Difference between inpatient DRG payment and estimated costs in Portuguese NHS Hospitals

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Introduction
Portugal began the gradual implementation of a prospective payment system using DRGs in 1989 and 6 grouper updates were adopted until the present date. For a given hospital it is expected that the DRG cost weight equals the expected cost of inlier LOS for that DRG. One of the main advantages of using casemix adjustment is that discrimination can be introduced in specific DRGs in order to value them differently than the expected cost.

It seems to be consensual that costs should be determined at patient level, thus requiring a direct costing approach. The difficulty on obtaining this level of cost detail moved away its implementation in several countries including Portugal. Indirect costing approach using a step-down methodology was gradually implemented in Portugal. Despite data availability, methodology in use presents relevant limitations such as the small level of cost disaggregation and the absence of linkage between cost centers and standardized production centers.

Although government sets DRG tariffs regularly, inpatient production payment is determined by the base price set under commissioning contract multiplied by the average casemix of the specific institution verified in a defined year. Four different base prices are defined depending on hospital structural characteristics. The main objective of the study was to define a standardized method to cost hospital inpatient production reflecting the relative weights of DRG tariffs in force and to compare the results obtained with the prospective hospital funding method currently used in Portugal.

Methods
The present study crosses, from 2009 to 2011 and for 53 Portuguese public NHS hospitals, estimated hospital costs and prospective DRG payment for inpatient hospital production.

DRG patient discharge database was used with AP21 grouper for the timeframe. Some exclusion criteria were adopted: episodes with negative or 0 days LOS, episodes with coding error DRGs, and episodes from hospitals where prospective DRG payment was not applicable.

Cost accounting database was used to collect, per year and hospital, global inpatient NHS hospital costs. Where data was not available, yet there was historical data, specific year cost was estimated based on historical weight of inpatient cost over the total cost of the hospital. Average cost per diem for each DRG was calculated based on the relative weight of each DRG to casemix index of the hospital. Specific episode cost was obtained multiplying the average cost per diem of DRG by the LOS and the equivalent inlier LOS ratio of the episode.

Results
Results has shown lack of adherence between the average costs faced by hospitals, the average current payment method (-20.5%, p<0.01) and the average DRG tariffs in force (-12.4%, p<0.01). The average difference between the current payment method and the DRG tariffs was -9.25% (p<0.01) with positive moderate correlation (+0.463, p<0.01).

Considering the subset of pure inlier cases the lack of adherence remained although relative differences changed significantly. Hospital inpatient production was under-financed in 7.1% (p< 0.01) by the current payment method. If DRG tariffs were directly applied production was under-financed in roughly 14.5% (p<0.01). The average difference between the current payment method and the DRG tariffs considering pure inlier LOS episodes was +8.6% (p<0.01).

Significant variations have been found between the 4 structural characteristics groups of hospitals (table 1), between the 5 Portuguese Health Regions and between DRG major diagnostic characteristics.

Conclusions
Despite the limitations of cost accounting method in use, global inpatient hospital costs were collected and
specific costs by DRG were estimated. The adoption of a widespread, robust and standardized cost accounting method is strongly recommended. Results obtained signal that NHS public hospital inpatient production was significantly under-funded. Significant variations were identified depending of structural characteristics of providers, geographic location and major diagnostic categories. The current payment methodology produces significant financial incentives that have to be taken into account by health decision-makers when aligning hospital priorities with population needs. Further studies are required once the transformation of outlier LOS episodes into equivalent LOS inlier episodes doesn't seem to be neutral for the funding model.

### Average Cost and Payment per Hospital Structural Characteristics Group (2009 - 2011)

<table>
<thead>
<tr>
<th>Hospital Group</th>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
<th>(D)</th>
<th>(E)</th>
<th>(F)</th>
<th>(G)</th>
<th>(H)</th>
<th>(I)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Cost</td>
<td>Average Cost per Episode for Equivalent Inlier LOS</td>
<td>Average Payment per Episode (Current Payment Method)</td>
<td>Average Payment per Episode (DRG Tariff in force)</td>
<td>Percent Diff. (C)/(B)</td>
<td>P-Value*</td>
<td>Percent Diff. (D)/(B)</td>
<td>P-Value*</td>
<td>Percent Diff. (C)/(D)</td>
</tr>
<tr>
<td>Total</td>
<td>1,181</td>
<td>€3,082,42</td>
<td>€2,449,38</td>
<td>€2,699,13</td>
<td>-20,54%</td>
<td>&lt;0,001</td>
<td>-12,43%</td>
<td>&lt;0,001</td>
<td>-9,25%</td>
</tr>
<tr>
<td>Group 1</td>
<td>1,402</td>
<td>€3,475,93</td>
<td>€3,193,39</td>
<td>€3,208,45</td>
<td>-8,13%</td>
<td>&lt;0,001</td>
<td>-7,70%</td>
<td>&lt;0,001</td>
<td>-0,47%</td>
</tr>
<tr>
<td>Group 2</td>
<td>1,306</td>
<td>€3,582,32</td>
<td>€2,865,58</td>
<td>€2,997,12</td>
<td>-20,01%</td>
<td>&lt;0,001</td>
<td>-16,34%</td>
<td>&lt;0,001</td>
<td>-4,39%</td>
</tr>
<tr>
<td>Group 3</td>
<td>0,958</td>
<td>€2,260,43</td>
<td>€1,646,99</td>
<td>€2,171,49</td>
<td>-27,14%</td>
<td>&lt;0,001</td>
<td>-3,93%</td>
<td>&lt;0,001</td>
<td>-24,15%</td>
</tr>
<tr>
<td>Group 4</td>
<td>0,961</td>
<td>€2,307,22</td>
<td>€1,724,64</td>
<td>€2,181,92</td>
<td>-25,25%</td>
<td>&lt;0,001</td>
<td>-5,43%</td>
<td>&lt;0,001</td>
<td>-20,96%</td>
</tr>
</tbody>
</table>

* Paired Samples T-Test, 95% Confidence Interval of the difference

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