

Esophageal balloon catheter

Insertion and correct placement

Esophageal pressure measurement is available on the HAMILTON-G5/S1 and the HAMILTON-C6 ventilators. This User Guide describes the use of NutriVent and Cooper Surgical esophageal balloon catheters. Instructions vary depending on the catheter type.

While the information contained herein is believed to be accurate, it does not represent an official recommendation from Hamilton Medical, nor may it substitute an opinion, assessment, or instructions provided by a trained healthcare professional.

Step 1: Before you start

1. Unpack the catheter and connect the 3-way stopcock directly to the esophageal catheter.
2. Inflate the balloon with a large volume (*NutriVent*: 6 ml, *Cooper*: 3 ml).
Check the balloon's integrity and tightness by applying gentle pressure to the balloon with your fingers.
3. To estimate the length of catheter to be inserted, measure the distance from the xyphoid, across the tip of the earlobe to the tip of the nose. Measurement starts from the end of the balloon.
4. *NutriVent*: Insert the guide wire into the gastric line (blue connector). Be sure to lubricate the guide wire before inserting it into the catheter.
5. Check the ventilator display and make sure the esophageal pressure waveform shows $Pes = 0 \pm 0.5$ cmH₂O to avoid a technical misreading of the value.
6. Connect the ventilator connection line to the ventilator Pes (or Paux/Pes) port.
7. Place the patient in a semi-recumbent position for easier and more accurate placement.
8. Consider applying lubricant to the tip of the catheter, if appropriate.

Step 2: Insert the catheter

- ▶ Carefully insert the catheter either transnasally or transorally to a depth of about 50–60 cm to position the balloon inside the stomach. If you feel resistance during insertion, pause and then continue by slightly turning the catheter.

Step 3: Inflate the balloon

1. Connect the stopcock of the catheter to the ventilator connection line.
2. Actively deflate the balloon with the syringe to ensure the balloon is completely deflated.
3. To equalize the system to the ambient pressure, remove the syringe, and open the stopcock to the ventilator and balloon; keep it open during inflation.
4. *NutriVent*: Inflate the balloon with 6 ml, then remove 2 ml. **4 ml remain.**
Cooper: Inflate the balloon with 3 ml, then remove 2 ml. **1 ml remains.**
5. Close the stopcock to the syringe.
6. Change the timescale of the real-time waveforms to 60 seconds resolution (66 seconds on HAMILTON-C6).

Step 4: Position the catheter

ACTIVE PATIENT

- ▶ Slowly withdraw the catheter until a negative pressure deflection replaces the positive deflection, and cardiac oscillations appear on the Pes waveform.

The presence of a positive pressure deflection during spontaneous inspiration generally indicates that the balloon is in the stomach.

PASSIVE PATIENT

- ▶ Withdraw the catheter gently until cardiac oscillations appear on the Pes waveform. A significant variance in baseline pressure of Pes means a change in position from abdomen to chest.



Step 5: Validate the measurement

- ▶ Perform a dynamic occlusion test during an expiratory hold maneuver.

- ▶ Compare the negative deflections of airway and esophageal pressures during 3–5 spontaneous breathing efforts.

- ▶ Compare the positive deflections of airway and esophageal pressure during gentle external chest compressions (squeezes).

The Pes and Paw waveforms display similar changes if the catheter is positioned correctly. The acceptable deviation from a 1:1 Δ Pes: Δ Paw ratio during the occlusion test is 20%. This equals a range of 0.8–1.2. The Ptranslum waveform should show no significant deflection during the occlusion test.



Step 6: Securing the catheter

1. Affix the catheter to the patient's nose with medical tape.
2. *NutriVent*: Carefully remove the guide wire and close the cover caps of the gastric line.
Cooper:
 - a. Deflate the esophageal balloon.
 - b. Carefully remove the guide wire and the Y-piece.
 - c. Reconnect the 3-way stopcock, and inflate the balloon with 3 ml, then remove 2 ml.
 - d. Close the stopcock to the syringe.



1. Progressively withdraw the catheter, 3–5 cm at a time, until the cardiac oscillations are less visible and the balloon is closer to the middle part of the esophagus.
2. Repeat Step 5 and validate the measurement.



Step 6: Advanced approach

As an advanced approach, consider titrating the optimal balloon filling volume.

