

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Is the QCI framework suited for monitoring outcomes and costs in a teaching hospital using Value Based Healthcare principles?: A retrospective cohort study
AUTHORS	van Veghel, Willem; van Dijk, Suzanne; Klem, Taco; Weel, Angelique; Bügel, Jean-Bart; Birnie, Erwin

VERSION 1 – REVIEW

REVIEWER	Riganti, Andrea University of Milan, Economics, Management and Quantitative Methods
REVIEW RETURNED	23-Oct-2023

GENERAL COMMENTS	<p>The authors aim to develop a pragmatic framework to monitor health outcomes per unit cost on an institutional level, considering two different populations taking advantage of data from a Rotterdam teaching hospital.</p> <p>I think they succeeded in their proposal and the paper is clear, nicely written and well-structured.</p> <p>I do have two major comments the authors may want to examine:</p> <ol style="list-style-type: none">1. The first one refers to the tails of the cost distribution: it might be of interest to separately run the analysis considering the inclusion/exclusion of the tails of the distribution of costs, as extreme values may influence the average results and may require separate analysis.2. The second one would be to run (at the maximum possible extent) some balance tests for missing values, as a non-negligible fraction of patients has been excluded from the analysis. In particular, a non-random distribution of missing observations may lead to biased results and therefore limit the strength of the reported effects. <p>I also have two minor comments:</p> <ol style="list-style-type: none">1. Page 8, case-mix adjusted values: the authors should be more precise on the definition of "Expected RO". It is not clear what are the elements of the expectation;2. Page 4, introduction: please be more transparent on the definition of income (first paragraph) and specify whether they are focusing on out-of-pocket expenditures and/or public expenditures for healthcare.
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REVIEWER	Revere, Lee University of Florida
REVIEW RETURNED	26-Oct-2023

GENERAL COMMENTS	Very interesting and comprehensive approach to cost effectiveness.
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Dr. Andrea Riganti, University of Milan

Reply:

Dear Reviewer,

Thank you for taking the time and effort to review our manuscript. We very much appreciate your helpful comments and hope we have clarified them adequately.

Comments to the Author:

The authors aim to develop a pragmatic framework to monitor health outcomes per unit cost on an institutional level, considering two different populations taking advantage of data from a Rotterdam teaching hospital.

I think they succeeded in their proposal and the paper is clear, nicely written and well-structured.

I do have two major comments the authors may want to examine:

1. The first one refers to the tails of the cost distribution: it might be of interest to separately run the analysis considering the inclusion/exclusion of the tails of the distribution of costs, as extreme values may influence the average results and may require separate analysis.

Reply:

A technical supplement is now attached to the paper in which we present the costs, outcome and QCI values including and excluding the tail of the cost distributions. The cut-off value was selected at P95 (the 95th percentile). The sub analysis was also added to the paper.

Revision (page 8, Methods):

“Supplementary analysis

Because extreme cost outliers may influence QCI values, results were calculated with and without outliers. The cut-off value was selected at P95.

Revision (page 13, Results):

Supplementary results comparing RO, ATC and QCI values including and excluding cost outliers are attached in technical supplements 1 (Breast cancer) and 2 (Bariatric population).

Excluding outliers had little impact on RO and QCI values for both groups. ATC values were slightly lower (AVG € 8,388.26 instead of €8,833.55) and less variable (a decrease in Inter Quartile Range (IQR) of € 253.31).

Excluding outliers impacted the average total costs of the breast cancer population predominantly in 2020, producing higher average QCI values (8.08 instead of 6.70) in that period.

2. The second one would be to run (at the maximum possible extent) some balance tests for missing values, as a non-negligible fraction of patients has been excluded from the analysis. In particular, a non-random distribution of missing observations may lead to biased results and therefore limit the strength of the reported effects.

Reply:

We agree with the reviewer that the proportion of excluded patients in the bariatric population due to missing value is substantial (27%), this may have affected the estimated RO, Costs and QCI values. Missing values are mostly due to missing data on the TWL and Deficiency indicators. Below we present the distribution of baseline characteristics of the bariatric groups including and excluding missing values.

Bariatric population						
		Patients not having missing data (n= 856)		Patients having missing data (n = 316)		Difference
Age	median (interquartile range)(y)	46y (34 - 53)		43y (31 - 53)		
Diagnosis	Morbid obesity BMI < 45	639	75%	239	76%	1%
	Morbid obesity BMI >= 45	217	25%	77	24%	-1%
Gender	M	177	21%	78	25%	4%
	F	679	79%	238	75%	-4%
Surgery type	Bypass	422	49%	166	53%	4%

	Sleeve	434	51%	150	47%	-4%
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Revision (p11, small print under table 2)

The table indicates that there are "...No large imbalances between patients having and not having missing data for all baseline variables except age were found. Lower age was significantly associated with the likelihood of having missing data ($p = 0.02$)".

Results (RO, Costs and QCI values) were adjusted for age differences in the case-mix adjustment. Also, patients having missing values are most likely those with no shows in the follow-up. The literature is conflicting on the impact of adherence to follow-up on total weight loss and deficiencies. Therefore, we cannot exclude that patients having missing data could, in this case, be a completely separate group. (That is, the missings are perhaps not Missing At Random but Missing Not At Random.) See, for example, Spaniolas et al. 2016 who found that adherence to follow-up independently associated with excess weight loss (EWL) and total weight loss (TWL). In contrast, the meta-analysis of Reiber et al. 2022 (Obes Surg. 2022 Mar;32(3):904-911) shows that adherence to follow-up is associated with EWL but not with TWL.

I also have two minor comments:

1. Page 8, case-mix adjusted values: the authors should be more precise on the definition of "Expected RO". It is not clear what are the elements of the expectation;

Thank you for this comment.

Firstly, due to this comment we discovered a small mistake in our R code for the case-mix adjustment procedure. We corrected this in table 4 and figure 1. The correction had no significant impact on our results and no impact on the conclusions of our manuscript.

Secondly, regarding your question, a patient's expected RO is the average RO of the stratum (case-mixed group) the patient is part of. For breast cancer, the strata are based on combinations of Age, Tumor status and ER and HER2 receptors; see page 8. For the bariatric population, the strata are based on combinations of Gender, Age and BMI (see page 8).

The following suggested revision may help to clarify the formula. We leave it to the Editor and Reviewer whether inclusion is helpful to readers.

Suggested Revision (p8, Case-mix adjusted values section)

For each stratum the expected RO is the average RO of that stratum over the quarters. For each quarter the expected are RO is the weighted average of the stratum-specific expected RO values in that quarter. The observed RO per quarter is the average observed RO of all the patients in that quarter. The average observed RO is the average RO of all the quarters. For the case mix procedure the latter is used as reference value. Therefore case-mix adjusted RO values are calculated as follows [23]:

Adjusted RO = average observed RO * (observed RO / expected RO)

The average total costs are calculated in the exact same manner:

Adjusted Average Total Costs = average observed Average Total Costs * (observed Total Costs / expected Average Total Costs)

2. Page 4, introduction: please be more transparent on the definition of income (first paragraph) and specify whether they are focusing on out-of-pocket expenditures and/or public expenditures for healthcare.

Reply

In this context we meant national income or GDP, not specific out-of-pocket and/or public expenditure. Therefore we made the following change:

Revision (p4, Introduction)

“This increase even exceeded the growth of the Gross Domestic Product (GDP) [1], implying that an increasing percentage of GDP has been spent on healthcare.”

Reviewer: 2

Dr. Lee Revere, University of Florida

Comments to the Author:

Very interesting and comprehensive approach to cost effectiveness.

Reply:

Dear Reviewer, thank you for your kind words. We do hope you enjoyed reading the article and again want to thank you for taking the time to review it.

VERSION 2 – REVIEW

REVIEWER	Riganti, Andrea University of Milan, Economics, Management and Quantitative Methods
REVIEW RETURNED	15-Jan-2024
GENERAL COMMENTS	The authors have adequately clarified my concerns and comments. I appreciated the work they have done and I enjoyed reading the paper. I do believe it is suitable for publication.

