Author's response to reviews

Title: Using value of information to guide evaluation of decision supports for differential diagnosis: Is it time for a new look?

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Author's response to reviews: see over
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Dear Editors,

We are pleased to resubmit our manuscript “Using value of information to guide evaluation of decision supports for differential diagnosis: Is it time for a new look?” for consideration for publication in *BMC Medical Informatics & Decision Making* as a Debate article. We thank the reviewers for their thoughtful comments and have revised the manuscript accordingly. Our point-by-point responses to reviewers’ comments are below. We are submitting a version of the revised manuscript with changes marked in blue and a clean version.

Thank you in again for considering this work.

Sincerely,

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Director, Division of Comparative Effectiveness and Decision Science
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**Response to critique**

**Reviewer 1**

1. Add a figure with a flowchart routing the reader through the two cases

We have added a flowchart to the figure as requested (see Figure 1).

**Reviewer 2**

No issues.

**Reviewer 3**

1. Increase description of VOI

We have now added a section entitled “Brief Summary of VOI” (page 4):

VOI is a framework developed by Claxton [5, 13] that has its conceptual roots in decision analysis and economics. A detailed description of VOI is beyond the scope of this paper. However, VOI assessment of an informatics intervention can be viewed as a three-step mathematical calculation: (1) “How would health outcomes change because of different decision making that would result from using the intervention?”, (2) “What is the monetarized value of
that change in health outcomes?” and (3) “How does #2 change after considering the costs of the intervention and considering the downstream consequences of its use?” Accordingly, if health outcomes would be improved by the post-intervention decision making compared to the pre-intervention decision making, (question 1), the expected value of information (EVI) would be numerically higher (or less negative) (question 2). However, if incremental costs of using the intervention are greater than those of not using the intervention including differences in diagnostic tests ordered and their downstream consequences (including false positives and complications), then the EVI would be numerically lower or more negative (question 3).

2. **In Figure 1 depict the case example described in the article and how each of the differential diagnoses changes the curve**

We have added a Flowchart to Figure 1 (see Reviewer 1) that depicts the case example described in the article.

3. **Figure 2 has no legend, and it would be useful to clarify for the reader what the Figure shows**

We have added the following legend to Figure 2 (page 12):

The EVI of DDX tools is based on the monetarized value of the morbidity and mortality prevented by promptly establishing a particular diagnosis, multiplied by the probability of that diagnosis, minus costs and monetarized value of time and complications from diagnostic tests that modify the probability of that diagnosis. The prior diagnostic possibilities (left column) are updated by diagnostic tests to produce updated diagnostic probabilities (right column). The updating here increases the likelihood of those diagnoses with greater preventable morbidity and mortality, therefore increasing EVI. However, the updating could proceed in the opposite direction, increasing the likelihood of diagnoses with lesser preventable morbidity and mortality, therefore, decreasing EVI. Costs associated with the diagnostic tests lower EVI (shown here by the red arrows). An optimal DDX decision support tool could be viewed as that which maximizes EVI.