

# Remote Monitoring and Education in a Home Mechanical Ventilation Pilot Program

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## Introduction

Patients using home mechanical ventilation (HMV) require continuous monitoring and education. This study evaluates the effectiveness of a remote home healthcare program in managing ventilator-dependent patients through monitoring, early abnormality detection, and physician interventions.

## Methods

This retrospective study analyzed 112 patients enrolled in the HMV home healthcare pilot program in South Korea from 2020 to 2025. Patients received bimonthly remote consultations conducted by home healthcare nurses, who assessed ventilator use, monitored respiratory status, educated caregivers, and referred cases requiring medical attention.

Caregivers submitted one-minute videos showing the ventilator screen and patient condition. Nurses reviewed ventilator settings (VTe, MVe, RR, PIP, leak) and oxygenation status (SpO<sub>2</sub>, HR, EtCO<sub>2</sub>), detecting abnormalities and providing guidance. Interface fit, secretion clearance, humidification, and cough assist settings were evaluated, and caregiver education covered ventilator use, troubleshooting, and airway care. Cases needing physician intervention were reviewed.

## Results

Patient demographic characteristics are summarized in Table 1. The number of remote consultations per patient was categorized into ranges, which are detailed in Table 2.

A total of 1,766 remote consultations were conducted, with 97.8% of patients maintaining stable ventilator use. Regular monitoring reinforced safe and effective home ventilator management.

Physician Interventions (38 Cases, 2.2%)

Of all consultations, 38 cases (2.2%) required physician intervention due to ventilator abnormalities, respiratory issues, or caregiver concerns.

- 14 cases (36.8%): Low SpO<sub>2</sub>, elevated EtCO<sub>2</sub>, or ventilator alarms, requiring outpatient evaluation.
- 10 cases (26.3%): Ventilator setting adjustments for decreased VT, MV, or increased leaks.
- 9 cases (23.7%): Caregiver-initiated concerns about cough assist settings, oxygen titration, or mask replacement, leading to recommendations.
- 5 cases (13.2%): No immediate changes needed, but additional education was provided.

Remote monitoring enabled early detection of respiratory instability, reducing emergency visits and complications. Caregiver education improved confidence and adherence to ventilator management, supporting long-term home care.

Variables	Number
Age (years)	47.3 ± 21.0
Sex (male : female)	66 : 46
Diagnosis	
ALS	38
Other MND	6
SMA	6
DMD	8
MMD	9
Other muscular dystrophy	13
Brain lesion	11
Lung lesion	4
Obesity hypoventilation	5
Other and unspecified kyphosis, thoracic region	5
Others	7

Table 1. Patient demographic characteristics

Home healthcare frequency, total	1766
In 2020	100
In 2021	287
In 2022	248
In 2023	419
In 2024	605
Contact frequency range	Number of patients
1-5	31
6-10	11
11-15	27
16-20	17
21-25	2
26-30	9
31-35	3
36-40	6
41-45	5
46-50	3

Table 2. The number of remote consultations per patient

## Conclusion

This study shows that remote monitoring and education effectively support ventilator-dependent patients. Nurse-led consultations allowed early detection of abnormalities, ventilator optimization, and prevention of complications. Although only 2.2% of cases required physician intervention, timely adjustments prevented respiratory failure and hospitalizations.

Beyond medical care, continuous education empowered caregivers to manage ventilators safely, improving long-term outcomes. The program successfully combined telemonitoring and real-time feedback, ensuring stable ventilation at home.