An economic evaluation of peripheral blood stem cell transplantation as an alternative to autologous bone marrow transplantation in multiple myeloma

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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
Methods of therapy of multiple myeloma: autologous bone marrow transplant (ABMT) and peripheral blood stem cell transplants (PBSCT).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients with multiple myeloma. No further details were given.

Setting
Hospital. The economic study was performed at the Royal Marsden Hospital in Sutton, Surrey, UK.

Dates to which data relate
The data for the effectiveness analysis were collected from patients treated between July 1988 and January 1995. The years during which the data on the resources used and costs were collected were not reported. No price year was given.

Source of effectiveness data
The estimate for final outcomes was derived from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same patient sample.

Study sample
The sample was selected from patients treated at the hospital between July 1988 and January 1995. The control group (ABMT) included 14 patients and the intervention group (PBSCT) 37. The intervention group was also divided into two subgroups of patients (15 and 22) with different treatment regimens. The control and the intervention groups were comparable in terms of demographic and disease-related characteristics. No power calculation was used to determine the sample size.

Study design
The study was designed as a case-control study. The control group (ABMT) was derived from 42 patients who were randomised to receive interferon-alpha in a prospective study of maintenance therapy with interferon-alpha after high dose chemotherapy. 14 patients with all drug charts available for review, no previous therapy, transplant at the hospital, 200 mg/m²? melphalan as conditioning and no growth factors post-transplant were included in the study. The intervention group (PBSCT) was composed of 37 patients. 15 patients met the above criteria and were the first to be treated with ABMT from November 1992. A further 22 consecutive patients, some of them with a previous treatment, were included between June 1994 and January 1995. The intervention group was divided into two subgroups with different regimens (A and B). All the patients received 125 microg/m²? twice a day for 7 days and four stem cell harvest on day 5 and 8 (regimen A). After the 8th day of treatment the last 22 patients had their regimen changed and received filgrastim at a dose of 12-16 microg./kg once daily for 4 days with harvests being performed on days 4 and 5 (regimen B). Patients were followed up until their discharge from the hospital.

Analysis of effectiveness
The analysis of the clinical study was based on treatment completers. The primary health outcomes used in the analysis were: days in hospital post-transplant, days on intravenous antibiotics, days to neutrophils >0.5x10⁹/l, days to neutrophils >1.0x10⁹/l, days to platelets >20x10⁹/l, days to platelets >50x10⁹/l, and blood and platelet requirements during hospitalisation.

Effectiveness results
The median number of days in hospital post-transplant was 27.5 (range: 21 - 42) and 19 (range: 15 - 28) in the ABMT and the PBSCT groups respectively, (p<0.0001). The median number of days on intravenous antibiotics was 19 (range: 13 - 37) and 12 (range: 4 -20) in the ABMT and the PBSCT groups respectively, (p<0.0001). The median days to neutrophils >0.5x10⁹/l and >1.0x10⁹/l were 22 (range: 13 - 43) and 26 (range: 22 - 86) in the ABMT group and 16 (range: 12 - 50) and 14 (range: 0 - 28) in the PBSCT group, with p-values <0.0001 and 0.0005 respectively. The median days to platelets >20x10⁹/l and >50x10⁹/l were 24.5 (range: 16 - 43) and 27 (range: 17 - 46) in the ABMT group and 14 (range: 0 - 28) and 19 (range: 11 - 96) in the PBSCT group, with p-values <0.0001 and 0.0019 respectively.

The median units of platelets required were 31.5 (range: 12-171) and 12 (range: 0-80) in the ABMT and the PBSCT groups respectively, (p=0.0005). Finally, the median units of packed cells required were 3 (range: 0-14) and 4 (range: 0-6) in the ABMT and the PBSCT groups respectively (p=0.91). In the PBSCT group the median platelet recovery (days to platelets >50x10⁹/l) with regimen A was 17 days whereas with regimen B it was 20.5 days (P=0.06).

Clinical conclusions
Patients in the PBSCT group showed a faster engraftment and less supportive care requirements than patients in the ABMT group. No significant differences were observed between the two regimens in the PBSCT group in terms of the clinical outcomes.

Measure of benefits used in the economic analysis
No summary benefit measure was developed. The outcomes used in the analysis were: days in hospital post-transplant, days on intravenous antibiotics, days to neutrophils >0.5x10⁹/l, days to neutrophils >1.0x10⁹/l, days to platelets >20x10⁹/l, days to platelets >50x10⁹/l, and blood and platelet requirements during hospitalisation.

Direct costs
The costs were measured from a hospital perspective and were not discounted since the follow up period was less than one year. Costs and quantities were not reported separately. The costs included in the analysis were hospitalisation, intravenous antibiotics, other drugs, blood products, growth factors, laboratory investigations, and harvesting procedures. The cost of hospitalisation was calculated from the day of the transplant to the day of discharge. The cost of drugs was obtained from the pharmacy computer system at the hospital. The other costs were obtained from the hospital finance department. The price dates were not reported.
Statistical analysis of costs
Costs were not treated in stochastically. 95% confidence intervals and P-values were calculated.

Indirect Costs
Not included in the analysis.

Currency
UK pounds sterling ()

Sensitivity analysis
A one-way simple sensitivity analysis was performed by varying the treatment costs. The cost of hospitalisation and the cost of stem cell harvest were varied by + and - 20%. The cost of antibiotics was varied by using the BNF prices. Despite the modification of these individual costs, the overall cost difference between the intervention and the control group remained statistically significant.

Estimated benefits used in the economic analysis
The median number of days in hospital post-transplant was 27.5 (range: 21 - 42) and 19 (range: 15 - 28) in the ABMT and the PBSCT groups respectively, (p<0.0001). The median number of days on intravenous antibiotics was 19 (range: 13 - 37) and 12 (range: 4 - 20) in the ABMT and the PBSCT groups respectively, (p<0.0001). The median days to neutrophils >0.5x10^9/l and >1.0x10^9/l were 22 (range: 13 - 43) and 26 (range: 22 - 86) in the ABMT group and 16 (range: 12 - 50) and 14 (range: 0 - 28) in the PBSCT group, with p-values <0.0001 and 0.0005 respectively. The median days to platelets >20x10^9/l and >50x10^9/l were 24.5 (range: 16 - 43) and 27 (range: 17 - 46) in the ABMT group and 14 (range: 0 - 28) and 19 (range: 11 - 96) in the PBSCT group, with p-values <0.0001 and 0.0019 respectively.

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Cost results
The median total cost was 11,026 (range: 8,023 - 21,535) in the ABMT group and 7,995 (range: 5,756 - 11,443) in the PBSCT group, (P=0.0001).

Synthesis of costs and benefits
Costs and benefits were not combined. In all outcomes which demonstrated statistical differences between the ABMT group and the PBSCT group, PBSCT was shown to be dominant. As the total costs for the PBSCT were also lower, the PBSCT can be considered as the dominant strategy.

Authors' conclusions
Patients undergoing PBSCT had a faster recovery than those receiving ABMT. This reduced the need for platelet transfusions, intravenous antibiotics and hospitalisation and resulted in a significantly lower cost.

CRD COMMENTARY - Selection of comparators
The comparator was an established therapeutic option in younger patients with multiple myeloma, however it is not clear if it was the most frequently used traditional technique in the treatment of malignant diseases.
Validity of estimate of measure of benefit
The authors did not calculate a summary measure of benefits and assumed that the benefits were the same in the two alternatives since the clinical outcomes in the ABMT group were dominated by the outcomes in the PBSCT group. Since patients were not randomly allocated to the two groups, this could imply some bias in the measure of the clinical outcomes and hence in the estimate of the benefits.

Validity of estimate of costs
Costs were considered from a hospital perspective only. Since the type of disease treated clearly affects patients’ quality of life, a patient perspective would perhaps have provided a better answer to the study question. The dates of the costs were not stated.

Other issues
The authors’ claim that a cost-minimisation analysis was conducted is not accurate from a theoretical point of view as the outcomes were not identical, and were in fact shown to be statistically different in the two groups. Hence the analysis should be correctly defined as a cost and outcomes analysis. The generalisability of findings to the whole population of patients with multiple myeloma is likely to be undermined by the fact that the study population included patients treated in one hospital only and the allocation has not been randomised.

Implications of the study
If the findings are confirmed by a double-blinded randomised study, treatment with PBSCT should be preferred to treatment with ABMT in patients with multiple myeloma.

Source of funding
Supported by funding from Amgen Ltd, Cambridge, UK.

Bibliographic details

PubMedID
8971391

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Anti-Bacterial Agents /economics /therapeutic use; Antineoplastic Combined Chemotherapy Protocols /administration & dosage /adverse effects /economics /therapeutic use; Bone Marrow Diseases /chemically induced /therapy; Bone Marrow Transplantation /economics; Convalescence; Drug Utilization; Female; Filgrastim; Granulocyte Colony-Stimulating Factor /economics /pharmacology; Hematopoiesis /drug effects; Hematopoietic Stem Cell Transplantation /economics; Hospital Costs; Humans; Length of Stay; Leukapheresis /economics; Male; Middle Aged; Multiple Myeloma /drug therapy /economics /therapy; Parenteral Nutrition, Total /economics; Platelet Transfusion /economics /utilization; Recombinant Proteins; Time Factors

AccessionNumber
21997006621

Date bibliographic record published
31/05/1999
Date abstract record published
31/05/1999