



# Relationship Between Weight Loss, Mechanical Ventilation, and Dysphagia Severity in ICU Patients

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## Introduction

Dysphagia is a common and potentially serious complication in patients who are hospitalized in the intensive care unit (ICU). This study aimed to investigate the relationship between weight changes, mechanical ventilation (MV) characteristics, and the severity of dysphagia in ICU patients.

## Methods

- **Study design and setting** : retrospective observational study, 2021 - 2024, single tertiary institute
- **Inclusion criteria** : underwent VFSS due to dysphagia symptoms within 6 months of ICU admission
- **VFSS protocol**

- 1) semisolid (International Dysphagia Diet Standardisation Initiative [IDDSI] 3, 1 spoon)
- 2) semisolid (IDDSI 2, 1 spoon)
- 3) sesame porridge (IDDSI 4, 1 spoon)
- 4) small liquid (IDDSI 0, 5 mL)
- 5) large liquid (IDDSI 0, 15 mL)

\* If a serious aspiration event without cough reflex occurred, the VFSS was ceased in that step.

- **Demographic data**

- 1) body mass index (BMI)
- 2) mechanical ventilation (MV) duration and type
- 3) body weight changes (admission weight - VFSS weight)
- 4) body weight change ratio (calculated as [body weight change / body weight at admission] × 100)

- **Outcome measures**

- 1) **Videofluoroscopic Dysphagia Scale (VDS)** : The severity of swallowing problem, which ranges from 0 to 100
- 2) **Penetration-Aspiration Scale (PAS)** : The severity of aspiration

## Results

### 1. Basic Characteristics

A total of 20 patients were included in the analysis. The causes of ICU admission were as follows: respiratory (35%), cardiac (15%), cardiac surgery (20%), non-cardiac surgery (15%), and other causes (15%). The mean age of patients was 70.5 years, and the average ICU stay was 19.9 days. The mean body weight change was -3.8 kg (-4.9%). Most patients (95%) required mechanical ventilation (MV), with 55% receiving endotracheal intubation and 40% undergoing tracheostomy (Table 1).

### 2. VFSS analysis

the mean total VDS score was  $33.4 \pm 24.4$ , and 45% of patients experienced aspiration (Table 2). The VDS subitems revealed that the pharyngeal phase (including factors like vallecular residue, laryngeal elevation, and pyriform sinus residue) was most affected. Weight loss was associated with higher VDS pharyngeal phase scores ( $r=-0.44$ ,  $p = 0.054$ ) (Figure 1).

**Table 2. Videofluoroscopic study data**

| Variables                              | Included Patients (N = 20) |
|--|----------------------------|
| <b>VDS subitems - oral phase</b>       |                            |
| Lip closure                            | 0.1 ± 0.4                  |
| Bolus formation                        | 1.2 ± 1.8                  |
| Mastication                            | 1.0 ± 2.2                  |
| Apraxia                                | 1.4 ± 1.4                  |
| Tongue to palate contact               | 0.8 ± 2.4                  |
| Premature bolus loss                   | 0.7 ± 1.1                  |
| Oral transit time                      | 1.6 ± 1.5                  |
| <b>VDS subitems - pharyngeal phase</b> |                            |
| Triggering of pharyngeal swallow       | 4.5 ± 0.0                  |
| Vallecular residue                     | 2.3 ± 1.5                  |
| Laryngeal elevation                    | 2.7 ± 4.2                  |
| Pyriform sinus residue                 | 3.8 ± 4.2                  |
| Coating of pharyngeal wall             | 5.8 ± 4.4                  |
| Pharyngeal transit time                | 1.2 ± 2.5                  |
| Aspiration                             | 6.3 ± 5.7                  |
| <b>VDS subtotal score</b>              |                            |
| VDS, oral phase subscore               | 9.6 ± 14.3                 |
| VDS, pharyngeal phase subscore         | 26.6 ± 17.9                |
| <b>VDS, total score</b>                |                            |
| VDS, total score                       | 33.4 ± 24.4                |
| <b>PAS score</b>                       |                            |
| PAS score                              | 4.1 ± 3.0                  |

PAS penetration aspiration scale; VDS, videofluoroscopic dysphagia scale

**Table 1. Patient demographic and basic characteristics**

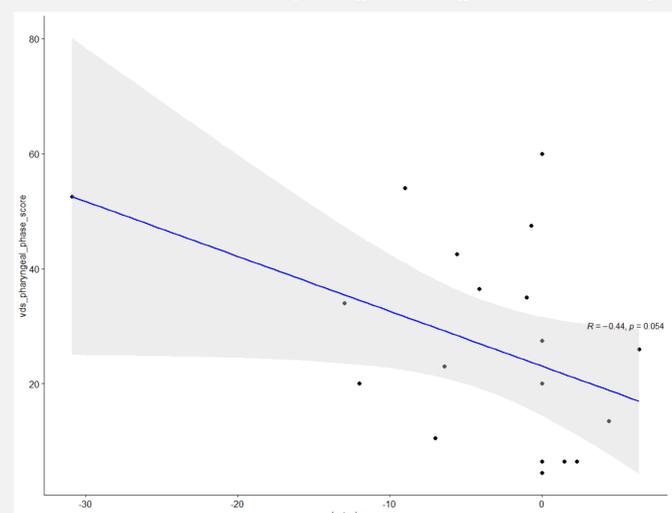
| Variables                                | Included Patients (N = 20) |
|--|----------------------------|
| Age, years                               | 70.5 ± 15.5                |
| Sex, male                                | 12 (60.0%)                 |
| BMI, kg/m <sup>2</sup>                   | 21.6 ± 3.2                 |
| ICU stay, days                           | 19.9 ± 18.5                |
| Hospital stay, days                      | 47.4 ± 29.2                |
| Time to VFSS, days                       | 10.4 ± 8.9                 |
| Cause of ICU admission                   |                            |
| - Respiratory                            | 7 (35.0%)                  |
| - Cardiac                                | 3 (15.0%)                  |
| - Surgery (cardiac)                      | 4 (20.0%)                  |
| - Surgery (non-cardiac)                  | 3 (15.0%)                  |
| - Others                                 | 3 (15.0%)                  |
| MV duration, days                        | 18.8 ± 20.0                |
| MV type                                  |                            |
| - No                                     | 1 (5.0%)                   |
| - Endotracheal tube                      | 11 (55.0%)                 |
| - Tracheostomy                           | 8 (40.0%)                  |
| Body weight at admission, kg             | 60.6 ± 12.2                |
| Body weight at VFSS, kg                  | 56.8 ± 9.4                 |
| Body weight change, <sup>a</sup> kg      | -3.8 ± 8.2                 |
| Body weight change ratio, <sup>b</sup> % | -4.9 ± 11.5                |
| Diet before VFSS                         |                            |
| - L-tube                                 | 13 (65.0%)                 |
| - NPO                                    | 3 (15.0%)                  |
| - Oral diet                              | 4 (20.0%)                  |
| Aspiration, yes                          | 9 (45.0%)                  |

<sup>a</sup> body weight at admission - body weight at VFSS

<sup>b</sup> (body weight change / body weight at admission) × 100

BMI, body mass index; ICU, intensive care unit; MV, mechanical ventilation; VFSS videofluoroscopic study

**Figure 1. Correlation Between Body Weight Change and VDS Pharyngeal Score**



## Conclusion

This study found that significant weight loss in ICU patients might be associated with more severe dysphagia, particularly in the pharyngeal phase. Given the high prevalence of dysphagia and aspiration in this population, early nutritional intervention and swallowing rehabilitation strategies should be considered critical components of care to improve outcomes, reduce complications such as aspiration pneumonia, and support better recovery during and after ICU admission.