


POINT OF VIEW

Survey on the actual number of nurses required for critical patients with COVID-19 in Japanese intensive care units: Preliminary report

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Abstract

Determining the number of nurses required for patients with coronavirus disease receiving mechanical ventilation and/or veno-veno extracorporeal membrane oxygenation is important to provide quality care. Therefore, we conducted this cross-sectional survey of 725 intensive care units in Japan. Data from 152 units with experience of managing patients with coronavirus disease who required tracheal intubation were analyzed. The median number of nurses required for a patient receiving mechanical ventilation or veno-veno extracorporeal membrane oxygenation was two. This number was more than that according to the Japanese standard determined by government. We conclude that more nursing staff is required for caring for patients critically ill with coronavirus disease in intensive care units.

KEYWORDS

COVID-19, extracorporeal membrane oxygenation, mechanical ventilation, nurses

Patients with coronavirus disease 2019 (COVID-19) admitted to the intensive care unit (ICU) require more nursing time than those without COVID-19 in the ICU (Bruyneel et al., 2021). In Japan, the number of nurses required for one COVID-19 with severe respiratory

failure patient and requiring mechanical ventilator and veno-veno extracorporeal membrane oxygenation (VV-ECMO) is not known. The survey aimed to clarify the number of nurses required for those patients and provide adequate nursing assignments for patients

critically ill with COVID-19 admitted to the ICU. This survey has preliminarily reported partial results, which are essential for establishing future COVID-19 measures.

This was a cross-sectional study using a postal mail survey. All ICUs in Japan with nursing staff, had less than two patients per nurse, and were accredited by the government, were included in the study. This study included 605 facilities and 725 ICUs. The survey form was mailed to the ICUs on October 20, 2020, and it was collected on November 15, 2020. Only nurses with a managing role, certified nurse, and certified nurse specialist filled out the survey form. This survey was conducted after obtaining approval from the research ethics review committee, Sapporo City University, Sapporo, Japan (Approval Number is 2008-1). Informed consent to participate was indicated from the return of the survey.

The survey instrument included institutional characteristics, the number of nurses in the ICU, role of nurse in the ICU. If the ICU experienced cases involving tracheal intubation or VV-ECMO management, the number of nurses involved for the procedure was obtained.

We conducted descriptive statistics and present median (interquartile range [IQR]) for continuous variables. Analyses were performed in Stata 16.1 (StataCorp, College Station, TX).

Among the 725 included ICUs, 302 responded. The response rate was 41.7%, and 282 valid responses were obtained. There were 133 ICUs (47.2%) which admitted patients with COVID-19 requiring tracheal intubation. There were 44 (33.6%) university hospitals and 31 (23.3%) ICUs specializing in emergency medicine. The median numbers of ICU beds and ICU nurses were 10 (8–14) and 33 (25–42), respectively.

Table 1 shows the number of nurses required for patients with COVID-19 who underwent emergency tracheal intubation or had mechanical ventilation during a non-emergency situation. It also shows the number of nurses required for patients with COVID-19 who underwent VV-ECMO or circuit exchange.

In the Japanese ICU nursing care system, the units were consistently staffed to guarantee a minimum nurse-to-patient ratio of 0.5 (Shime, 2016). However, our survey revealed that more nurses were required to manage patients critically ill with COVID-19 regardless of the emergency. These findings were dependent on the ICU's structure, cohort strategies, such as using private rooms and separate areas, and the number of critically ill cases. We conclude that the at least two nurses are required to stabilize COVID-19 with mechanical

TABLE 1 The number of nurses required to care for critical COVID-19 patients with mechanical ventilation or VV-ECMO

	Median (IQR)
Mechanical ventilation, <i>n</i> = 133	
Emergency tracheal intubation, <i>n</i> = 126 ^a	3 (2–4)
Day shift, stable, <i>n</i> = 128 ^a	2 (2–2)
Night shift, stable, <i>n</i> = 128 ^a	2 (1.75–2.00)
VV-ECMO, <i>n</i> = 61	
Introduction and/or circuit exchange, <i>n</i> = 54 ^a	4 (3–4)
Day shift, stable, <i>n</i> = 54 ^a	2 (2–3)
Night shift, stable, <i>n</i> = 54 ^a	2 (2–2)

Abbreviations: COVID-19, coronavirus disease 2019; IQR, interquartile range; VV-ECMO, veno-veno extracorporeal membrane oxygenation.

^aThere were missing values.

ventilation and VV-ECMO. In emergency situations, three and four nurses were required in COVID-19 with mechanical ventilation and VV-ECMO, respectively. The number of nurses required to manage patients critically ill with COVID-19 in the ICU was inadequate to fulfill the nurse staffing requirements regulated by the existing system.

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CONFLICT OF INTEREST

The authors declare they have no competing interests.

AUTHOR CONTRIBUTIONS

All authors contributed to the study design. Miya Hamamoto, Takeshi Unoki, Mitsuhiro Tamoto, Hideaki Sakuramoto, Yusuke Kawai, Takeharu Miyamoto, Yumi Ito, and Etsuko Moro developed the survey. Miya Hamamoto, Mitsuhiro Tamoto, and Takeshi Unoki contributed to formal analysis. Miya Hamamoto and Takeshi Unoki wrote the original draft. Mitsuhiro Tamoto, Hideaki Sakuramoto, Yusuke Kawai, Takeharu Miyamoto, Yumi Ito, Junko Tatsuno, and Etsuko Moro contributed to the interpretation of the data and revised the manuscript. Osamu Nishida supervised the study. All

authors have read and approved the final version of the manuscript.

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