Adult and Infant Mask Ventilation Quality Evaluation from Various Viewpoints by Non-medical Personnel: Randomized Simulation Trial

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Authors’ contributions
This work was carried out in collaboration among all authors. Authors KH, YN, KM and NK contributed to the study design and implementation, statistical analysis and manuscript preparation. Authors TN, FT and RK contributed to the study implementation and manuscript preparation. All authors discussed the methods and results and approved the final manuscript.

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To The Editor,

Manual mask ventilation is an important component of rescue airway management not only for medical professionals but also non-medical personnel in both adult and infant resuscitation [1]. An essential consideration for mask ventilation safety is whether sufficient ventilation has been achieved or not [2]. Non-medical personnel often find it difficult to evaluate and differentiate sufficient or difficult mask ventilation [3]. Here, we conducted a survey on the subjective difficulty of evaluating the quality of adult and infant mask ventilation by non-medical personnel from various viewpoints.

On November 2019, we conducted a simulation-based crossover trial with 16 school clerks at our university who were not involved in clinical work and had no experience with resuscitation. The CPARLENE® manikin (Wisconsin, U.S.A.) and Resusci Anne® manikin (Laerdal, U.S.A.) were used to perform adult and infant mask ventilation,

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respectively. Participants visually evaluated the quality of manual mask ventilation conducted by a certified resuscitation instructor (N.K.) from four different viewpoints: headside-upward, headside-horizontal, lateral-upward, and lateral-horizontal (Fig. 1a and 1b). The difficulty of evaluating the quality of ventilation by the same instructor from the four viewpoints was evaluated on a visual analog scale (VAS), which ranged from 0 (extremely easy) to 100 (extremely difficult) [3,4]. The order of evaluation was randomized using random number table. Results obtained

![Figure 1](image-url)

**Fig. 1.** (a) Four viewpoints for evaluating the quality of manual mask ventilation in adult simulations. (b) Four viewpoints for evaluating the quality of manual mask ventilation in infant simulations. (c) Comparison of the subjective difficulty of evaluating the quality of mask ventilation from four viewpoints in adult simulations. (d) Comparison of the subjective difficulty of evaluating the quality of mask ventilation from four viewpoints in infant simulations. *P<0.05 compared to headside-upward

*Source: Nakamura et al. (present study)*
from each trial were compared using one-way repeated measures analysis of variance. Statistical analyses were performed with JMP® 11 (SAS Institute Inc., Cary, NC, USA) [5]. P<0.05 was considered statistically significant.

In the adult ventilation trial, the subjective difficulty was generally lower with horizontal viewpoints compared to upward viewpoints, although no significant difference was found among the four viewpoints (Fig. 1c). In the infant ventilation trial, the subjective difficulty for the lateral-horizontal viewpoint was significantly lower compared to the headside-upward viewpoint (P=0.012) (Fig. 1d).

Overall, the subjective difficulty of ventilation evaluation for upward viewpoints tended to be higher than that for horizontal viewpoints, suggesting that horizontal viewpoints, especially the lateral-horizontal viewpoint, may be effective for evaluating the quality of adult and infant manual mask ventilation by non-medical personnel. These findings suggest that it would be helpful for basic life support guidelines to emphasize that respiratory or mask ventilation should be performed from the lateral-horizontal viewpoint, especially for infant resuscitation.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The Research Ethics Committee of our institute judged that ethical approval was unnecessary for this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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