Author's response to reviews

Title: The Swiss Neonatal Quality Cycle, a monitor for clinical performance and tool for quality improvement

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Author's response to reviews: see over
Dear Editorial Board

Thank you very much for accepting our manuscript entitled "The Swiss Neonatal Quality Cycle, a monitor for clinical performance and tool for quality improvement" for the review process and sending us the reviews. Attached please find the second version of our manuscript with the requested changes and corrections made.

Here is a point-by-point response to all concerns:

**Reviewer 1: Prakeshkumar Shah**

**Background:**
1. Good rationale, bit unclear on “how this might work” aspect. (Minor)

   - We are uncertain about what is meant by "how this might work". If it refers to the idea of the tool functioning like a bedside monitor, then this is meant as a metaphor which helped the Swiss NICU directors understand our procedure. This is why it was mentioned in the background but could also be removed if deemed confusing. In order to shorten the discussion (see below) we have removed the respective section in the discussion as redundant.

**Methods:**
1. Reference of manual either to website or other document would have been useful. (Minor)

   - A reference to the manual has been added.

2. Figures need more explanation as foot note and some documentation on the figure direct as to what is 3 SD below or above mean etc. (Major)
3. Would be helpful to see the second part of figure 2. (Major)
4. Would be helpful to indicate what Y axis meant in descriptive terms. (Minor)

   - 2-4: Figures 1-2 and their captions have been adjusted accordingly.

5. Does risk adjustment mean only GA groups correction? Then it better be called GA group adjusted rather than risk adjusted. If not, then explain what was adjusted in each model. (Major)

   - Wherever risk-adjustment is mentioned in the text of the manuscript it is stated as being limited to GA group adjustment. To remove the word "risk" itself would make the purpose of the adjustment for which the SMR-charts were developed more difficult to understand. We are currently studying the effect of several antenatal factors that cannot be influenced by the individual units in order to build a more refined, multivariable risk-adjustment model. We plan to publish this study within the next 12 months.

6. Reliability: It is unclear in the format it is explained now. If one understands correctly; e.g. for an indicator such as late onset sepsis the rate is 7% in the network. Meaning thereby out of 2025 VLBW infants there were 140 infants who developed this indicator. Now this means if
all nine units contributed equal number of infants over 3 year period approximately 16 neonates per unit developed infection. Division of this in eight quarters means there would be 2 infants per quarter per unit may be eligible for this indicator. With expected degree of natural variation, it is likely that a particular unit may not have any infection during two or more quarters – would this unit be counted as irregular?

As one can see that in this example, there are quite marked similarity assumptions and it is not ‘real” life as there would be small and big units in the network and they would not be accounted similarly in the network. – Please explain this more clearly. (Major)

Results:
1. It would have been useful if definitions of each were given for comparative purposes such as Late onset sepsis, BPD, IVH – what denominators were used in both calculation. (Minor)

   In order to save space, a reference for the definitions has been added. The denominators have been specified.

2. All tables need a footnote for explanation as it is hard to understand some results such as reliability. (Major)

   Table captions have been edited for better understanding.

3. One most important aspect lacking is over the three years of study period what modifications were suggested at the meetings and how it was monitored that these interventions were applied in individual unit. (Major)

4. Are there any interventions which made more positive impact than others? (Minor)

   3-4: The quality cycle is in its beginning phase. First, a database which implemented the listed routines for data completeness and plausibility had to be established with at least 4 years of data (i.e. 2006-2010). 4 years of data were needed to a) pool the data of two years in order to increase the overall N and b) so that the previous two year period could be included into the reliability test. Then a specific protocol on how to detect possible areas of quality improvement and how to initiate change had to be established, i.e. the hereby presented quality cycle.

   We are now in the phase of applying the quality cycle and recording its effect and efficiency in order to compare the data recorded from 2009-2011 with data recorded from 2014-2015 and thereby quantify the effect of the quality cycle, provided we are awarded the requested necessary funding.

   However, since the setting differs from a randomized controlled trial, it will never be possible to maintain that a possible effect is caused by the quality cycle (which is mentioned in the limitations).

   Nevertheless, we have observed that the routinely held meetings of the Swiss Neonatal Network representatives with its presentation of preliminary findings and center to center comparisons has led to the events described at the end of the result section which is why we reported on them with the approval of said representatives.

   We have adjusted the limitations accordingly.
Discussion
1. Discussion can and need to be reduced by 40% to avoid duplication and redundancy. (Major)

Ł The discussion has been reduced to avoid redundancy.

Overall:
1. An interesting paper which supports the idea of monitoring based on benchmarking model and some QI efforts for a national network of relatively small size units. The paper would benefit from more explanations, information on actual QI efforts, acknowledging the limitation that QI efforts were not monitored itself and documenting that change has occurred over time (either by comparing their own rated in previous 3 years). - discretionary

Ł See above (3.-4.)

Reviewer 2: Roberto Bellu

Reviewer's report:
The paper covers a very important topic and the problem is very well defined.
The authors manage a neonatal network in a well-defined area (Switzerland) with relatively few NICU centers, and this make the quality improvement project feasible. The methods are very well explained and the results are interesting for the neonatal community. The discussion is very comprehensive and can be useful for people managing other network. Strength and limitations of the work are well stated.
One critical point is risk-adjustment: the authors stated that this “has been simplified to reflect only the units’ individual distribution into gestational age groups”; it would be interesting and advisable to consider also adjustment with other well-known models that take into account also congenital malformation, gender, Apgar score and so on. This could be particularly relevant in a setting with relatively small number, where causal variation can play a major role in determining differences between centers (minor essential revisions).

Ł See answer to reviewer 1 comment nr. 5 under methods.

Maybe some more comparison with other network experience on quality improvement (e.g. Vermont Oxford Network) could be useful in the discussion (discretionary revisions).

Ł We have somewhat refined the comparison to the Vermont Oxford Network in the first part of the discussion under "Identification of improvement areas". But we refrained from elaboration in order not to counteract the previous reduction of the discussion.

Editorial's concerns:

1. We have sought the assistance of a fluent English speaking colleague and have revised the manuscript and in particular the abstract accordingly.
2. A statement referring to the governmental approval of the study is listed in the first part of the methods section under "study collective".

We feel the manuscript has gained from the changes made and hope that they meet the approval of the reviewers and the editorial. We thus would be very grateful if our manuscript could be accepted and published in your Journal in its current form.

Yours sincerely,

Mark Adams