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Reviewer A

In regards to the VBHC tool, I would name as a score and state at the very beggining of methods section, even before describing KPIs.
It is mentioned in introduction, but from my reading got a little consfusing when I got to methods. If you make it clear at the begining that this is your aim and how you calculate it.
Reply: We have named the Tool as a score, Patient Value in Thoracic Surgery Score (PVTS score), and we have stated it at the beginning of methods section, just before KPIs (Lines 151-2). Moreover, as suggested, we have tried to make it clear how to calculate it (Lines 165-176). The overall value was obtained by dividing total outcomes (each outcome item counts from 1 to 7) per total costs (sum of resources employed in each cost item) multiplying per 1000.

As far as PPI table 1, I would split in 2 tables, one for outcome and another for cost.
Reply: We have split the table as suggested in Table 1a for outcomes and Table 1b for costs.

It is not clear for outcome indicators if patient experience data was collected using a former questionaire or thorugh chart review. It would be interesting to give this information, I understand that if there is a formal tool to capture those outcome data your work would be more powerful.
Reply: Patient experience data were collected through questionnaire administered at discharge. We have added this point to the paper (Lines 146-7)

There were improvements adopted that might have impacted outcome, it is not clear if they had an impact in cost or outcome. It would be interesting to see your opinion, even if there were not enough daa to prove them, any speculation, hint.
Reply: According to VBHC approach, we think that ultimately it is not so important to know if an improvement have increased outcomes or lowered costs, since what really matters is to increase the value.

Reviewer B

I congratulate Dr Orlandi and colleagues on this work aiming to develop holistic tool to evaluate and asses value of care in patient undergoing thoracic surgery for lung

cancer. I have several questions for the authors
1) Appreciating inclusion of all the available VBHC tools and assigning structure; can the authors comment on the very broad inclusion of variables that are clearly not available in any real-life application of the tool?
2) The authors analyze their own institutional value outcomes with majority of the variables unavailable. I accept that the tool can be used to evaluate VBHC performance overtime in a single institution, however, can not be universally applied. Can the authors comment on this?

Reply: 1) Based on our literature review regarding path of care of lung cancer patients, we have decided to include several variables, in order to make our tool as much holistic as possible. As you have correctly noted, some variables are not easily available in real-life setting, but we do believe that they should be anyway included in the tool to make it completer and more holistic (Lines 355-7).
2) Our experience is doubtless partial, but we think it must be considered a starting point and it could be inspiring for other Thoracic Surgery Units to apply a VBHC approach in their practice and to make our Tool even more complete and powerful. We agree with you that currently our Tool cannot be universally applied, since it deserves a prospective validation before (Lines 363-6).

Reviewer C

The authors present the work as an introduction of VBHC tool in thoracic surgery. The concept is really interesting and the development of convenient indicator of global care, including patient's outcome, point of view, costs,… is mandatory. The authors have pointed out a list of key-performance indicators (KPI) for a specific surgery and have initiated interesting changes to improve patient's pathway. However, methodology of the study is not clear for me especially in the abstract and should be explicated. Is the study really designed to evaluate the feasibility of the VHBC tool in lung cancer surgery? Analysis of a performance tool is a complex process. For example, data for only one third of the indicators could be found what is mentioned only in the end of the discussion. The choice of each indicator could be discussed and pertinence of this tool compared to other ones. Feasibility of the use of the proposed version of the VBHC tool is not fully demonstrated. In contrary, the results highlight the impact on the KPI of modifications in the patient's pathway. Evolution of the VBHC score should be taken with caution in accordance with the numerous lacking data.

Reply: We have attempted to make clearer the methodology and aim of the study in the abstract (Lines 50-52, 57) and in the text (Lines 128-134, 151-2, 167-8). The main aim of our work was to identify KPIs specific for thoracic surgery and to develop a

model that could be applied in this field for considering the value of patients, but rather than to validate the Tool, we wanted to report our early experience on applying it in our center, and that's the reason why we have not discussed the choice of each indicator but we have preferred to extensively present our encouraging results. We agree with you on the fact that applicability of our Tool is not fully demonstrated, mainly because we have lacked several of the variables included in our Tool. Nevertheless, our results not only highlight the impact on KPIs of modifications in patients' path, as you have underlined, but also represent a starting point in the long way of applying VBHC to thoracic surgery (Lines 397-402). Moreover, we have added your last consideration to the limitation section (Lines 363-6).

Reviewer D

Orlandi et al attempted to introduce the concept of value-based health care in thoracic surgery. I have several reservations about the validity and conclusions of this study:
- Firstable, the authors did not assess the benefit of an established VBHC program, but analyzed and studied a set of indicators to identify improvements and effectiveness.
- Unfortunately, the primary objective is unclear and I would recommend to avoid ambiguous terms such as "to introduce".
- Authors should be more concise and clear as to the goals of this study. In my opinion, this is a retrospective cost-effective evaluation of a bundle of indicators in thoracic surgery - and does not evaluate a stablished VBHC approach (as the authors alluded along the manuscript).
- To my understanding, the authors performed a cross-sectional analysis in a program that had not adopted any VBHC principle. Was any VBHC adopted a priori?
- Furthermore, all the key performance indicators should be defined thoroughly. How was "improvement in quality of life" measured?
- There are several "clinical efficacy" indicators that do not truly evaluate clinical efficacy: for example number of nursing discharge letters or source of referral. Why Table 2 only includes a subset of the indicators?
- How each indicator was converted to a 7-liker scale? This should be explained in more detail.

Reply: The main aim of our study was to report our experience in developing a Tool made up with indicators which could identify improvements and effectiveness of changes on the value for the patient. With that purpose we adopted an embryonic VBHC approach, without applying any established VBHC program. This could be considered just a first step towards the VBHC, and we have added this consideration along the manuscript.
- We agree with your consideration (Lines 397-402).
- We have modified as suggested (Lines 126-134).

- We thank you for this comment, and we have attempted to revise the manuscript removing the allusions about the evaluation of an established VBHC program.
- No VBHC program was adopted a priori; however, VBHC approach inspired us in developing the Tool, aiming at trying to find and express the value for the patient.
- As updated in the manuscript, patients' personal experience was measured through questionnaires administered at discharge (146-7), where they had to evaluate each variable from 1 to 7.
- We have identified the lack of nursing discharge letter containing post-operative guidance and advice as a weak point, since in the past patients complained systematically on the lack of practical suggestions from the nursing personal. This complaint has translated into an increased number of outpatient visits as well as an increase in postoperative complications arisen at home, e.g. related to incorrect management of the wound or to erroneous heparin injection. Therefore, we have related this aspect to clinical efficacy. Concerning the source of referral, we experienced that a direct referral from the GP could be more effective and timesaving than referral from other specialties or even than access to Emergency Department for a related complication. Table 2 includes only a subset of indicators since those are the indicators of clinical efficacy that were applied at our center in calculating the overall outcome value, as highlighted in Table 1, green boxes.
- 7-Likert Scale was applied in outcomes KPIs, whereas costs KPI were calculated through the sum of each cost. Regarding the clinical efficacy, the conversion of the applied indicators is explained in Table 2; since the conversion was arbitrarily made based on our experience and literature review, we have preferred not to show how to convert others clinical efficacy indicators, since they were not applied in our personal report. On the other hand, patient experience indicators were converted based on a questionnaire administered at discharge.