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Homogeneity and standardization in hand hygiene compliance

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To the Editor—Healthcare-associated infection (HAI) is a major problem for patient safety and hand hygiene is recommended as one of the most effective strategies for preventing HAI.[1,2] In 2004, WHO launched the global hand hygiene campaign to improve hand hygiene practices, which included 5 indications for hand hygiene: before patient contact, before an aseptic task, after body fluid exposure risk, after patient contact, and after contact with patient surroundings.[3]

Monitoring healthcare workers' adherence to recommended hand hygiene practices is considered an important element of an effective hand hygiene program. Because many factors (eg, observation bias, selection bias, information bias and the Hawthorne effect) can occur during monitoring, increasing attention has been given to reduction of these biases to achieve more accurate measurement of hand hygiene compliance.[4–6] Notably, overall hand hygiene compliance observed in different studies should not be compared directly, due to heterogeneity among the studies. That is, the overall hand hygiene compliance should not be directly compared when the proportion of observations conducted among each of the 5 indications for hand hygiene differs among the studies.

Taking the following research studies as an example (Table 1), hand hygiene indications 1 and 2 in study 1 show lower compliance than those in study 2. However, study 1 (53.8%) exhibits a higher overall compliance than study 2 (46.3%). The main reason for this inconsistency is the difference in the proportion of various indications for hand hygiene between these 2 studies.

Accordingly, we believe that homogeneity and standardization should be considered not only at the design stage of every hand hygiene monitoring scheme but also at the time of compliance analysis. We also recommend that these factors should be added to the new version of the *WHO Guidelines on Hand Hygiene in Health Care*.

Homogeneity in design

To allow accurate comparison of hand hygiene compliance, researchers should ensure that each hand hygiene indication has the same proportion of observed opportunities during each study period. For example, in each study period, 40% of total observations are conducted in relation to indication 1, 20% of observations are conducted in relation to indication 4, and 40% of observations are conducted in relation to indication 5. Using this scheme, all observational samples will be homogeneous and the overall compliance rates will be comparable because the proportion in each sample is equal for the same indication. When publishing compliance results, it is necessary to report the total number of hand hygiene opportunities and actions regarding the 5 individual indications as well as total hand hygiene opportunities.

Standardization in comparison

When hygiene compliance from different studies is compared, standardization is needed. Direct and indirect standardization can be applied, and the use of these 2 standardized methods should depend on the availability of data. Direct standardization can be carried out using the following formula:

$$p' = \frac{N_1 p_1 + N_2 p_2 + \ldots + N_i p_i}{N_1 + N_2 + \ldots + N_i} = \frac{\sum N_i p_i}{\sum N_i} \quad (1)$$

The numerator of p' may be recognized as the number of standardized actions and the denominator of p' is the overall standardized opportunity number. N_i represents the standardized opportunity number (the sum of opportunity numbers of every corresponding hand hygiene indication in all studies), and p_i is the respective original compliance of each hand hygiene indication. In this example, the values of N_1, N_2, p_1, and p_2 were 500 (ie, 300 + 200), 700 (ie, 100 + 600), 60.0%, and 35.0% in study 1, respectively. Therefore, the overall standardized compliance should be calculated as 45.4% for study 1 and 50.4% for study 2 using the direct standardization method, which corrected for the effect of having different proportions of observations performed among the various hand hygiene indications during the 2 studies.

Additionally, when the total number of hand hygiene actions (r) in all studies and the opportunity number of every indication (n_i) are available but compliance is missing or the opportunity number

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Table 1. Example of Different Proportions of Hand Hygiene Indications

	Study 1			Study 2		
Hand Hygiene Indication	Opportunity	Action	Compliance, %	Opportunity	Action	Compliance, %
Indication 1	300	180	60.0	200	130	65.0
Indication 2	100	35	35.0	600	240	40.0
Total	400	215	53.8	800	370	46.3

is small in each indication, the indirect method, based on the following relationship, is appropriate:

$$p' = P\frac{r}{\sum n_i P_i} \quad (2)$$

Here, P is defined as the overall hand hygiene compliance published in a reference study, and P_i is the reference compliance of each hand hygiene indication obtained from the same study. Hence, $n_i P_i$ is the expected action number of each hand hygiene indication.

In summary, a threat to meaningful hand hygiene compliance measurement is bias, which includes selection, observation, and confounding biases. If hand hygiene compliance is compared between healthcare settings or over time, homogeneity of measurement and standardization of results should be considered. Another essential component of meaningful hand hygiene compliance measurement is an appropriate sample size, as described in the WHO recommendations.[7]

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Assessing the methodological quality of studies included in systematic reviews: Interpretation of scores

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To the Editor—Assessing the methodological quality of and, thus, risk of bias within studies included in systematic reviews is important to place the conclusions of systematic reviews in context. The choice of appropriate tools to assess the risk of bias depends on the design of the individual study.[1] The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement[2] recommends the following: (1) to present quality assessments as scores for each component domain, (2) to restrict the primary analysis to studies judged to be at low risk of bias, (3) to stratify studies according to risk of bias using subgroup analysis or meta-regression, or (4) to adjust the result from each study in an attempt to remove the bias. Despite all available information and guidance, we feel that a step in this process is missing: the interpretation of the scores, that is, the classification of a study as being of low, medium, or high methodological quality. When only reporting scores without interpretation or threshold, it is impossible to select or stratify studies during analyses.

Possible approaches to classify the quality of included studies could be (1) to divide the assessed scores of included studies for each tool in thirds, (2) to divide the highest possible score for each tool in thirds, (3) to come up with your own scoring system, (4) to not interpret scores, or (5) to establish uniform thresholds that

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