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Sleep Disturbance in Community-Dwelling Patients Using Home Mechanical Ventilator

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Objective

In patients with respiratory distress, the mechanical ventilator is a life-sustaining treatment. In recent years, home mechanical ventilators (HMVs) have been widely used in Korea and government support has been provided, allowing caregivers to take care of patients at home. Unfortunately, patients using HMV require more attention to prevent respiratory complication and to manage the machine than those who are not. Also, the use of HMV increases the discomforts of the patients, such as sleep disorders, anxiety and unsynchronized respiration with the machine. This study is designed to investigate the current state of HMV use of community-dwelling patients and their discomforts as sleep disturbance through questionnaires.

Methods

A total of 136 patients using HMV and their caregivers answered the questionnaire. The questionnaire was composed of 2 sections about the pattern of HMV use and sleep disturbance of the patient. Depending on the item, there were missing data due to non-responders due to sensitive topics or special circumstances of the patients and family members. Items about sleep quality were analyzed the correlation between the patients using non-invasive ventilation (NIV) and those who using invasive ventilation via tracheostomy.

Results

Demographics and descriptive data are shown in Table 1. Patients were using HMV for an average of 16.73±8.76 hours a day. About two-thirds of subjects were ventilated via tracheostomy, and the others were using non-invasive ventilation with various types of interface. Only 11 (8.2%) patients answered that they experienced HMV-induce accidents less than once a month (Table 2). The average sleep time of the patients using non-invasive ventilation (NIV) and invasive ventilation were 7.41±2.85 and 7.45±1.94 hours, respectively, and showed no significant difference between 2 groups. All the subjects reported moderate to severe degree of sleep disturbance. The tracheostomy group complained more difficulty in initiating sleep than the NIV group (p=0.027). They also reported that sleep disturbance interferences their lives more severely than the other

group (p=0.044). The subjects using invasive ventilation rated their psychologic problems and discomfort due to HMV use as a disturbing factor of sleep, compared with those who are using NIV (p=0.002 and 0.010, respectively). Detailed answers of the patients are listed in Table 3.

Conclusion

In this study, we found that the patients using HMV has a moderate to severe degree of sleep disturbance. They were more disturbed by difficulties in starting sleep and daily lives due to sleep disturbances than those who are using NIV. They also reported more psychologic problems and discomforts due to HMV use.

Table 1. Demographics and analyzed data of the subjects

Variables (n=136)	Values
Sex	
Male	99 (72.8%)
Female	37 (27.2%)
Age (years)	53.82±17.49
Height (cm)	163.34±10.91
Weight (kg)	54.26±13.62
Body Mass Index (BMI)	20.18±4.31
Abdominal circumference (cm)	76.46±13.95
Diagnosis	
Neuromuscular disease	104 (76.5%)
Brain lesion	14 (10.3%)
Spinal cord injury	5 (3.7%)
Pulmonary disease	8 (5.9%)
ETC	5 (3.7%)
Marital status	
Single	37 (27.2%)
Married	93 (68.4%)
Divorced	6 (4.4%)

All parameters were analyzed using descriptive analysis except for some missing data due to some partial non-responders

Table 2. State of home mechanical ventilator use

Variables	Values
HMV usage time (hours a day) (n=133)	16.73±8.76
HMV interface	
Tracheostomy	89 (65.4%)
Nasal mask	28 (20.6%)
Full face mask	11 (8.1%)
Nasal prong	8 (5.9%)
Frequency of HMV-induced accident	
Not at all	124 (91.2%)
Less than once a month	12 (8.8%)
Once to twice a month	0 (0%)
More than once a month	0 (0%)

All parameters were analyzed using descriptive analysis except for some missing data due to partial non-responders.
HMV, home mechanical ventilator

Table 3. Sleep quality and interferences in patients according to the type of ventilator use

Items	Type of ventilator use			p-value
	Total (n=124)	Invasive (n=81)	Non-invasive (n=43)	
Sleep quality of patients				
Overall sleep time per day (hours)	7.42±2.55	7.41±2.85	7.45±1.94	0.914
Do you feel difficulty of initiating sleep?*	2.25±1.28	2.44±1.30	1.91±1.19	0.027†
Do you feel difficulty of maintaining sleep?*	2.50±1.18	2.62±1.23	2.28±1.05	0.129
Do you get up too early?*	2.30±1.29	2.39±1.28	2.14±1.30	0.304
Do you satisfy with your sleep?*	3.14±1.04	3.26±0.99	2.93±1.11	0.094
How much sleep disturbance interferes with your daily life?*	2.51±1.18	2.67±1.19	2.21±1.12	0.044†
How much do you worry about your sleep disturbance?*	2.41±1.29	2.57±1.36	2.12±1.13	0.055
What is the obstacles to your sleep?				
Psychologic problems	63 (50.8%)	49 (60.5%)	14 (17.3%)	0.002†
Discomfort due to HMV use	38 (30.6%)	31 (38.3%)	7 (8.6%)	0.010†
Frequent position change	39 (31.5%)	22 (27.2%)	17 (21.0%)	0.156
Pain from every possible source	33 (26.6%)	23 (28.4%)	10 (12.3%)	0.528
Daytime hypersomnolence	17 (13.7%)	11 (13.6%)	6 (7.4%)	0.959
Noise due to HMV use	12 (9.7%)	10 (12.3%)	2 (2.5%)	0.165

All parameters were analyzed using descriptive analysis except for some missing data due to partial non-responders. Items indicated with asterisk (*), which are Likert scale ranging from 0 (not at all) to 4(very severe), are described by Mean±SD. The items for obstacles to sleep allowed multiple responses.
HMV, home mechanical ventilator
Dagger (†) means statistically significant ($p<0.05$)