 20 (7%)

**Medication**
- Aspirin: 245 (92%)
- Beta blockers: 103 (39%)
- ACE inhibitors (including 30 treated for hypertension): 57 (21%)

<table>
<thead>
<tr>
<th>Lipid</th>
<th>mean (mmol/l) (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol</td>
<td>6.08 (1.08)</td>
</tr>
<tr>
<td>on admission (n=115)</td>
<td></td>
</tr>
<tr>
<td>after recovery (n=267)</td>
<td>5.97 (1.00)</td>
</tr>
<tr>
<td>follow-up (n=161)</td>
<td>5.22 (0.88)</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>1.93 (1.04)</td>
</tr>
<tr>
<td>after recovery (n=261)</td>
<td></td>
</tr>
<tr>
<td>follow-up (n=156)</td>
<td>1.70 (0.90)</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>0.99 (0.27)</td>
</tr>
<tr>
<td>after recovery (n=257)</td>
<td></td>
</tr>
<tr>
<td>follow-up (n=154)</td>
<td>1.05 (0.26)</td>
</tr>
</tbody>
</table>

Even samples obtained during the first 24 hours of an admission for myocardial infarction cannot be used to exclude a lipid-problem; all patients should be retested after convalescence, unless there is a contraindication to lipid therapy (1.8 mmol/l) later in the trial. The slight attenuation in average cholesterol reduction with time in 4S and other 'statin' trials analysed by intention to treat is thought to be due to dilution by patients who stopped treatment but continued to provide blood samples. Treatment effect with simvastatin is not thought to diminish in patients who continue to comply with therapy.

By contrast with the drug-treated group, the 33 patients who continued without lipid-lowering medication after attending the one-stop clinic and who had been retested by 31 January 1996 showed no significant change overall (5.7 before vs 5.8 mmol/l after). Amongst this group were elderly patients with cholesterol levels over 5.5 mmol/l in whom dietary advice had been reinforced, and some younger patients who had declined lipid-lowering medication. In one exceptional patient the cholesterol fell from 8.2 (measured on admission to the coronary care unit) to 6.3 mmol/l shortly before his one-stop clinic review. Although simvastatin was recommended he refused it and with further dietary effort the cholesterol fell to 5 mmol/l two months later.

**Discussion**

The average cholesterol decrease in one-stop clinic patients accepting simvastatin approached that seen in the treatment arm of 4S. The data from 4S indicated that a cholesterol reduction of this size, if sustained for five or six years, should prevent four of the nine expected deaths from coronary heart disease per 100 patients treated. Additionally, substantial amelioration of recurrent non-fatal myocardial infarction and need for revascularisation procedures would also be anticipated.

For comparison, 72% of patients in the active-treatment arm of 4S (taking 20-40 mg simvastatin) were within the target of 5.2 mmol/l or less at one year. The average cholesterol reduction was 28% at six weeks, when all patients were still on 20 mg, and 25%
Learning points

- coronary heart disease is an area ripe for audit, several treatments (including cholesterol reduction) having proven benefit
- routine patient management and prospective accumulation of audit data can be integrated through information technology. This is best organised at the outset if a new service is being initiated
- when treatment is started in hospital but requires long-term continuation by general practitioners, appropriate audit links between primary and secondary care must be established
- treatment regimes used in clinical trials may require modification when applied to individual patients in routine clinical practice

In 4S, treatment reduced these by about a third.\(^3\)

Although most patients seen in the one-stop clinic had undergone several lipid tests, the pre-clinic profile was used as the main basis for therapeutic decisions for two reasons. First, 4S demonstrated that relative risk reduction in treated patients is independent of the baseline cholesterol.\(^4\) Therefore, if after three months compliance with diet a patient is seen as a candidate for treatment, in the typical case there is little advantage in delaying the decision in order to define the baseline more precisely and much to be gained by seeking the greatest cholesterol reduction possible. Second, the likelihood of patients defaulting from follow-up may increase if multiple tests are undertaken without action.

Although high-density lipoprotein (HDL) cholesterol and triglyceride concentrations were assayed in nearly all one-stop patients, in practice most decisions were made on the total cholesterol. This may seem crude but was the strategy adopted in 4S. The value of HDL measurements is in refining coronary heart disease risk assessment but in a group of patients with established coronary disease, risk is necessarily high, so HDL levels may be less helpful in this context than in estimating future risk in an individual without current coronary heart disease. However, when further information becomes available from on-going trials of lipid treatment in coronary heart disease,\(^10,11\) the Walsall protocol may require modification to take into account HDL and calculated low-density lipoprotein (LDL) concentrations.

The long-term financial consequences of this treatment are important. Lipid-lowering medication in myocardial infarction survivors appears cost-effective when compared with other interventions, such as thrombolysis, coronary artery by-pass grafting and breast cancer screening.\(^15,16\) However, it must be recognised that the immediate costs will fall on primary care, while the major savings will be in hospital expenditure and will only accrue later.

Although typical drug doses in the one-stop clinic were substantially lower than those used in 4S, a similar proportion of simvastatin-treated patients achieved the target cholesterol of 5.2 mmol/l or less. Even though some of the Walsall patients may have benefited from a further increase in simvastatin, experience in the one-stop clinic is probably a better guide to the potential costs of implementing lipid-lowering therapy in myocardial infarction survivors in a routine clinical setting than is the dosage regime used in 4S and cost-effectiveness may be considerably better than has previously been supposed.

Following the success of this one-stop approach, discussions are taking place with the cardiologists at the Manor Hospital about a multidisciplinary one-stop post-myocardial infarction clinic to include all aspects of assessment, not just the metabolic.

The success of lipid-lowering strategies depends on long-term compliance: clinical benefits are not seen until after 12-18 months of therapy but then become progressively greater as treatment is prolonged.\(^4,9\) Although the one-stop clinic has been successful in initiating therapy in targeted patients, treatment must be continued indefinitely in primary care. A variety of factors may mitigate the ideal. It is vital that there is on-going monitoring of patients who have been commenced on medication. Audit of these and similar patients must be given a high priority in primary care. The database developed for the one-stop clinic has the capacity to be adapted as a long-term recall mechanism to assist general practitioners with appropriate interval testing and, in collaboration with Walsall Medical Audit Advisory Group, it is hoped to begin piloting this extension to the original scheme over the next few months.

Ideally, actual clinical events, as well as the metabolic effects of treatment, should be followed in patients. Few districts have high quality record linkage systems, although with the advent of a unique NHS patient number this may become easier. The information department at Walsall Health is hoping to monitor successive cohorts of patients for coronary heart disease events (including need for angiography, coronary artery bypass grafting/angioplasty, repeat myocardial infarction and death) over the coming years.

![Figure](http://pmj.bmj.com/ on June 16, 2017 - Published by group.bmj.com) The relationship between serum cholesterol levels measured on samples obtained within 24 hours of admission to the coronary care unit (CCU) and those recorded after recovery (OPD) in patients not given lipid-lowering medication \((n=93, y=0.528x + 2.817, r^2=0.303, p=0.27)\)
This project was funded by Walsall Health. Thanks are due to Mr DC Crothers (Biochemistry Department, Manor Hospital) for help with data analysis.

This audit was carried out at the Manor Hospital, Walsall (Walsall Hospitals NHS Trust), in collaboration with Walsall Heartcare (cardiac rehabilitation centre), having been commissioned by Walsall Health.


Medical Anniversary

GEORGE MINOT, 2 DECEMBER 1885

George Minot (1885 – 1950) was born in Boston, Massachusetts, son of a local doctor. He became MD (Harvard) (1912) and spent his working life as a haematologist. He showed the value of liver (and later vitamin B12) in the treatment of pernicious anaemia, for which he shared the Nobel prize with William Murphy and Dr Whipple in 1934. He died on 25 February 1950. — DG James


doi: 10.1136/pgmj.72.854.744

Updated information and services can be found at:
http://pmj.bmj.com/content/72/854/744

These include:

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/