Author's response to reviews

Title: Program level implementation of malaria rapid diagnostic tests (RDTs) use: Outcomes and cost of training health workers at lower level health care facilities in Uganda

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Author's response to reviews: see over
Response to Reviewers comments
We appreciate all the very useful comments and corrections suggested by our reviewers. Below in blue are the response (black) to the comment listed in blue.

Reviewer 1:
Comment 1
1. It is not surprising and not particularly interesting that there is a relatively high level of adherence to RDT training procedures only a month or so after training. Instead, follow up after training should have been longer because of importance really is the long term retention of skills and its consequent change in diagnostic and treatment behaviour; the specific characteristics of those who have not adhered to training; the treatment of those who were not positive for malaria vis-a-vis those who were confirmed for malaria.

Response 1:
The aim message from this study was cost and outcome of a one-day training to perform the RDT test.
1. We have included the limitation of six weeks follow-up. However we still show that ‘one-day training’ is effective in transferring skill and 76% of the patients offered a diagnostic test.
2. This study show early evidence of changes in antimalarial prescription behaviour as a result of training and provision of RDTs. This being a cross sectional evaluation, we do not have data on the long term retention of skills including the cascade training. However, it is very unlikely a health worker will lose a practical skill they have performed over a month, but rather may stop performing the task due to related service delivery constraints within the health system.

Comment 2
2. The claim that the training will amount to savings of 21 million USD in saved AMDs is wrong. It is the scale up and use of RDTs rather the training per se that contributes to savings. If one wants to understand the additional savings attributable to training, then one has to evaluate RDT+training vs RDT scale up only. Furthermore any estimates of cost-savings must be
balanced against increased responsibilities to health worker and impact on care for patients and other factors.

Response 2

1. We agree that the training per se may not independently led to the savings of $21million alone without the provision of RDTs. We have therefore removed the statement that savings of 21million was are result of training (alone).

2. We have added this in the limitations sections. During this operational study it was not possible to have a wedge-stepped design of having health facilities receiving RDTs before training as a comparison are to the Training + RDTs reported here. Whereas we were able to document the amount of antimalarial saved, it was not possible to extrapolate the impact and the cost savings of training alone in this setting.

Comment 3

3. It is also interesting that the reported concordance rate during training was similar to the adherence rate which makes one wonder why a concordance rate of near 100% was not used during training as the 80% threshold could be low and with skills transfer often deteriorating down the training chain, may have a negative impact when health workers are trained by the ToTs. What was the field performances of those individuals whose concordance was between 80% to 90% compared to those 90% to 100%. Was clustering in post-training performance? This could be revealing!

Response 3

3.1 The results show that nursing assistants had lower scores than other health worker cadres with formal pre-service training.

3.2 To further analyze the clustering due to post test scores, we have included a scatter plot with the post test results against concordance performance. We have now included the spearman’s correlation coefficient and calculated a correlation coefficient.

Comment 4

4. The cost of training per person appears to be only for those who were formally trained. How about the cost of training by ToTs?
Response 4:

4.1 The cost of TOT was included in this calculated cost see methods section page 8 last paragraph reads: Program implementation costs were classified into a) set-up costs that included a three-day trainer of trainers (TOT) based on a pre-developed protocol/guidelines and b) recurrent costs such as; the one-day training (recurrent because of the need for refresher training of health workers given the high rates of staff turnover) as well as the national and local supervision costs.

Comment 5

In think this study falls short of being a proper evaluation of the RDT training or a full assessment of impact of RDT scale up on diagnosis and cost savings thus limiting its value. It could be improved by more indepth analysis and interpretation of the data.

Response 5:

We have restructured the discussion to include limitations of the study to show how other future similar study could improve on these findings. However the main message for this paper is that one day training provided sufficient skill at a cost of $101 and skills were useful in leading to 76% of patients tested within the first month of deployment of RDTs. We have improved the context of the paper by mentioning that this was part of a bigger study to evaluate impact of RDTs scale-up.
Reviewer 2

1. Abstract: The email address of AC needs a spelling correction (finddiagnisitic vs finddiagnostic). Also, define AMD before using it for the first time in abstract
Corrected as suggested

2. Introduction: Little spellings errors (line 6 para 1- word “of” should be added before ACTs and after reference 5- the next sentence “a” is omitted before word—need.
Corrected

3. Towards end of the paragraph; I think the authors want to explore health workers performance for the use of RDTs and not explore use of RDTs …. I think the wording should be rephrased
We have revised the sentence to read: This implementation research was conducted to train and document the process of training health workers to perform and use RDTs in a public health care setting

Minor essential revision:

4. There is a need to add a reference of the revised National Guideline for malaria diagnostics after reference No 16

Added a reference (Malaria treatment and control policy ref # 16)

5. Discussion: The discussion will be more interesting (and the work be more meaningful) if cost-effectiveness analysis took into consideration the benefits of a ‘cascade model training’ and compare this to the first hand health workers training costs of $101 if extended to cover the whole country. As well the discussion may extend to compare these training costs and the AMD averted by either analysis strategy (with extrapolations whenever possible/ necessary)

Response 5
Cascade training was an incidental finding in this study and we do not have enough data to compare it with first hand training. We have include this is the discussion as a future study. We have added this in the limitations sections. During this operational study it was not possible to have a wedge-stepped design of having health facilities receiving RDTs before training as a comparison are to the Training + RDTs reported here. Whereas we were able to document the amount of antimalarial saved, it was not possible to extrapolate the impact and the cost savings of training alone in this setting

Major compulsory revisions:
6. Methods 1: Need to define HCIII and HCII before they are first used.
Response 6
We have defined HCII and HCII as Lower level health facilities and added the populations they serve.

7. Methods 2: There is a lot of repetition from reference 17; p with little acknowledgement of the fact that the said reference described similar study. It will save time if most of methods described in the current paper which also appears in 17- should just be referred to it.

Response 7
This evaluation on training was sub set of a larger study carried out to evaluate the effect of RDT test results on health workers' anti-malarial prescription practices in the management of fever at lower level health facilities in different malaria epidemiological settings in Uganda. This has now been properly referenced

8. Methods 3: It will be more useful to describe the sampling strategy used. It looks like a multi-stage (with 3 or 4 stages) for better understanding of a reader
Response
The health facilities were selected using a multi-stage sampling method and the details have been reported elsewhere [17]. The facilities were eligible for participating in the study if they met the following criteria: 1) current lack of functional parasite-based diagnostic services, 2) no previous involvement in a similar research, 3) over 200 suspected malaria cases managed at the facility per week and 4) availability of a recording system that comprised outpatient registers, health management information system (HMIS) and drug consumption data. Of the eligible facilities (Kapchorwa 10, Jinja 10, Iganga 15, Mbale 12 and Mubende 11), four were randomly selected from each district. In each of the five districts, one health facility did not receive training and was used as a comparison group.

9. Methods 4: In the training, describe the number of sessions had (back-to-back indicates more than one session), with number of participants per session and relation with number of facilitators.
Response
Two one-day trainings were conducted, each consisting of half the trainees. The ration of trainer to trainee was 1:4.

10. Methods 5: Messages relating to adherence of testing results and following IMCI may bring contradictory meaning, especially if the IMCI guideline referred to here is the classical one which promoted syndromic approach in management of malaria. It will be useful to provide a reference and/ or elaborate further in those lines
Response
Health workers were trained to treat according to RDTs test results. However, they still had liberty to use presumptive treatment for children under five years since it was the national policy at the time of the study.

11. Results/ Discussion related to Table 3: It will be worthwhile to discuss the findings and relate them to malaria transmission patterns/ seasonality during the study period,
order to rule-out decline of malaria/ fever cases due to decline in malaria transmission; particularly give a fact that you sampled areas with different transmission intensities.

We have limited our finding to the training and cost of conduction the training. We have therefore left out the cost-effectiveness given the limitations highlighted before. Therefore the previous table 3 has been removed from the paper and only the proportions tested and treated are added in the narrative results section. (See reviewer 1 response)

12. Results: Add numbers (or fractions) before percentages

These have been added in the results section and left out in the discussion.
Reviewer 3

The objective is defined in the introduction but repeated in the first para of methods. The objective could be a little more specific than stated.
Response
The objective has been removed from the methods section

National malaria guidelines are referred to in several places but it’s not clear what these were at the time of the study. My understanding is that the WHO 2010 guideline was still not policy in Uganda at that time, and if so it’s not clear what staff were told in terms of prescribing antimalarals to RDT negative children <5yrs old.
Response
In the methods section on training, we stated this: Health workers were trained to treat according to RDTs test results. However, they still had liberty to use presumptive treatment for children under five years since it was the national policy at the time of the study.
The evaluation of training is a little unclear, especially in regards to the ‘questions’ and ‘concordance’ referred to at the time of training. Was this data based on ‘before and after’ and was it a questionnaire or observation of RDT use etc.
Response
The pre-post evaluation was based on the details in the treatment guidelines. The Concordance test was an observation score by the supervisor/trainer. Additional file 1 has been added to show the steps evaluated. The test has been clarified as stated here: A pre-training exercise was conducted to assess the health workers’ knowledge in malaria case management. The training was based on the WHO curriculum for use of RDTs [18] and the content included concepts and guidelines of parasite-based management of malaria, RDT job aid, record keeping, distribution, storage and waste disposal of RDTs as well as hands-on practice in performing the RDT. After the training, the pre-training test exercise was re-done to assess the knowledge gained. In addition, health workers were observed and scored for adherence to the procedures to perform the RDTs based on the pictorial chart used during the training (see Figure 1).
Participants were considered competent if they scored ≥ 80% in the post-training practical concordance test (see additional file)

The sampling of health facilities could be clearer. I understand that this was not a probability sample but based on some degree of judgement but it’s not clear what database was used and how HF's were actually selected.
Response
The selection of the HF's has been clarified (top page 7)
The health facilities were selected using a multi-stage sampling method and the details have been reported elsewhere [17]. The facilities were eligible for participating in the study if they met the following criteria: 1) current lack of functional parasite-based diagnostic services, 2) no previous involvement in a similar research, 3) over 200 suspected malaria cases managed at the facility per week and 4) availability of a recording system that comprised outpatient registers, health management information system (HMIS) and drug consumption data. Of the eligible facilities (Kapchorwa 10, Jinja 10
Iganga 15, Mbale 12 and Mubende 11), four were randomly selected from each district. In each of the five districts, one health facility did not receive training and was used as a comparison group.

Comment
In my opinion the results of prescribing is the most important but the data in Table 3 are difficult to understand. o ‘Clinical malaria’ is a confusing term. Malaria is ‘clinical’ by definition in that it is the illness caused by plasmodium parasites. Presumably patients in this category had ‘illness suggestive of malaria’? How was this recorded and from what source? o The sites were from a range of malaria ecologies including hypoendemic yet the % RDT positive varied little and was above 25% in all. That’s not at all consistent with a wide range of transmission.

Response:
Similar to the response given to the first reviewer, table 3 was removed and data presented as narrative to limit the information to training outcomes. In the method we state the source of data as OPD registers.

. o It’s not clear what % of patients (either ‘all’ or ‘suspected malaria’) were RDT tested, and of those what proportion of RDT negatives were treated with AMD.
Response
The proportion of patients test was 76% and reference is made to the above comments that this study limited its report to cost and training outcomes. The longitudinal component of the bigger study has been referenced to clarify impact of testing with RDTs (Reference 17).

Again, the source of the data is not described in the methods. If it was the routine health facility register then the limitations need to be discussed.
Response
Yes the source of data was mentioned, but the limitations not discussed as these are outside the key outcomes. The reliance of routine data has been mentioned as limitation.

Comment
I think the economic analysis is very superficial. I think the costs of preparing the training materials should be included, and more importantly the costs of alternative treatments (e.g. antibiotics) to AMDs and illness episode costs need to be included. Clearly the study design does not allow for all of this but more caution should be used in claiming a cost saving.

Response
We have removed the cost effectiveness component due to the limitations of our design. Details are shown in the responses to the first reviewer.