Costing report: Erythropoiesis-stimulating agents (epoetin and darbepoetin) for treating anaemia in people with cancer receiving chemotherapy (including review of TA142) (TA323)

Published: November 2014
This costing report accompanies NICE’s technology appraisal guidance on Erythropoiesis-stimulating agents (epoetin and darbepoetin) for treating anaemia in people with cancer receiving chemotherapy (including review of TA142).

Issue date: November 2014

This report is written in the following context

This report represents the view of NICE, which was arrived at after careful consideration of the available data and through consulting with healthcare professionals. It should be read with the NICE guidance. The report is an implementation tool and focuses on the recommendations that were considered to have a significant impact on national resources.

Assumptions used in the report are based on assessment of the national average. Local practice may be different from this, and the impact should be estimated locally.

Implementation of the guidance is the responsibility of local commissioners or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties and to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity and foster good relations. Nothing in this costing tool should be interpreted in a way that would be inconsistent with compliance with those duties.

National Institute for Health and Care Excellence
Level 1A
City Tower
Piccadilly Plaza
Manchester M1 4BT

www.nice.org.uk

© National Institute for Health and Care Excellence, 2014. All rights reserved. This material may be freely reproduced for educational and not-for-profit purposes. No reproduction by or for commercial organisations, or for commercial purposes, is allowed without the express written permission of NICE.
1 Introduction

1.1 Technology appraisals cover the use of new and existing medicines and treatments within the NHS in England. Unless otherwise directed by the Department of Health, Clinical commissioning groups, NHS England and, with respect to their public health functions, local authorities should make funding available for treatments recommended by NICE within 3 months of publication of the guidance.

1.2 This report is supported by a local costing template – a spreadsheet that can be used to estimate the local cost of implementing the guidance. By varying the assumptions and feeding in data that reflect local circumstances, the local estimated cost and saving implications can be calculated using the template. This costing report illustrates the broader implications for the NHS using a standard population of 100,000 people.

1.3 The appraisal for this topic is based on contract prices which include a discount when compared with the list prices. The level of the discounts offered by each manufacturer is commercial in confidence. The costing template is calculated using the latest British National Formulary (BNF) drug list price before the application of any discounts on list prices that the NHS may have.

1.4 This topic relates to anaemia, a common adverse effect of chemotherapy. The commissioner for this topic is clinical commissioning groups. The provider for this topic is secondary and tertiary care hospital services. NHS England commissions chemotherapy services.

2 Guidance

2.1 The guidance states:
Erythropoiesis-stimulating agents (epoetin alfa, beta, theta and zeta, and darbepoetin alfa) are recommended, within their marketing authorisations, as options for treating anaemia in people with cancer who are having chemotherapy.

If different erythropoiesis-stimulating agents are equally suitable, the product with the lowest acquisition cost for the course of treatment should be used.

3 Background

3.1 Epoetin alfa, beta, theta and zeta are recombinant human erythropoietin analogues used to shorten the period of symptomatic anaemia in patients having cytotoxic chemotherapy. They are recommended for use at haemoglobin concentrations of 100 g/litre or lower, with target values of up to 120 g/litre.

3.2 Darbepoetin alfa (Aranesp, Amgen) is a hyperglycosylated derivative of epoetin that stimulates erythropoiesis by the same mechanism as the endogenous hormone. Aranesp has a UK marketing authorisation for the ‘treatment of symptomatic anaemia in adult cancer patients with non-myeloid malignancies who are receiving chemotherapy’. The summary of product characteristics recommends darbepoetin alfa is used at haemoglobin concentrations of 100 g/litre or lower, with target values up to 120 g/litre.

3.3 Erythropoiesis-stimulating agents (ESA’s) are used in addition to, rather than to completely replace existing options for managing anaemia.

3.4 The cost for a 12 week treatment period for each drug is given in table 1. All drugs are given by injection and are available in pre-filled syringes. These costs are analysed further in the costing template.
Table 1: Cost per 12 week treatment course for ESA's

<table>
<thead>
<tr>
<th>Product</th>
<th>Cost per 12 week course £</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epoetin alfa: Eprex</td>
<td>1641</td>
</tr>
<tr>
<td>Epoetin alfa: Binocrit</td>
<td>1285</td>
</tr>
<tr>
<td>Epoetin beta: NeoRecormon</td>
<td>2609</td>
</tr>
<tr>
<td>Epoetin theta: Eporatio</td>
<td>1643</td>
</tr>
<tr>
<td>Epoetin zeta: Retacrit</td>
<td>1680</td>
</tr>
<tr>
<td>Darbepoetin alfa: Aranesp</td>
<td>2489</td>
</tr>
</tbody>
</table>

3.5 Costs may vary in different settings because of negotiated procurement discounts. The costing template can be amended for local prices.

4 Assumptions made

4.1 The costing model makes the following estimates:

Activity

- Cancer incidence (excluding non-melanoma skin cancers and myeloid malignancies) is 0.62% (Cancer research UK 2014).

Solid tumours

- Around 90% of people have a solid tumour (Cancer research UK 2014)
- The percentage of people with solid tumours who are treated with chemotherapy is 46% (National Cancer Intelligence Network 2014)
- Around 60% of people who have a solid tumour will develop anaemia (per FAD and PenTag report 2013).

Haematological cancer
• Around 10% of people have a haematological cancer (Cancer research UK 2014).

• The percentage of people with haematological cancers who are treated with chemotherapy is 75% (National Cancer Intelligence Network 2014).

• Around 70% of people with haematological cancers will develop anaemia as a result of chemotherapy (per FAD and PenTag report 2013).

Current and future practice

• Current practice assumes an estimated 20% of people who have chemotherapy will have a red blood cell transfusion (Mercante S 2000), around 1% have ESA’s (NICE costing statement TA142 updated) and, in the remaining 79%, the disease can be managed with either chemotherapy dose adjustment or iron supplements.

• Future practice assumes that 50% of people who develop anaemia will have a haemoglobin level of less than 100 g per litre and would have treatment with ESA’s.

• ESA’s are assumed to be used within their marketing authorisations.

• ESA’s reduce the number of blood transfusions needed by 37% (Final appraisal determination section 4.1.9).

• ESA’s reduce the number of units of blood transfused by 0.87 (Final appraisal determination section 4.1.10).

Costs

• Unit costs are set out in the attached costing model.

5 Costing summary

5.1 Table 2 sets out the cost of implementation for a population of 100,000 in England using the NICE assumptions set out in section 4.
Table 2 Cost of implementation for a population of 100,000 using NICE assumptions

<table>
<thead>
<tr>
<th></th>
<th>Current costs £'000s</th>
<th>Future costs £'000s</th>
<th>Change £'000s</th>
</tr>
</thead>
<tbody>
<tr>
<td>People having a blood transfusion</td>
<td>72</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>People having ESA’s</td>
<td>2</td>
<td>151</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>74</td>
<td>223</td>
<td>149</td>
</tr>
<tr>
<td>Potential savings – transfusion events avoided</td>
<td></td>
<td>-17</td>
<td>-17</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>206</td>
<td>132</td>
</tr>
</tbody>
</table>

5.2 Based on the assumptions in section 4, the annual cost associated with implementing this recommendation is estimated as £132,000 for a population of 100,000.

6 Other considerations

6.1 The cost of adverse events associated with ESA’s was not substantially different to the cost of adverse events in people who did not have ESA’s.

6.2 The decision to use ESA’s is based on individual cases. For cancers which are metastatic most clinicians may consider ESA’s over dose-reducing chemotherapy, for cancers where chemotherapy is adjuvant or curative other options may be considered. This needs to be taken into account when estimating future uptake of ESA’s.

7 Sensitivity Analysis

7.1 The full sensitivity analysis can be found in Appendix B of this report. The variables to which the model is most sensitive are:
7.2 Percentage of people with a solid tumour – sensitivity ratio 1 (most sensitive)

This is one of the main drivers for activity; therefore a change to the baseline value of plus or minus 5% produces a change in cost per 100,000 of around £63,000.

7.3 Cancer incidence – sensitivity ratio 0.23 (joint second most sensitive)

This assumption is sensitive because it relates to the whole population, varying the baseline estimate by plus or minus 0.12% produces a change in cost per 100,000 of around £51,000.

7.4 Estimated percentage of people who need treatment with ESA’s – sensitivity ratio 0.23 (joint second most sensitive)

Varying the proportion of people who need treatment with ESA’s by plus or minus 10% results in a change in cost of around £53,000. This is because this estimate affects the number of people who may receive treatment with ESA’s in the future.

8 Benefits

8.1 The following benefits are anticipated:

- ESA’s may reduce the use of blood transfusions and the number of units of blood transfused. Potential savings are around £17,000 per 100,000 population.
- NHS benefits of avoiding blood transfusions include: avoiding the problems related to limited supply of blood, and reduced hospital attendances for blood transfusions, which releases hospital resources to meet other demands.
- Benefits for the person include: avoiding problems such as iron overload, immune injury, and viral and bacterial infections.
• ESA’s in combination with intravenous iron may be considered for people who cannot be given blood transfusions and who have profound cancer treatment-related anaemia.

• It is possible for people to self-administer ESA’s at home, which is more convenient and avoids the need for a hospital attendance.

• ESA treatment is an option for correcting anaemia and reduces the need for blood transfusions, which is highly valued by people who have had chemotherapy.

• The Appraisal Committee concluded that ESA treatment improves health-related quality of life compared with treatment without ESA’s.

9 Impact of guidance for commissioners and providers

9.1 The commissioner for this topic is clinical commissioning groups. This topic falls within programme budgeting category 20A ‘Adverse effects and poisoning – Unintended consequences of treatment’. The annual cost to the commissioner is estimated to be £132,000 per 100,000 population (before any procurement discounts). There may be savings for providers of blood transfusion services that relate to capacity released for other work because of a reduced number of transfusions needed and cost savings in the number of units of blood needed for transfusions. These are estimated to total £17,000 per 100,000 population.

10 Conclusion

10.1 Based on the standard assumptions in the costing model the annual cost associated with implementing this recommendation is estimated as £132,000 for a population of 100,000.
Appendix A. References

Cancer research UK (January 2014) UK cancer incidence by country.


National cancer intelligence network (March 2014) Cancer intelligence unit - Top Chemotherapy Regimens by Diagnostic Group report - Table: Patients by Diagnostic Group.

National Institute for Health and Care Excellence (2014) Final appraisal determination (FAD): Erythropoiesis-stimulating agents (epoetin and darbepoetin) for treating anaemia in people with cancer receiving chemotherapy (including review of TA142)

Peninsula Technology Assessment Group (PenTAG) University of Exeter Medical School (2013) report on the effectiveness and cost effectiveness of ESA’s.
Erythropoiesis-stimulating agents for cancer-treatment induced anaemia

Sensitivity analysis - Population of 100,000

The table below shows the sensitivity of the total cost of implementation to changes in each variable individually. If there are 2 variables that make up 100% between them, they have been varied together to ensure the model remains realistic.

The sensitivity ratio allows comparison of the variables by analysing the percentage changes in the variables and associated cost. The closer the ratio is to 1, the more sensitive the overall cost is to fluctuations in the variable.

### Table 1. Individual variable sensitivity

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline value</th>
<th>Minimum value</th>
<th>Maximum value</th>
<th>Baseline costs (£000's)</th>
<th>Minimum costs (£000's)</th>
<th>Maximum costs (£000's)</th>
<th>Change (£000's)</th>
<th>Sensitivity ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer incidence (excluding non melanoma skin cancers and myeloid malignancies)</td>
<td>0.62%</td>
<td>0.50%</td>
<td>0.74%</td>
<td>131,937</td>
<td>106,986</td>
<td>158,339</td>
<td>51,353</td>
<td>0.23</td>
</tr>
<tr>
<td>Percentage of people with a solid tumour</td>
<td>90%</td>
<td>85%</td>
<td>95%</td>
<td>131,937</td>
<td>137,462</td>
<td>200,287</td>
<td>62,825</td>
<td>1.00</td>
</tr>
<tr>
<td>Percentage of people with a haematological cancer</td>
<td>10%</td>
<td>5%</td>
<td>15%</td>
<td>131,937</td>
<td>200,287</td>
<td>137,462</td>
<td>-62,825</td>
<td>0.11</td>
</tr>
<tr>
<td>Proportion of people treated with chemotherapy (solid tumours)</td>
<td>46.0%</td>
<td>36.0%</td>
<td>56.0%</td>
<td>131,937</td>
<td>108,232</td>
<td>155,642</td>
<td>47,410</td>
<td>0.19</td>
</tr>
<tr>
<td>Proportion of people treated with chemotherapy (haematological)</td>
<td>75.4%</td>
<td>65.4%</td>
<td>85.4%</td>
<td>131,937</td>
<td>128,902</td>
<td>134,972</td>
<td>6,070</td>
<td>0.04</td>
</tr>
<tr>
<td>Percentage of people who have solid tumours who develop anaemia</td>
<td>60.0%</td>
<td>50.0%</td>
<td>70.0%</td>
<td>131,937</td>
<td>113,763</td>
<td>150,111</td>
<td>36,348</td>
<td>0.19</td>
</tr>
<tr>
<td>Percentage of people who have haematological cancers who develop anaemia</td>
<td>70.0%</td>
<td>60.0%</td>
<td>80.0%</td>
<td>131,937</td>
<td>128,666</td>
<td>135,207</td>
<td>6,541</td>
<td>0.04</td>
</tr>
<tr>
<td>Percentage of people who need a red blood cell transfusion</td>
<td>20.0%</td>
<td>15.0%</td>
<td>25.0%</td>
<td>131,937</td>
<td>131,937</td>
<td>131,937</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Percentage of people who are currently treated with erythropoiesis stimulating agents (TA142)</td>
<td>0.4%</td>
<td>0.3%</td>
<td>0.5%</td>
<td>131,937</td>
<td>131,937</td>
<td>131,937</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Estimated percentage of people who need treatment with ESA's</td>
<td>50.0%</td>
<td>40.0%</td>
<td>60.0%</td>
<td>131,937</td>
<td>105,549</td>
<td>155,324</td>
<td>52,775</td>
<td>0.23</td>
</tr>
<tr>
<td>Percentage of people who take up epoetin alfa - Eprex</td>
<td>16.7%</td>
<td>16.7%</td>
<td>19.8%</td>
<td>131,937</td>
<td>131,937</td>
<td>131,937</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Percentage of people who take up epoetin alfa - Binocrit</td>
<td>16.7%</td>
<td>4.8%</td>
<td>16.7%</td>
<td>131,937</td>
<td>120,814</td>
<td>131,937</td>
<td>11,123</td>
<td>0.03</td>
</tr>
<tr>
<td>Percentage of people who take up epoetin beta</td>
<td>16.7%</td>
<td>10.9%</td>
<td>16.7%</td>
<td>131,937</td>
<td>120,957</td>
<td>131,937</td>
<td>10,980</td>
<td>0.06</td>
</tr>
<tr>
<td>Percentage of people who take up epoetin theta</td>
<td>16.7%</td>
<td>0.0%</td>
<td>16.7%</td>
<td>131,937</td>
<td>111,974</td>
<td>131,937</td>
<td>19,963</td>
<td>0.04</td>
</tr>
<tr>
<td>Percentage of people who take up epoetin zeta</td>
<td>16.7%</td>
<td>0.4%</td>
<td>16.7%</td>
<td>131,937</td>
<td>112,621</td>
<td>131,937</td>
<td>19,316</td>
<td>0.03</td>
</tr>
<tr>
<td>Percentage of people who take up darbepoetin alfa</td>
<td>16.7%</td>
<td>16.7%</td>
<td>64.1%</td>
<td>131,937</td>
<td>131,937</td>
<td>162,399</td>
<td>30,462</td>
<td>0.02</td>
</tr>
</tbody>
</table>