

# The Impact of Cardiovascular Disease, Inspiratory Pressure, and Hemoglobin Levels on Unplanned Readmissions of Home Ventilator Patients Prior to Discharge: A Retrospective Study

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## Background

- Unplanned readmissions, defined as unscheduled hospital returns after discharge, serve as a critical clinical quality metric. Among long-term ventilated patients, the readmission rate is notably high, ranging from **20% to 40%**. However, the pre-discharge factors influencing these unplanned readmissions remain unclear.
- Aim:
  - Investigate the characteristics and prognosis of unplanned readmissions among home ventilator users.
  - Analyze the impact of demographic characteristics, disease attributes, physiological parameters during hospitalization, respiratory care metrics, and other factors on patients' readmission at different intervals.

## Methods

- The retrospective study was conducted in a medical center in Taipei, Taiwan.
- The hospitalization data of patients from 2013.01.01~2017.12.31, were collected by using the hospital's Research Electronic Data Capture (REDCap) system.
- Institutional Review Board and Ethics Committee NTUH-REC No. (201901054RIND)

A flowchart (Figure 1) illustrates the patient selection process. Demographic variables were analyzed using descriptive statistics. HMV patients were divided into early and late unplanned hospital readmission groups based on a **30-day cutoff**, where patients readmitted within 30 days after discharge were categorized as **early readmissions**, while others were classified as **late readmissions**.

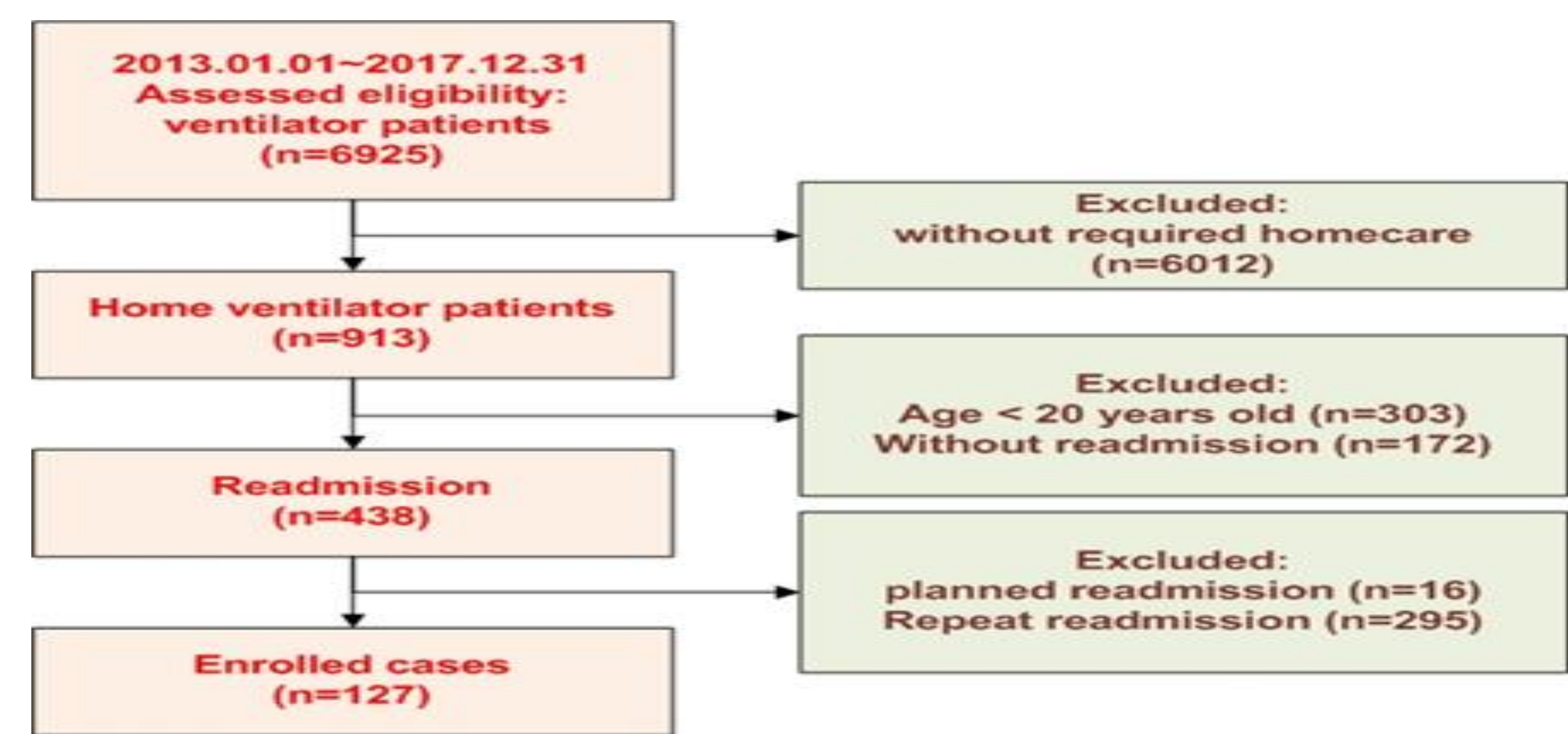


Figure 1: Flowchart of study

## Results

- Analysis of pre-discharge factors regarding demographic changes are shown in Table 1.
- Significant differences in **weight, BMI, CCI, ventilator days, and admission days** were observed between early and late unplanned readmission groups.
  - Notably, unplanned readmissions occurred, on average, **15 days** after discharge.

**Table 1 Demographics and characteristics changes of home ventilated patients with unplanned hospital readmission.**

Variables	Interval day of unplanned hospital readmission		P-value
	≤30 days	≥ 31 days	
Number	42	85	
Gender <sup>a</sup>			
Man	16 (38.1%)	43 (50.6%)	0.184
Female	26 (61.9%)	42 (49.4%)	
Age <sup>b</sup>	69.9 ± 21.3 (20.3 ~ 96.3)	68.9 ± 19.2 (20.0 ~ 92.6)	0.797
Height (cm) <sup>b</sup>	158.3 ± 8.6 (140.0~175.0)	159.7 ± 9.3 (139.0 ~ 78.0)	0.417
Weight (kgw) <sup>b</sup>	52.0 ± 16.2 (29.0 ~ 121.0)	59.4 ± 17.7 (26.0 ~ 118.0)	0.024*
BMI (kg/m <sup>2</sup> ) <sup>b</sup>	20.8 ± 5.8 (10.0 ~ 40.9)	23.3 ± 6.4 (10.8 ~ 46.2)	0.036*
Obesity <sup>a</sup>			
Normal	20 (48.2%)	41 (48.0%)	0.051
Underweight	13 (12.9%)	11 (18.9%)	
Overweight	5 (16.5%)	14 (15.0%)	
Obese	4 (9.5%)	19 (22.4%)	
Education level <sup>a</sup>			
Illiterate or elementary school	16 (38.1%)	33 (38.8%)	0.929
Junior high school	3 (7.1%)	9 (10.6%)	
Senior high school	7 (16.7%)	13 (15.3%)	
College or above	16 (38.1%)	30 (35.3%)	
Charlson comorbidity index <sup>b</sup>	2.9 ± 2.2 (0~7)	1.7 ± 1.5 (0~6)	0.000*
Ventilator days <sup>b</sup>	81.4 ± 78.8 (2~432)	47.5 ± 36.6 (6~163)	0.001*
Admission days <sup>b</sup>	88.1 ± 77.5 (2~432)	51.9 ± 39.9 (2~178)	0.001*
Interval days after discharge <sup>b</sup>	15.1 ± 9.2 (2~30)	164.8 ± 143.2 (31~813)	<0.001*

a : number (percentage), chi-square test; b : mean±SD, (minimal ~maximal), independent T test; \*p<0.05: significantly different

- In the **Multivariate logistic regression analysis** (Table 2). Key findings:
- P<sub>lmax</sub> ≥ 30 cmH<sub>2</sub>O** associated with lower 30-day readmission risk (OR: 0.207) compared to P<sub>lmax</sub> < 30 cmH<sub>2</sub>O.
  - Hemoglobin levels ≥ 10.1g/dL** linked to reduced 30-day readmission risk (OR: 0.280) compared to levels <10.1g/dL.
  - Patients with chronic cardiovascular disease** had notably higher 30-day readmission risk (OR: 4.535) compared to those without.

**Table 2 Multivariate logistic regression analysis for the significant risk factors.**

Variables	B	SE	OR	95% CI		P-value
				Lower limit	Upper limit	
P <sub>lmax</sub>	-1.575	0.668	0.207	0.056	0.767	0.018*
Hemoglobin	-1.272	0.627	0.280	0.082	0.958	0.043*
Cardiovascular diseases	1.512	0.656	4.535	1.253	16.413	0.021*

In the multivariate logistic regression model, Abbreviations: B: regression coefficient, SE: standard error, OR: odds ratio.

## Conclusion

- This study represents the first exploration of pre-discharge factors associated with unplanned readmission among home mechanical ventilation (HMV) patients in Taiwan.
- Significantly, our findings emphasize the critical role of **inspiratory muscle strength, hemoglobin levels, and the persistence of chronic cardiovascular** issues as predictive factors for unplanned readmissions.
- Addressing and managing these identified factors pre-discharge can substantially contribute to minimizing the occurrence of unplanned hospital readmissions in the HMV patient population.

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## Disclosures

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