Reviewer's report

**Title:** A large-scale assessment of hand hygiene quality and the effectiveness of the "WHO 6-steps"

**Version:** 1  **Date:** 6 August 2012

**Reviewer:** Mary-Louise McLaws

Reviewer's report:

Compulsory Revisions

This manuscript focuses on the technique of hand hygiene with ABHR - a focus that has been omitted in recent times from the literature. This manuscript is well written and my only comments on the writing are:

1. **Introduction P2:** substitute "responsible for" with "attributed to" as epidemiologic studies cannot be identified factors as responsible only attributable or increase in risk.

2. **Methods P3**
   - paragraph 3, 4th, 5th and 7th sentences should read:
   These images were then observed on separate screens, and evaluated by blinded NUH infection control staff separated by partition from the HCWs undertaking the hand hygiene. Pass-fail of hand hygiene technique was via UV imagery allowing....
   - "In our definition, every area uncovered by UV on either ...."
   - Page 4: please expand “QR”
   - Insert inter rater into “good level of inter rater concordance..”

I have the following suggestions to the analysis as the data have been over-analysed.

3. **Statistical methods**
4. **What was the rationale for setting the alpha at 1% not 5% level?**
5. **Please report p-values as (p<0.001) rather than p= 0.000024. All significance #0.001 please specify as “(p=0.005) not (p-value = 5x10-3 )

6. **Although you have the numbers for precision it is not really helpful to be give percentages to one decimal place. Please round up.

7. It is unusual to discard groups of 20 without collapsing them into another e.g. age group. The rationale for age groups is based on behaviour, physiology or statistics (equal groupings). Your groups are by 10-year groupings which has not real benefit other than to suggest there is some age related factor. It would have been more informative had you grouped by e.g. student staff (<25), early-mid-career (25-35) and senior (35+). One of the statistical rationale for categorical cu-points is equal (or close) numbers.
Results
8. Please give the Study population 4762 first then the study group of 4642 (ie those you have got for analysis after loss to follow or incomplete surveys etc). Something like “Of the 4762 enrolled 120 provided incomplete surveys resulting in 4642 participants.”

9. Please provide 95% Confidence Intervals around proportions in the text and table: Table 1 remove the failure rate but give % (Pass/denominator)

10. Be careful about the number of ways you’ve analysed the same datasets—otherwise you have to adjust for multiple comparisons (is this why you set alpha at 1% - if so then mention this in the methods). Also be careful not to overstate a finding simply because it has reached significance. I would simply do a total gender difference : 75% (95% CI 74%-76%) versus 62% (95%CI 59%-65%) (p<0.001) is 13 percentage points (PP) different. Do not drill down by profession as this is telling us the same thing but random error will have more of an impact as the numbers get smaller and is it really necessary? E.g. Page 5 line 3 – There is only 6PP difference in female nursing staff versus male physicians of 40-49 is not really important as you’ve already told me males are a little worse than females.

77.4% nurses and 72.2% physicians should read 77% (95%CI 75%-79%) and 72% (95%CI 68%-76% ) which illustrates that while the p-value is significant it is not really that important given the difference is 5 PPs. I’d say there’s little importance difference and that both nurses and physicians have room to improve their technique.

- Page 5, paragraph 3 please give p-value and 95%CI when making a statements of significance being reached (e.g. 38% (95%CI ) versus 25% (95CI ), p= ; 36% (95%CI ) versus 27% (95%CI ), p= ).

- The rationale for grouping <40 with >60 can only be valid if you’re trying imply that technique suffers with inexperience or with being a very experienced clinician. Yet, 5 Moments and ABHR was introduced around 2009 globally (some hospitals earlier) which is only 3-4 years ago so experience would not be a factor, the only rationale associated with age would be missing out on in-house education. In addition, focusing on the <40 years of age has grouped the inexperienced with the mid career, the 60+ are few and experienced like the 41-59. I advise you to re categorise your age groups and test <25; 25-35 and >39 or use two groupings (<40 and 40+) and retest.

- Figures 1 and 2 please use a smaller scale for vertical axis.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:
I declare that I have no competing interests.