**ARTICLE DETAILS**

<table>
<thead>
<tr>
<th>TITLE (PROVISIONAL)</th>
<th>Do university hospitals perform better than general hospitals? A comparative analysis among Italian regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTHORS</td>
<td>Nuti, Sabina; Grillo Ruggieri, Tommaso; Podetti, Silvia</td>
</tr>
</tbody>
</table>

**VERSION 1 - REVIEW**

| REVIEWER | Jørgen T Lauridsen  
|-----------|---------------------|
|           | Centre of Health Economics Research (COHERE)  
|           | University of Southern Denmark |
| REVIEW RETURNED | 23-Feb-2016 |

**GENERAL COMMENTS**

The study relies on aggregate data rather than individual level data. Therefore, Q5 and Q13 are irrelevant.

The study is performed along lines of similar studies. Thus, the results can be replicated and properly benchmarked with previous literature.

The statistical methods are standard from similar studies and well motivated. Likewise, all professional standards are followed.

The innovative contribution is results for Italy on relative performance of university hospitals as compared to non-university hospitals. Such evidence is not at present available. A good review of existing knowledge ensure the integration of the Italian evidence.

Thus, I consider the study to be correct and novel. If the editor finds the contribution significant, then I recommend acceptance.

| REVIEWER | Gwyn Bevan  
|-----------|---------------------|
|           | London School of Economics & Political Science  
|           | England |
| REVIEW RETURNED | 04-Mar-2016 |

**GENERAL COMMENTS**

This is an interesting paper that uses information collected through the Inter-Regional Performance Evaluation System (IRPES developed by the Management and Health Laboratory of the Scuola Superiore Sant’Anna of Pisa) and the Italian National Outcome Evaluation Programme (developed by the National Agency for Healthcare Services) to compare University Hospitals (UHs) and General Hospitals (GHs) in Italy. It is worthwhile giving some more information on the institutional setting & how this compares with other countries.

The institutional setting in Italy as described here implies a
dichotomy between UHs and GHs. UHs lie outside the regional system, but are financed for care of patients by regions using case-based payment systems by DRGs with additional payments for the added costs for education and research, which varies by region. It would be helpful to say a little more about this institutional setting, which seems to be similar to that in England prior to the 1974 reorganisation when (undergraduate) UHs were brought within the regional structure. I wrote about different models of how UHs were organised in Europe and the USA in 1987 (Bevan and Rutten, 1987) that may be helpful in relating the Italian setting to the models of other countries. One question is to what extent has Italy maintained a dichotomy between UHs and GHs, and whether medical students are increasingly being taught clinical medicine outside UHs (as in England).

A key issue for UHs is that they are typically more expensive than GHs when they are compared in terms of costs per case. It is argued that the reasons for UHs’ higher comparative costs are that they differ from GHs in being centres for medical education, research, training and highly-complex and highly-specialized care. This paper makes cost comparisons between UHs and GHs in Italy and needs to discuss two problems in making such comparisons. First, do Italian UHs have complex relationships with university medical schools in which staff paid to work in one institution provide services for the other (as in England)? Second, the products of UHs are often jointly produced and so it is hard to disentangle the costs of the different products and hence compare costs of care in UHs and GHs (Bevan, 1999). In this paper how are allowances made for regions’ payments to UHs for the added costs for education and research? It would be helpful to discuss these complexities in the methods section of this paper.

The statistical comparisons of UHs and GHs look fine to me, but I am no statistician. My impression from studying variations in costs of UHs and GHs in England in the past is that these reflected historic differences in funding so GHs that became new UHs had much lower costs than the traditional UHs. The outcomes in England were large variations in costs of UHs with some having costs comparable with GHs and other UHs had costs much higher than GHs (Bevan, 1999). This paper reports large standard deviations in costs per weighted case for both UHs and GHs: in 2011, the means were 4678 and 4348 (Table 3) and the standard deviation were 1089 and 775 (Table 5). This suggests 95 per cent were within ranges from about 2500 to 6900 for UHs and 2800 to 5800 for GHs. Hence there seems to be considerable overlap in these distributions, which is exactly the point made by this paper across the various indicators. I suggest that it would be helpful to have some Figures that illustrated this point for unit costs and other selected indicators.

One key difference between UHs and GHs is, as expected, in diagnostic costs, with mean costs in UHs being about 60% higher than in GHs in 2011. It would be useful to have some discussion of this difference and also its materiality in terms of the higher costs of UHs.

The interesting finding of this paper is that in Italy although UHs have institutional arrangements that differ from those of GHs this seems to have resulted in few significant differences between these types of hospital because of the large variations within each hospital type. One question given the differences in regions’ performance in
Italy (Nuit et al, 2016) is whether the variations across UHs reflect the regions to which they belong: e.g., do the UHs in Tuscany have better performance on the IRPES than other UHs because they have been subjected to that regional system of monitoring performance for 10 years?

The principal finding seems to be that UHs tend to have higher unit costs of care but not higher quality than UHs. This analysis, as the authors argue, questions the current arrangements for autonomy of UHs as the evidence shows they do not provide, as may have been expected, better quality of care than GHs. It would be helpful in describing the institutional arrangements of UHs in Italy at the start of the paper to prepare for this finding. What is the justification and rationale of their autonomy and is this just a continuing legacy of the historical arrangements to create the Italian NHS?

References


VERSION 1 – AUTHOR RESPONSE

REVIEWER 1 REPLY:
Dear Professor Lauridsen,
we are grateful for your comments and for the time spent in reading our manuscript. In the new version of the paper submitted, we added some new considerations in order to follow other referee’s suggestions. These new parts are highlighted in yellow.

REVIEWER 2 REPLY:
Dear Professor Bevan,
we are grateful for your comments that give us the chance to improve the manuscript. We revised the manuscripts following your suggestions and adding some new considerations in all the paper’s sections. We highlighted them in yellow in the new submission. Here we summarize the main changes.

Firstly, we added more information in the Background Section on the institutional and organizational setting of Italian teaching hospitals. We believe that the new background improves the description of the institutional arrangements and the organizational features that are relevant for both explaining more clearly the national context at the start of the paper and helping readers to follow our Discussions and Conclusions. We indeed explained how the teaching status is attributed in Italy and added some important details on the dichotomy between GHs and UHs (with particular reference to internal organization, staff and financing mechanisms).

Considering the classification based on the suggested paper Bevan&Rutten-1987, as explained in the
new manuscript submitted, in Italy UHs follow a mixed institutional setting and it is difficult to link their organization to a specific category of the proposed taxonomy. Indeed, there are both UHs owned by private and public university and UHs owned jointly together with the Regional Administration. Moreover, regardless of the ownership structure, the UHs are part of a hierarchical hub-and-spoke hospital network together with general hospitals in which they are the referral centres for the highly-complex services. In addition, depending on their ownership and the regional setting, the financial mechanisms may differ. For these reasons, we provided in the paper a more comprehensive description in order to let readers to compare the institutional setting with those of their country (Paragraph 2.1).

We also took into account your comments on cost analysis. The UH product in terms of patient care is jointly delivered, but hospital staff hired by the university (professors and researchers), as explained in the new version of the Background, receive an integrative 30% remuneration for this activity. Hence, even if it is difficult to distinguish the patient care activity delivered by hospital and university staff, it is possible to account for all the staff costs sustained for delivering care. For these reasons, we believe that the indicator “Average cost per weighted case” allows an effective comparison of costs between UHs and GHs. We added in the Background (Paragraph 2.1) details about this issue and we consequently extended the description of the indicator “Average cost per weighted case” in the Methods Section (Table 1 – Paragraph 3.2).

We performed an in-depth analysis of the two indicators included in the economic and financial evaluation, by inspecting how the distribution of values and whether the results of the Mann-Whitney U test changed after deleting outliers. Indeed, the standard deviations of the “Average cost per weighted case” sharply decreased. Including outliers, in 2011, they were 1089 for UHs and 775 for GHs and, in 2012, 985 and 850 respectively. By removing the outliers, these standard deviations changed as follows: in 2011, 625 for UHs and 671 for GHs. In 2012, they were respectively 514 and 734. However, after outliers removal, the analysis implications did not change, so that for this indicator the two groups did not show significant differences. We therefore decided to add a sentence in the manuscript to highlight this point regarding the considered indicator.

Regarding the potential role played by the Region in the model, we included in the Discussions some considerations about the need for investigating the relationship between local strategies and performance as relevant factor that may drive results, regardless of cross-regional hospital group affiliations. In this regard, the role played by a combination of different integrated governance tools, among others the IRPES, may have an impact, as already suggested in the paper by Nuti et al., 2016. We are glad for your comments and we believe that it is a valuable suggestion for improving the comparative analysis of this topic by investigating the impact of the regional effect on the two group of hospitals. We will be therefore committed in design a new specific study on this topic, taking into account your valuable intuition.

**VERSION 2 – REVIEW**

| REVIEWER          | Jørgen T. Lauridsen  
| University of Southern Denmark  
| Denmark  |
| REVIEW RETURNED  | 04-Apr-2016 |

| GENERAL COMMENTS  | The study relies on aggregate data rather than individual level data. Therefore, Q5 and Q13 are irrelevant.  
| The study is performed along lines of similar studies. Thus, the results can be replicated and properly benchmarked with previous literature. |
The statistical methods are standard from similar studies and well motivated. Likewise, all professional standards are followed.

The innovative contribution is results for Italy on relative performance of university hospitals as compared to non-university hospitals. Such evidence is not at present available. A good review of existing knowledge ensure the integration of the Italian evidence.

Thus, I consider the study to be correct and novel. If the editor finds the contribution significant, then I recommend acceptance.

REVIEWER

Gwyn Bevan
London School of Economics & Political Science
England

REVIEW RETURNED 07-Apr-2016

GENERAL COMMENTS

I am delighted at the ways in which the authors have responded to my comments on the previous draft in making changes for this revised article. I have four minor comments.

First, although the English is good I noted a spelling mistake, e.g., 'strenghts', and there may be others, so do please check the spelling. I also feel that some of the language, although correct, differs from what would be written by someone whose mother tongue is English: e.g. 'The overall analysis showed heterogeneous results. In general, being in the UHs group rather than the GHs does not generally affect performance. Thus, Italian UHs cannot straightforwardly be associated with better results in terms of appropriateness, efficiency, patient satisfaction, and outcomes". So the paper would benefit from stylistic editing to remove infelicities in drafting.

Second, the key finding is that in Italy UHs and GHs do not belong to disjoint sets but their distributions of performance overlap across various indicators. The tables show few differences between statistical measures for the two types of hospital. It would be valuable to add a Figure showing how the distributions compare on the different indicators, e.g., using box and whisker plots for UHs and GHs separately for each indicator.

Third, it would be interesting to give some indication of the scale of the extra finding UHs receive for additional costs of teaching and research in Italy.

Fourth, it would be worth saying that the researchers plan to investigate the impacts of systems of regional governance on the performance of the UHs in Italy.

VERSION 2 – AUTHOR RESPONSE

Reviewer: 1 - Jørgen T Lauridsen

Dear Professor Lauridsen,

in the new version of the paper submitted, we added some new considerations in order to follow other
referee's suggestions. These new parts are highlighted in yellow.

Best regards,

Sabina Nuti

Reviewer: 2 - Gwyn Bevan

Dear Professor Bevan,

we are grateful for your comments that give us the chance to improve our manuscript.

As regards your first consideration, the paper has been reviewed by an English native speaker. Secondly, we added a new Appendix including the box plots for IRPES and NOEP indicators with significant differences between UHs and GHs at the Mann-Whitney U test (Appendix II). Furthermore, we revised the manuscript following your suggestions and adding some new considerations in the paragraph "2.1. The Italian context", in order to give some additional indications of the extra funding received by UHs in Italy. Finally, we stated that we plan to investigate the impacts of regional systems of governance on UH performance in Italy.

All the new revisions are highlighted in yellow in the new submission.

Thank you for your comments. We tried to revise our manuscript following your valuable suggestions.

VERSION 3 - REVIEW

<table>
<thead>
<tr>
<th>REVIEWER</th>
<th>Jørgen T. Lauridsen</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Southern Denmark</td>
<td>Denmark</td>
</tr>
<tr>
<td>REVIEW RETURNED</td>
<td>27-May-2016</td>
</tr>
<tr>
<td>GENERAL COMMENTS</td>
<td>The study relies on aggregate data rather than individual level data. Therefore, Q5 and Q13 are irrelevant. The study is performed along lines of similar studies. Thus, the results can be replicated and properly benchmarked with previous literature. The statistical methods are standard from similar studies and well motivated. Likewise, all professional standards are followed. The innovative contribution is results for Italy on relative performance of university hospitals as compared to non-university hospitals. Such evidence is not at present available. A good review of existing knowledge ensure the integration of the Italian evidence. Thus, I consider the study to be correct and novel. If the editor finds the contribution significant, then I recommend acceptance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REVIEWER</th>
<th>Gwyn Bevan</th>
</tr>
</thead>
<tbody>
<tr>
<td>London School of Economics &amp; Political Science</td>
<td>England</td>
</tr>
<tr>
<td>REVIEW RETURNED</td>
<td>01-Jun-2016</td>
</tr>
<tr>
<td>GENERAL COMMENTS</td>
<td>I have nothing further to add on this revision</td>
</tr>
</tbody>
</table>
Do university hospitals perform better than general hospitals? A comparative analysis among Italian regions
Sabina Nuti, Tommaso Grillo Ruggieri and Silvia Podetti

BMJ Open 2016 6:
doi: 10.1136/bmjopen-2016-011426

Updated information and services can be found at:
http://bmjopen.bmj.com/content/6/8/e011426

These include:

References
This article cites 25 articles, 3 of which you can access for free at:
http://bmjopen.bmj.com/content/6/8/e011426#BIBL

Open Access
This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections
Articles on similar topics can be found in the following collections
Health policy (676)
Health services research (1504)

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/