

## Investigating the Indoor Air Quality of the Respiratory Care Wards

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**Abstract :** Various biological specimens, drugs, and chemicals exist in the hospital. The medical staffs and hypersensitive inpatients expose might expose to multiple hazards while they work or stay in the hospital. Therefore, the indoor air quality (IAQ) of the hospital should be paid more attention. Respiratory care wards (RCW) are responsible for caring the patients who cannot spontaneously breathe without the ventilators. The patients in RCW are easy to be infected. Compared to the bacteria concentrations of other hospital units, RCW came with higher values in other studies. This research monitored the IAQ of the RCW and checked the compliances of the indoor air quality standards of Taiwan Indoor Air Quality Act. Meanwhile, the influential factors of IAQ and the impacts of ventilator modules, with humidifier or with filter, were investigated. The IAQ of two five-bed wards and one nurse station of a RCW in a regional hospital were monitored. The monitoring was proceeded for 16 hours or 24 hours during the sampling days with a sampling frequency of 20 minutes per hour. The monitoring was performed for two days in a row and the AIQ of the RCW were measured for eight days in total. The concentrations of carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), particulate matter (PM), nitrogen oxide (NO<sub>x</sub>), total volatile organic compounds (TVOCs), relative humidity (RH) and temperature were measured by direct reading instruments. The bioaerosol samples were taken hourly. The hourly air change rate (ACH) was calculated by measuring the air ventilation volume. Human activities were recorded during the sampling period. The linear mixed model (LMM) was applied to illustrate the impact factors of IAQ. The concentrations of CO, CO<sub>2</sub>, PM, bacterial and fungi exceeded the Taiwan IAQ standards. The major factors affecting the concentrations of CO, PM<sub>1</sub> and PM<sub>2.5</sub> were location and the number of inpatients. The significant factors to alter the CO<sub>2</sub> and TVOC concentrations were location and the numbers of in-and-out staff and inpatients. The number of in-and-out staff and the level of activity affected the PM<sub>10</sub> concentrations statistically. The level of activity and the numbers of in-and-out staff and inpatients are the significant factors in changing the bacteria and fungi concentrations. Different models of the patients' ventilators did not affect the IAQ significantly. The results of LMM can be utilized to predict the pollutant concentrations under various environmental conditions. The results of this study would be a valuable reference for air quality management of RCW.

**Keywords :** respiratory care ward, indoor air quality, linear mixed model, bioaerosol

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