TECHNOLOGY ASSESSMENT REPORT FOR THE HTA PROGRAMME

FINALISED VERSION: 28 August 2002

Title:

Review of coronary artery stents and appraisal of drug-eluting stents

A. This protocol is provisional and subject to change

B. Details of review team

Rumona Dickson, Ms
Director, LRIG
Liverpool Reviews and Implementation Group (LRIG)
New Medical School
Ashton Street
Liverpool, UK
L69 3GE
Tel: 0 151 794 5682/5541
Email: rdickson@liv.ac.uk

Details of other members of the review team

Bagust A
Bakhai A
Dundar Y
Haycox A
Hill R
Mujica Mota R
Reaney A
Walley T
Williamson P

C. Full title of research question

In the setting of Coronary Artery Disease (CAD), to assess the clinical and cost effectiveness of stents and drug-eluting stents for the prevention of restenosis, compared with Percutaneous Transluminal Coronary Angioplasty (PTCA) and Coronary Artery Bypass Graft (CABG)

D. **Clarification of research question and scope**

Clinical Comparisons
In patient populations, with stable angina and Acute Coronary Syndrome (ACS):

- Percutaneous Transluminal Coronary Angioplasty versus stent
- Stent versus drug-eluting stent
- Stent versus Coronary Artery Bypass Graft

E. **Report Methods**

The National Institute of Clinical Excellence issued guidance on the use of coronary artery stents in May 2000.(1) This guidance was in part based on evidence provided by a review of coronary artery stents, authored by Meads and colleagues and published as an HTA monograph in 2000.(2)

Given the relationship of the review outlined in this protocol to both the published HTA monograph(2) and NICE guidance currently in place,(1) the review will refer to and, where appropriate, use data directly from these sources.

Search strategy
The results of the search conducted by Meads and colleagues, 2000(2) (1990 to November 1999) will be utilised in the review. The progress of ongoing studies noted by Meads and colleagues, 2000(2) will be determined.

The following databases will be searched for relevant published literature for the period from January 1999 to August 2002.

- CCTR (Cochrane Controlled Trials Register)
- CDSR (Cochrane Database of Systematic Reviews)
- DARE (Database of Abstracts of Reviews of Effectiveness)
- EMBASE
- Health Technology Assessment (HTA) database
- ISTP (Index to Scientific & Technical Proceedings)
- MEDLINE
- NHS EED (NHS Economic Evaluation Database)
- Science Citation Index

Details of the search strategies used to explore EMBASE and MEDLINE are available in Appendix I.

Research groups identified through searches of the registers listed below will be contacted for information about ongoing trials:

- National Research Register
- Cochrane Library
- UKCCCR Register
- National Institute of Health
- CenterWatch Clinical Trials Listing Service
- Current Controlled Trials (CCT), including the Medical Research Council Register
- ClinicalTrials.com

Bibliographies of previous reviews, retrieved articles, industry submissions made to the National Institute for Clinical Excellence (NICE) will be searched for further studies.

Handsearching of recent issues of cardiology journals and cardiology conference abstracts will be conducted.

More specifically, conference proceedings for the following meetings will be obtained for the purposes of handsearching:

- American College of Cardiology (2000, 2001 and March 2002)
- American Heart Association (2000, 2001 and November 2002)
- British Cardiac Society (2000, 2001 and May 2002)
- European Society of Cardiology (2000, 2001 and August 2002)
- Transcatheter Cardiovascular Therapeutics (2000, 2001 and September 2002)

Internet resources (including industry supported websites), which include searchable content on Cardiovascular Intervention, will be examined for information on clinical trials and cost data.

Quality assessment strategy

Quality assessment criteria based on CRD Report No. 4(3) (see Appendix III) will be applied to the clinical studies included in the HTA report by Meads and colleagues.(2)

All included studies, resulting from our own searching, will be assessed for methodological quality. The quality of clinical effectiveness studies will be assessed using criteria based on CRD Report No. 4.(3) Cost effectiveness studies will be quality assessed using criteria updated from the checklist developed by Drummond.(4) Two reviewers will evaluate study quality independently. Disagreements will be resolved by consensus (if necessary a third reviewer will be consulted).

Data extraction strategy

We will accept the data extraction as reported in Meads and colleagues,(2) although additional data will be extracted as required. Data from sources located in our own search will be extracted as detailed below and will include information listed in Appendix II.

Data relating to study design, findings and quality will be extracted by one reviewer and independently checked for accuracy by a second reviewer. Study details will be extracted on pre-tested data extraction forms. Time permitting, authors of the studies will be contacted for missing data. Data from studies presented in multiple publications will be extracted and reported as a single study with all other relevant publications listed. Only data from English language studies will be included in the report.

Inclusion and exclusion criteria

a. Inclusion criteria

Study design	**Clinical effectiveness:** Randomised Controlled Trials (RCTs) **Economic evaluation:** Full economic evaluations that compare two or more options and consider both costs and consequences: including cost-effectiveness, cost-utility analyses or cost-benefit analyses
Population	Adults with CAD in native or graft vessels Patients with stable angina or Acute Coronary Syndrome which includes Acute Myocardial Infarction (ST segment elevation and depression, Q wave and non-Q wave) and unstable angina
Comparators	PTCA versus PTCA with stent Stent versus drug-eluting stent Stent versus CABG
Outcomes	**Clinical:** One or more of the following: combined event rate or event free survival; death; Acute Myocardial Infarction (AMI); Target Vessel Revascularization (TVR); repeat treatment (PTCA, stent or CABG) **Radiological:** Binary restenosis (greater than 50%); Late loss **Economic:** Utility weights related to clinical outcomes **Quality of life**

b. Exclusion criteria

RCTs that:
- Are continuing to recruit patients
- Provide only unplanned, interim findings
- Provide data on only a sub-group of patients

Comparison of:
- PTCA or stents to medical management
- Single versus multiple vessel stenting
- Various stent designs
- Anticoagulant or anti-platelet comparisons (data on their use in included trials will be noted)
- PTCA or stenting to other PCI interventions (e.g. Atherectomy, Rotabaltors, Brachytherapy)

Methods of analysis/synthesis

a. Methods of analysis for clinical studies

Individual study data and quality assessment will be summarised in structured tables and as a narrative description. Potential effects of study quality will be discussed.

Heterogeneity between studies will be assessed by considering differences in the (a) study population, (b) intervention, (c) outcome measures and (d) study quality. Data will be pooled only if this would be clinically and statistically appropriate.

Primary outcomes: Clinical outcomes measured in the medium (3 to <12months) and long term (1 to 5 years).

Secondary outcomes: Clinical outcomes measured in the short term (less than 3 months)

For binary outcomes, relative treatment effects will be presented in the form of relative risks (RR). For continuous outcomes, mean differences will be calculated. For time-to-event outcomes, hazard ratios will be obtained.

The following variables are considered to be potential effect modifiers: vessel diameter, lesion length, lesion type, diabetes or Saphenous Vein Graft (SVG). Individual patient data from each trial would provide the most reliable evidence for this question however this approach is precluded by resource constraints. This is also true for asking trialists to provide compatible aggregate data results. Instead we shall undertake a meta-regression, regressing relative treatment effects on summary measures describing each characteristic.

b. Methods of analysis for economic studies

For the three main comparisons specified for this review (i.e. stent versus PCTA, stent versus CABG and drug-eluting stent versus stent), individual study data and quality assessment will be summarised in structured tables and as a narrative description. Potential effects of study quality will be discussed.

A model will be developed to estimate the comparative cost-effectiveness of alternative treatment strategies, specifically comparing two key areas of the current review:

- Stenting and CABG
- Drug-eluting stents and stents

The results will be presented in terms of cost per life year gained or possibly as cost per quality adjusted life year (QALY), if appropriate utility data are available. This model will combine data on clinical and cost-effectiveness available from the systematic review and expert clinical opinion (e.g. review panel members, clinicians undertaking stenting and surgery) with cost data relevant to the UK NHS. Further details of the modelling and data requirements are summarised in the next section.

Methods for estimating costs and cost-effectiveness and/or cost/QALY

a. Cost data

The primary perspective for the costing will be the NHS. Cost data will therefore focus on the marginal direct health service costs associated with the treatment options (e.g. stents, equipment, bed-days in hospital etc).

Quantities of resources used will be identified from consultation with experts, primary data from relevant sources and the reviewed literature. Unit cost data will be extracted from the literature (e.g. Personal Social Services Research Unit and Chartered Institute of Public Finance and Accounting cost databases) or obtained from other relevant sources (drug price lists, NHS reference costs). All cost data will be converted to a single year (2002) in pounds sterling.

The following data will be needed to estimate costs incurred by the NHS for particular procedures.

- Staff time costs, consumables, overheads and capital charges associated with the treatment alternatives
- Length of stay and treatment intensity during initial hospitalisation
- Post-procedure costs during the period of hospitalisation and follow-up

Where appropriate costs will be discounted at 6%, the rate recommended in the NICE guidance to manufacturers and sponsors of submissions.(5)

Development of a model will also require data on the following:

- Number and type of procedures in the UK
- Audit data on length of stay
- Audit data on complication rates
- Outcome data (years of life gained, TVR)
- Mortality rates

b. Assessment of benefits

A balance sheet will be constructed to list benefits and costs arising from alternative treatment strategies. We anticipate that the main measures of benefit will be reduced mortality and improved quality of life.

Where appropriate, effectiveness and other measures of benefit will be discounted at 1.5%, the rate recommended in the NICE guidance to manufacturers and sponsors of submissions.(5)

c. Modelling

For the estimation of costs and effectiveness over the lifetime of cohorts of patients who initially receive the different treatment strategies, a Markov model is the preferred approach. The precise nature of the model will be constrained by the data available. The results in terms of costs and effectiveness will be presented in terms of a balance sheet. A formal combination of costs and benefits will also be performed, although the type of economic evaluation will only be chosen in light of the variations in outcome identified in the different treatment options.

Ideally, the results would be presented as incremental cost per QALY ratios for each alternative considered. If sufficient data are not available to construct these measures with substantial precision, incremental cost effectiveness analysis will be undertaken.

Detailed sub-group analyses (e.g. type of lesion treated, age of patient, co-morbidities) would be useful, but it seems unlikely that the data to undertake these exist. As we expect only limited data for long follow-up periods (e.g. five years or more), the model may be most suitable for estimating the cost-effectiveness of the treatment alternatives over the short to medium term. Modelling techniques will be used to obtain long-term estimates, though any such projections must be viewed as indicative rather than definitive.

In addition to developing our own economic model, we will undertake a detailed analysis of the industry model(s), if submitted, which will include an assessment of strengths and weaknesses and a discussion of the implications of different assumptions.

d. Sensitivity Analysis

Sensitivity analysis will be applied to the model in order to assess the robustness of the results to realistic variations in the levels of the underlying data (e.g. acquisition price of stents). Where the overall results are sensitive to a particular variable, the sensitivity analysis will analyse the exact nature of the impact of variations.

The results of the evaluation will be used to estimate comparative cost-effectiveness ratios under different treatment scenarios based upon appropriate sub-groups of patients.

F. Handling the company submission(s)

The Liverpool Reviews and Implementation Group intends to:

a. Undertake a systematic review of published cost-effectiveness and cost-utility studies

b. Develop our own economic model

Whether the model is developed to estimate cost-effectiveness or to estimate cost-utility will depend on the information available to us, including that contained in the company submission(s).

c. Use the industry dossier:

- As a source of data, looking for studies that meet the inclusion criteria (RCTs/other effectiveness as well as cost effectiveness, cost utility studies and cost benefit analysis).
- To briefly compare the industry model(s) with our own model.
- To undertake an analysis of any industry models, including the strengths and weaknesses and the implications of different assumptions. The detail with which this can be undertaken will depend on the number and size of company dossiers submitted.

Any 'commercial in confidence' data taken from the company submission will be underlined in our report (followed by an indication of the relevant company name e.g. in brackets) so that the NICE secretariat can negotiate (before and during the Institute's consultation process) with industry the subsequent inclusion of such data in the HTA monograph publication or subsequent peer-review publications.

G. Project Management

a Timetable/milestones:

Submission	**Date**
Draft protocol	06 August 2002
Finalised protocol	28 August 2002
Progress report	20 November 2002
Complete, near final draft report to external reviewers and NICE Technical Lead	14 January 2003
Draft report	12 February 2003

b. Competing Interests

Adrian Bagust is a Senior Research Fellow with the York Health Economics Consortium (YHEC), University of York. YHEC services have been commissioned to prepare the Industry Submission for this review on behalf of Guidant Corporation. Adrian Bagust has not and will not contribute or be party to information contained in the work undertaken at YHEC.

Ameet Bakhai is of the Royal Brompton Hospital currently visiting Harvard Clinical Research Institute, Boston, USA as a Senior Cardiology Research Fellow. Ameet Bakhai has worked on projects involving Bristol Myers Squibb and Merck & Co. USA. Through his appointment with the Institute, he is a member of an academic department which is involved in collaborations with Boston Scientific and Guidant Corporation.

Alan Haycox is a Senior Lecturer in Health Economics, University of Liverpool. Alan Haycox has held a grant awarded by Medtronic, Inc. and holds a grant from Janssen Pharmaceutica Products, L.P. (Johnson & Johnson) – for work in unrelated areas.

No further relevant competing interests exist for members of the Review Team.

c. External reviewers

The Technology Assessment Report will be subject to external peer review by at least two experts. These reviewers will be chosen according to academic seniority and content expertise and will be agreed with NCCHTA. We recognise that methodological review will be undertaken by the NICE secretariat and Appraisal Committee, but if the TAR encounters particularly challenging methodological issues we will organise independent methodological reviews. External expert reviewers will see a complete and near final draft of the TAR and will understand that their role is part of external quality assurance. All reviewers are required to sign a copy of the NICE Confidentiality Acknowledgement and Undertaking. We will send external reviewers' signed copies to NCCHTA. Comments from external reviewers and the Technical lead, together with our responses to these will be made available to NCCHTA in strict confidence for editorial review and approval.

d. Review Advisory Panel

The Group will recruit an Advisory Panel of experts to support the development of the review. Panel members may advise on specific sections of the review: clinical, healthcare policy, health economics, statistics and review methodology.

H. Appendices

I Details of MEDLINE and EMBASE search strategies

a. MEDLINE Search Strategy

1. randomized controlled trial.pt.
2. randomized controlled trials.sh.
3. random allocation.sh.
4. double blind method.sh.
5. single blind method.sh.
6. clinical trial.pt.
7. clinical trials.sh.
8. controlled clinical trials.sh.
9. (clin$ adj25 trial$).ti,ab.
10. ((singl$ or doubl$ or trial$) adj25 (blind$ or mask$)).ti,ab.
11. random$.ti,ab.
12. research design.sh.
13. exp Evaluation Studies/
14. follow up studies.sh.
15. prospective studies.sh.
16. (control$ or prospective$ or volunteer$).ti,ab.
17. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16
18. animal.sh.
19. human.sh.
20. 18 not (18 and 19)
21. 17 not 20
22. exp STENTS/ or stent$.mp.
23. exp Coronary Disease/ or exp Myocardial Infarction/ or exp Coronary Artery Bypass/ or exp Coronary Arteriosclerosis/ or exp Coronary Vessels/ or exp Coronary Circulation/ or exp Angina Pectoris/ or exp Angioplasty, Transluminal, Percutaneous Coronary/ or exp Electrocardiography/ or exp Risk Factors/
24. 21 and 22 and 23
25. limit 24 to (english language)

b. EMBASE Search Strategy

1. exp randomized controlled trial/
2. exp controlled study/
3. randomized controlled trial$.tw.
4. exp randomization/
5. exp double blind procedure/
6. exp single blind procedure/
7. 1 or 2 or 3 or 4 or 5 or 6
8. exp stent/ or 'stents'.mp.
9. exp coronary artery dilatation/ or exp coronary blood vessel/ or exp coronary artery disease/ or exp coronary vein/ or exp coronary care unit/ or exp coronary artery fistula/ or exp coronary vessel malformation/ or exp coronary hemodynamics/ or exp coronary artery ligation/ or exp left anterior descending coronary artery/ or exp coronary reperfusion/ or exp coronary artery obstruction/ or exp left coronary artery/ or exp coronary risk/ or exp coronary artery pressure/ or exp right coronary artery/ or exp coronary sinus/ or exp coronary artery recanalization/ or exp transluminal coronary angioplasty/ or exp coronary sinus blood flow/ or exp coronary artery spasm/ or exp coronary stent/ or exp coronary artery surgery/ or exp coronary vascular resistance/ or exp coronary artery thrombosis/ or exp coronary vasodilating agent/ or exp coronary artery/ or exp coronary artery aneursym/ or exp coronary artery anomaly/ or exp coronary artery atherosclerosis/ or exp coronary artery blood flow// or exp coronary artery bypass graft/ or exp coronary artery bypass surgery/ or exp coronary artery circumflex branch/ or exp coronary artery collateral circulation/ or exp coronary artery constriction/
10. 7 and 8 and 9
11. limit 10 to (human and english language)

II Details of data extraction

Clinical effectiveness data to be extracted will include, but not be limited to:

Study Details

- Study bibliographic data
- Type of report (abstract, full manuscript, interim report)
- Type of study
- Methodological details of study
- Concomitant drug therapy (e.g. anticoagulant, antiplatelet therapies)

Participants

- Age
- Sex
- Level of disease (single versus multi vessel; lesion type; length, diameter and location of lesion)
- Co-morbidity (e.g. diabetes, previous AMI)
- Number recruited or accrued
- Length of follow-up
- Type of follow-up (angiographic and clinical or clinical only)

Results (data for all outcomes specified will be extracted as available)

- Mortality (short term and long term)
- Combined event rate or event free survival
- AMI
- TVR
- CABG
- Repeat treatment (PTCA, stent or CABG)
- Binary Restenosis Rate
- Quality of life
- Major adverse events

III Details of quality assessment

a. **Studies of clinical effectiveness** will be assessed using the following criteria, based on CRD Report No. 4(3)

- Was the method used to assign participants to the treatment groups really random? *(Computer generated random numbers and random number tables will be accepted as adequate, whilst inadequate approaches will include the use of alternation, case record numbers, birth dates or days of the week)*
- Was the allocation of treatment concealed? *(Concealment will be deemed adequate where randomisation is centralised or pharmacy-controlled, or where the following are used: serially numbered containers, on-site computer-based systems where assignment is unreadable until after allocation, other methods with robust methods to prevent foreknowledge of the allocation sequence to clinicians and patients. Inadequate approaches will include: the use of alternation, case record numbers, days of the week, open random number lists and serially numbered envelopes even if opaque)*
- Was the number of participants who were randomised stated?
- Were details of baseline comparability presented in terms of treatment free interval, disease bulk, number of previous regimens, age, histology and performance status?
- Was baseline comparability achieved for treatment free interval, disease bulk, number of previous regimens, age, histology and performance status?
- Were the eligibility criteria for study entry specified?
- Were any co-interventions identified that may influence the outcomes for each group?
- Were the outcome assessors blinded to the treatment allocation?
- Were the individuals who were administered the intervention blinded to the treatment allocation?
- Were the participants who received the intervention blinded to the treatment allocation?
- Was the success of the blinding procedure assessed?
- Were at least 80% of the participants originally included in the randomisation process, followed up in the final analysis?
- Were the reasons for any withdrawals stated?
- Was an intention to treat analysis included?

Items will be graded in terms of ✔ **yes** (item adequately addressed), ✖ **no** (item not adequately addressed), ✔/✖ *partially* (item partially addressed), **?** **unclear** or not enough information, **NA** not applicable or **NS** not stated.

b. **Studies of cost effectiveness** will be assessed using the following criteria, which is an updated version of the checklist developed by Drummond(4)

- Study question
- Selection of alternatives
- Form of evaluation
- Effectiveness data
- Costs
- Benefit measurement and valuation
- Decision modelling
- Discounting
- Allowance for uncertainty
- Presentation of results

All items will be graded as either ✔ **yes** (item adequately addressed), ✖ no (item not adequately addressed), **?** **unclear** or not enough information, **NA** not applicable or **NS** not stated.

V. Background

Coronary Heart Disease (CHD) is a major cause of morbidity and mortality in the UK accounting for more than 125,000 deaths per year.(6) The disease process results in a narrowing of the blood vessels that supply the heart muscle.

Although rates of coronary heart disease have been decreasing over the past three decades, this has not been consistent across age groups, gender or socio-economic class. A more rapid reduction has been seen in younger age groups (45-54 years), in men and in higher socio-economic groups. In addition, the rate of decline in the UK has been slower than that in other developed countries (e.g. Denmark, Norway, Australia).

Manifestation of symptoms may be acute or chronic. Acute Coronary Syndrome (ACS) is an operational term that includes Acute Myocardial Infarction (ST segment elevation and depression, Q wave and non-Q wave) and unstable angina.(7)

Evolution of technologies
Treatment of CHD has included rapid progress over the past 30 years. Treatment of acute coronary syndrome may include use of thrombolytic agents.(8) Follow-up medical management may include the use of anti-platelet agents, anticoagulants, beta-blockers, etc.(7, 9)

The development of surgical treatment such as Coronary Artery Bypass Grafting (CABG) began in the late 1960s. Improved surgical techniques and intra and post-operative management have been shown to be effective in the treatment of sub-groups of patients (e.g. patients with severe angina, multiple vessel disease, etc).(7)

Research in the late 1970s focused on the development of less invasive treatments. The first Percutaneous Transluminal Coronary Angioplasty (PTCA) was performed in Switzerland in 1977.(10) Rapid dissemination and refinement of techniques meant that by the mid 1980s use of PTCA was common.

Adjunct techniques evolved as a part of what has come to be classified as Percutaneous Coronary Interventions (PCI). The term PCI may be used to include balloon angioplasty, artherectomy, stenting, etc.(11) In addition, the indications for PCI have evolved and whereas originally only used in elective cases, treatment is now being provided to individuals with ACS.

Coronary artery stents
Change in the use of stents has been rapid and as noted by the American College of Cardiology in 1998,(11)
"The rapid evolution of stent design, deployment approaches, and adjunctive therapy have led to changes in clinical practice patterns that precede rigidly controlled supporting scientific data."

This rate of change has made it difficult for those responsible for developing clinical guidance to ensure that their recommendations are based on both rigorous and up-to-date evidence. For example the NHS guidance issued in 1999 was based in a systematic review comparing the use of balloon angioplasty to coronary stents.(2) Although this review included 35 trials, an additional 16 trials were excluded because they were in progress and had not yet completed their patient allocations. Recently produced guidelines in the USA indicate that this field of care is changing so rapidly that their guidelines will be reviewed annually.(7) The most recent development in the use of stents has been the use of stents that elute pharmacological agents – drug-eluting stents.

Various factors influence the effectiveness of PTCA with or without stent. These include patient factors such as symptom presentation (e.g. patients with ACS versus stable angina), previous history (e.g. previous saphenous vein graft, presence of co-morbidity) and the extent of the disease process (e.g. single versus multiple vessel disease, size if target vessel, size and type of lesion)

Initial success of elective PTCA ranges between 96 to 99%.(12) Restenosis of the treated vessel is the most common problem with need for repeat procedures in approximately 20% to 50% of patients.(2) Reports indicate lower treatment success rate in patients with small arteries, long lesions, previous CABG and in patients with diabetes.(13)

Current service provision in the UK
The British Cardiovascular Intervention Society (BCIS) provide annual audit data related to the use of PCI in the UK.(14)

BCIS data from 2000 indicate that 66 centres are providing interventionalist treatment including PTCA and stents. The number of procedures has increased annually since 1991 and over 33,000 PCI procedures were reported in 2000 with reports of the use of stents in 85% of these procedures. BCIS data related to type of patients receiving treatment, whether stents were inserted under elective/suboptimal conditions and outcomes is difficult to assess as results represent only a limited number of centres (14 to 29 centres).

Provision of PCI in the UK in 2000 is reported to be 600 per million. This level of provision exceeds rates in some other European countries (e.g. Spain, Denmark, Finland and Greece) but is much lower than countries such as France, Switzerland, Belgium and Germany where the reported rates in 1998 were greater than 1200 per million.

The use of drug-eluting stents has only recently been licensed in the UK. Approval for additional designs is expected over the coming year (Communication from NICE - July 2002). The following table includes data provided by NICE regarding the drug-eluting stents that are anticipated to be included in the NICE appraisal process.

Manufacturer	Product Name	Pharmaceutical agent
Biocompatables	*DEXTRA™*	dexamethasone
Boston Scientific	*TAXUS™*	paclitaxel
Cook	*V-Flex Plus PTX™*	paclitaxel
Cordis	*CYPHER™*	sirolimus (rapamycin)
Guidant	*ACHIEVE™*	paclitaxel

Costs of stents vary and individual purchasers may negotiate costs related to volume of purchase. Current listed costs for uncoated stents are in the range of £975 while costs for the new generation drug-eluting stents are quoted to be in the region of £1500.(15)

VI References

1. National Institute for Clinical Excellence. Guidance on coronary artery stents in the treatment of ischaemic heart disease (Technology Appraisal Guidance no.4). London: National Institute for Clinical Excellence; 2000 May 2000. Report No.: Technology Appraisal Guidance no.4.
2. Meads C, Cummins C, Jolly K, Stevens A, Burls A, Hyde C. Coronary artery stents in the treatment of ischaemic heart disease: a rapid and systematic review. *Health Technology Assessment (Winchester, England)* 2000;**4**:1-153.
3. Khan K, Ter Riet G, Glanville J, Sowdon A, Kleijnen J. Undertaking systematic reviews of research on effectiveness. CRD guidance for carrying out or commissioning reviews. 2nd Edition. CRD Report 4. York: NHS Centre for Reviews and Dissemination (CRD), University of York. 2000.
4. Drummond M, Stoddart GL and Torrance GW. Methods for the economic evaluation of health care programmes. Oxford: Oxford Medical Publications; 1987.
5. National Institute for Clinical Excellence. Technical guidance for manufacturers and sponsors on making a submission to a technology appraisal. London: National Institute for Clinical Excellence; 2001.
6. British Heart Foundation. British Heart Foundation statistics database 2002. British Heart Foundation
7. ACC/AHA. ACC/AHA 2002 Guideline Update for the management of patients with unstable angina and non-ST-segment elevation myocardial infarction: American College of Cardiology and American Heart Association; 2002.
8. Boland A, Dundar Y, Bagust A, Haycox A, Hill R, Mujica Mota R, et al. Early thrombolysis for the treatment of acute myocardial infarction: a rapid and systematic review. *Health Technology Assessment* 2002 (in press).
9. ACC/AHA/ACP-ASIM. Guidelines for the management of patients with chronic stable angina: Executive summary and recommendations. *Circulation* 1999;**99**:2829-2848.
10. PTCA Organisation. Andreas R. Gruentzig (1939-1985); http://www.ptca.org/archive/bios/gruentzig.html
11. ACC Expert Consensus Panel. ACC expert consensus document on coronary Artery Stents. *JACC* 1998;**32**:1471-82.
12. ACC/AHA. ACC/AHA guidelines for percutaneous coronary intervention - executive summary. *Circulation* 2001;**103**:3019-3041.
13. Ashby DT, Dangas G, Mehran R, Leon MB. Coronary artery stenting. *Catheterization & Cardiovascular Interventions* 2002;**56**:83-102.
14. British Cardiovascular Intervention Society (BCIS). BCIS - Audit Section; http://www.bcis.org.uk/audit/index.html
15. British Cardiovascular Intervention Society (BCIS). Drug-eluting stents - but at a premium; http://www.bcis.org.uk/cgi-bin/item.cgi?id=172&d=1&h=0&f=0&dateformat=%o%20%B%20%Y: November, 2001

Document information:

Stents_Protocol_280802.doc
Last saved by rahill
Last printed 14/10/2002 14:55 Page 14 of 14