Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The use of eight different implants for hip prostheses operations. The reference implant was a Charnley implant. This was compared with "Ti-Fit implant" (Richards Tennessee, USA), "Coxa" (Thackray, UK), "CMV 3" (CMV Laboratories, UK), "Boneloc" (Polymers Reconstructive, Denmark), "Christiansen" (Francobal, France), "Wagner" (Aesculap, Germany) and all other implants.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study comprised all patients undergoing surgery for a hip implant in Norway between 1987 and 1994. No demographic details of the patient population were provided in the paper.

Setting
The setting was not specified. The economic study was carried out in Norway.

Dates to which data relate
The effectiveness data were gathered during the period 1987 to 1994. The price and resource use estimates were from 1993.

Source of effectiveness data
The data on the 5-year recurrence rate, i.e. the number of patients undergoing a second surgical procedure within 5 years, were derived from a retrospective analysis of a computerised hip register that routinely collects data on all hip implants in Norway. In addition, the authors used literature reviews to collect data on two other implants, the "Christiansen" and the "Wagner".

Link between effectiveness and cost data
The estimate of recurrence rate was derived from the retrospective study. The data from a total of 33,656 patients were recorded on a database. The resource use data were based on the Diagnosis Related Group (DRG)-cost for hip implant surgery.

Study sample
All patients undergoing hip replacement in Norway between 1987 and 1994 who were on the hip register were included:
4,970 patients were in the reference group ("Charnley" implant),
173 patients were in the "Ti-Fit" group,
153 patients were in the "Coxa" group,
1,807 patients were in the "CMV3" group,
1,250 patients were in the "Boneloc" group, and
24,027 patients used other non-specified implants.

The literature review identified 6,500 patients using the "Christiansen" implant and 2,200 patients using the "Wagner" implant. The baseline characteristics of the participants were not given.

**Study design**
The main study was a retrospective analysis of a database of data collected routinely on hip surgery. The data from the literature review were based on one study, for which no design details were provided.

**Analysis of effectiveness**
The 5-year recurrence rate for each type of hip implant was determined through the hip register.

**Effectiveness results**
The recurrence rates for the different types of hip implants were:

reference (Charnley), 2.2%;

Ti-Fit, 26.2%;

Coxa, 16.5%;

CMV3, 6.7%;

Boneloc, 7.7%;

Christiansen, 15.0%;

Wagner, 36.0%; and

all other implants, 4.5%.

**Clinical conclusions**
The Charnley implant had the lowest recurrence rates. The authors concluded that the Wagner, Christiansen, Ti-Fit and Coxa implants gave poor clinical results on account of their very high 5-year recurrence rates in comparison with the Charnley implant.

**Measure of benefits used in the economic analysis**
This was a cost-consequences analysis and, therefore, no summary measure of benefit was provided.

**Direct costs**
Only the costs of the hip implant surgery and recurrent hip implant surgery were recorded. The DRG price was used to cost hip implant surgery. It was assumed that the price for all implants was the same. The total additional costs were calculated from the observed recurrence rate and were adjusted for differences in gender, age and diagnosis. The costs were not discounted.

**Statistical analysis of costs**
No statistical analysis of costs was reported.

**Indirect Costs**
No indirect costs were recorded.

**Currency**
Norwegian Kroner (Nok).

**Sensitivity analysis**
No sensitivity analysis was reported.

**Estimated benefits used in the economic analysis**
Not applicable.

**Cost results**
The cost of a recurrence was estimated to be Nok 100,000. The additional annual costs of each implant when compared with the Charnley implant were:

- Ti-Fit, 0.8 million Nok;
- Coxa, 0.5 million Nok;
- CMV3, 1.7 million Nok;
- Boneloc, 2.7 million Nok;
- Christiansen, 16.6 million Nok;
- Wagner, 14.91 million Nok; and
- all other implants, 10.7 million Nok.

**Synthesis of costs and benefits**
Not relevant.

**Authors' conclusions**
The authors concluded that the hip register has enabled researchers to assess the quality of implants used in Norway. They commented that this study highlighted the extra costs associated with the use of inferior hip implants.

**CRD COMMENTARY - Selection of comparators**
The choice of comparators was reasonably argued. Decision-makers in other settings should judge the relevance of this
comparator in their own context, and be aware that the results of a better prosthesis might be hidden within the ‘all other’ category.

Validity of estimate of measure of effectiveness
The estimate was based on routinely recorded information, which appeared to be a complete register of all surgery undertaken to insert hip implants. The authors provided little information with which to assess the accuracy and validity of the data recorded in this register. It is also worth noting that there could be other measures of effectiveness, particularly in relation to quality of life. Without information to the contrary, it is reasonable to consider that a prosthesis might have a higher revision rate, but, during its useful lifetime, provide a better quality of life.

Validity of estimate of measure of benefit
Not applicable.

Validity of estimate of costs
DRG costs were not developed for use in economic evaluation, where ideally, long-term marginal costs of a programme should be estimated. This requires knowledge of the additional resource quantities used and the unit costs, which would be applied in a given setting. However, for practical purposes, accountancy data and reimbursement rates are frequently used to cost health care interventions in such analyses. Readers should judge whether the estimated cost of implant surgery reported in this study is relevant to their own setting. It should also be recognised that the assumption that surgery costs were the same for all prostheses could disguise a difference, which might make a prosthesis relatively less costly.

Other issues
The issue of generalisability was not addressed explicitly. However, the authors found that their results were comparable with those from a study in Sweden. The authors noted that they could have used the results of other prostheses, which have better short-term outcomes than the Charnley, as the reference. The authors’ conclusions were in keeping with the study population.

Implications of the study
The authors commented that the Ti-Fit implant and the Coxa implant have been withdrawn from the Norwegian market, partly due to the results of the study becoming known, and that the Boneloc implant has been withdrawn worldwide. They recommended that national registries should be increasingly used to monitor the quality of implants, and that the introduction of products should be based on randomised controlled studies. These recommendations should be viewed within the limitations of the study, in terms of the lack of cost information and the consequences in terms of quality of life.

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