Carboxymaltose in the Treatment of Chemotherapy-Induced Anemia: An Effectiveness and Cost-Minimization Analysis

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Faculty Disclosure

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Yes, please specify:
INTRODUCTION

• Anemia is highly prevalent in cancer patients ⇒ 30-90%\(^1,2\)
• Iron deficiency is also highly prevalent in cancer patients ⇒ 32-60%\(^3,4\)
  – Absolute ⇒ depletion of reserves
  – Functional ⇒ sequestration of reserves
  – Reduction of iron availability\(^5\)
• Treatment of chemotherapy-induced anaemia (CIA):
  Red blood cells (RBC) and/or iron ± erythropoiesis-stimulating agents (ESA)\(^1\)
  – ESA and blood transfusion: may increase mortality\(^6\)
  – Intravenous (IV) iron can improve Hb levels and reduce RBC requirements\(^7\)
  – 2 formulations of IV iron: iron sucrose and ferric carboxymaltose (FCM)\(^7\)
• Administration of a big dose of iron in a single infusion
• Similar efficacy and lower economic impact
• However, it has not been prospectively evaluated

\(^1\) Appro M(2018); Esmo Guidelines. \(^2\) Macciò A(2014); Haematologica. \(^3\) Naoum FA(2016); Rev Bras Hematol Hemote. \(^4\) De Castro J(2014); Clin Transl Oncol. \(^5\) Lebrun F(2017); Support Care Cancer. \(^6\) Schrijvers D(2010); ESMO Guidelines. \(^7\) Steinmetz(2013);
OBJECTIVES

• To assess the effectiveness of FCM in the treatment of iron-deficient CIA in patients diagnosed with solid tumours
• To evaluate the economic impact of FCM protocol

METHODS

PROSPECTIVE FCM ARM
1/1/2015 - 31/12/2016

Initial Hb (iHb)
Control Hb (cHb)
Red blood cell units
Costs of CIA treatment

RETROSPECTIVE CONTROL ARM
1/1/2013 - 31/12/2014

Red blood cell units
Costs of CIA treatment

Hematopoietic response

Transfusional rate

Cost-minimization analysis

aPositive haemoglobin variation 4 weeks after the FCM treatment; bTransfusional rate: number of red blood cell units per chemotherapy treatment
METHODS

Medical Oncology Department

PROSPECTIVE FCM ARM
1/1/2015 - 31/12/2016

Hb ≤ 10 g/dL

Order:
• Ferritin
• Transferrin saturation (TSAT)
• B12 vitamin
• Folic acid

Ferritin<800ng/mL and TSAT<50%

FCM

Weight 35 – 70 Kg
1000 mg + 500 mg with ≥ 1 interval week

Weight > 70 Kg
1000 mg + 1000 mg with ≥ 1 interval week

Ferritin and TSAT 3 to 4 weeks after
**RESULTS**

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**PROSPECTIVE FCM ARM**

1/1/2015 - 31/12/2016

N=99

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**Baseline and post-treatment Hb levels.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Ferric Carboxymaltose group</th>
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<tbody>
<tr>
<td>Baseline Hb (g/dL)</td>
<td>Carboxymaltose group</td>
</tr>
<tr>
<td>Mean, SD&lt;sup&gt;a&lt;/sup&gt;</td>
<td>9.2 ± 0.8</td>
</tr>
<tr>
<td>Min-Max&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.7 – 10.8</td>
</tr>
<tr>
<td>Post-treatment Hb&lt;sup&gt;b&lt;/sup&gt; (g/dL)</td>
<td></td>
</tr>
<tr>
<td>Mean, SD&lt;sup&gt;a&lt;/sup&gt;</td>
<td>10.6 ± 1.3</td>
</tr>
<tr>
<td>Min-Max&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.8 – 14.2</td>
</tr>
</tbody>
</table>

<sup>a</sup> Abbreviations: SD – standard deviation; Min – Minimum; Max – Maximum

<sup>b</sup> Hb value at follow-up visit during week 4.

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Hematopoietic response: 84 (84.8%)

Response ≥ 2g/dL: 23 (23.2%)
## RESULTS

**PROSPECTIVE FCM ARM**  
1/1/2015 - 31/12/2016  

**RETROSPECTIVE ARM**  
1/1/2013 - 31/12/2014

### Transfusions and FCM infusions

<table>
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<tr>
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<tbody>
<tr>
<td>Patients (n)</td>
<td>1732</td>
<td>1811</td>
</tr>
<tr>
<td>ChT(^a) cycles</td>
<td>12322</td>
<td>13221</td>
</tr>
<tr>
<td>Number of transfusions</td>
<td>194</td>
<td>189</td>
</tr>
<tr>
<td>RBC(^a) units</td>
<td>657</td>
<td>517</td>
</tr>
<tr>
<td>Patients treated with FCM</td>
<td>0</td>
<td>99</td>
</tr>
<tr>
<td>Total FCM vials</td>
<td>0</td>
<td>319</td>
</tr>
<tr>
<td>Transfusion per patient (%)</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Transfusional rate(^b) (%)</td>
<td>5.3</td>
<td>3.9</td>
</tr>
</tbody>
</table>

\(^a\)Abbreviations: ChT – Chemotherapy; RBC – red blood cell; FCM – ferric carboxymaltose.  
\(^b\)Number of RBC units per chemotherapy session.

RR 0.84  
(95% CI 0.74-0.94)
Global treatment costs (red blood cell transfusions + FCM treatment) and cost-effectiveness of FCM treatment (per patient and chemotherapy cycle).

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<tr>
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<th>Control group</th>
<th>Ferric Carboxymaltose group</th>
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<tbody>
<tr>
<td>Transfusions</td>
<td>126 144,00 €</td>
<td>99 264,00 €</td>
</tr>
<tr>
<td>Ferric Carboxymaltose</td>
<td>-</td>
<td>32 562,40 €</td>
</tr>
<tr>
<td>Total costs</td>
<td>126 144,00 €</td>
<td>131 826,40 €</td>
</tr>
<tr>
<td>Total cost per patient</td>
<td>72.83 €</td>
<td>72.79 €</td>
</tr>
<tr>
<td>Total cost per ChT cycle</td>
<td>10.24 €</td>
<td>9.97 €</td>
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Incremental cost per patient: -

Incremental cost per ChT cycle: -0.04€

-0.27€

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^Unitary cost of transfusion (administration+ RBC unit) = 192€.

^Unitary cost of FCM treatment (administration + vial) = 121.20€.

^Costs were calculated considering the total number of patients and chemotherapy cycles described in table 2.
CONCLUSIONS

• We showed prospectively that the FCM treatment was effective in 85% cancer patients with CIA of grade ≥2 and iron deficiency.
• Our results showed a significant reduction in the percentage of cancer treatments that needed RBC support in the FCM arm.
• The cost minimization analysis was favorable: direct cost saving was achieved in the FCM treatment group, which can be explained by the reduced need for transfusions.
• As far the indirect costs:
  – Health care perspective: savings in time booked at ambulatory clinic and in number of RBC units
  – Patient’s perspective: less hospital visits and work absences, cost savings with transportations, among others.
Thank you for the attention