Critical Contact
NIV mask fitting workshop

Therapeutic Care
October 2018
Learning objectives

• Understand the components for performing optimal NIV
• Understand the different NIV mask options and how to select the right mask
• Properly fit the patient with a Philips Respironics mask

“There is arguably more evidence to support the use of noninvasive ventilation (NIV) than any other practice related to the care of patients with acute respiratory failure”

How can you achieve optimal NIV?
Optimal NIV

• Definition
  – Appropriately selected patient
  – Proper delivery system
  – Skilled clinician

• Delivery system
  – Equipment that works together
    • Dedicated vent with leak compensation, Auto-Trak, monitoring, FiO$_2$, Alarms
    • Active humidification with circuit
    • Masks and elbows

Addala, D and Shrimanker, R and Davies, MG. 2017. “Non-invasive ventilation: initiation and initial management”. British Journal of Hospital Medicine. 78(9): C140-C144
A complete system

- Our V60, masks and circuits were designed to work together, as a complete system.
- When using our system, patient leak can be calculated and displayed.
V60 with Auto-Trak

- Successful NIV with Auto-Trak
  - Auto-adaptive leak compensation
  - Auto-adaptive inspiratory triggering
  - Auto-adaptive expiratory cycling

Auto-Trak technology improves patient-ventilator synchrony by automatically adapting to changing breathing patterns and dynamic leaks.
Mask settings

- The arrows can be used to select desired Mask Leak symbol. Choose from:
  - E/T Trach
  - Philips Respironics Masks — select Mask
    - L1
    - L2
    - L3
    - L4
  - Other for non-Philips Masks
- The Accept button applies this action

Watch the video clip demonstrating EE function
Mask and exhalation port selection
Mask selection considerations

<table>
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<tr>
<th>Comparison</th>
<th>Total face</th>
<th>Oro-nasal</th>
<th>Nasal</th>
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<td>Immediate ventilation required</td>
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<tr>
<td>Mouth breather</td>
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<td>Facial abnormalities</td>
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<td>Lack of teeth</td>
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<td>Eye irritation</td>
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<td>Mouth access</td>
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<td>Long term NPPV</td>
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Port settings

• Use the arrows to select the desired exhalation port setting
• Use the Accept button to select that action
• Choices include:
  - Philips Respironics Whisper Swivel
  - Philips Respironics Disposable Exhalation Port
  - Philips Respironics Plateau Exhalation Valve
  - When using a Non-Philips Respironics exhalation device, select other
  - When no exhalation device is present, select None
Filtered disposable exhalation port (FEP)

- Intentional leak
- Single use, fixed orifice variable flow
- The FEP shown here is an alternate exhalation port with quieter flushing and with filtration capabilities when adding an approved filter

Note: A minimum EPAP of 4cmH₂O is supplied with V60 to ensure sufficient CO₂ flushing.
Filtered exhalation port

- Allows NIV treatment of patients that may be contagious
- The quiet DEP has eleven small vent holes which improve the noise characteristic of the DEP
- Tubing swivel at the port/tubing junction allows directional control of exhaled gas and in a direction away from the caregiver
Philips whisper swivel

- Intentional leak
- Fixed orifice with a variable flow.
  Note: A minimum EPAP of 4 cmH$_2$O is supplied with V60 to allow sufficient CO$_2$ flushing in single limb circuit
- Multiple patient use exhalation port that provides a continuous leak path
- A proximal line port must be connected to the mask or added connector for use with the V60
Plateau exhalation valve (PEV)

- Intentional leak
- Reusable exhalation port for use with integrated proximal pressure port
- Variable orifice with fixed flow which provides higher leak than fixed orifices (DEP or Whisper Swivel) at low expiratory pressures that will aid in flushing CO₂ if there is a concern for rebreathing
Comparison of exhalation port performance

Leak Flow Rate vs Circuit Pressure of the Disposable Exhalation Port, Whisper Swivel and PEV.

The PEV leak rate is higher than fixed orifices (DEP or Whisper Swivel) at lower expiratory pressures, which will aid in flushing CO₂ if there is concern for rebreathing.

Selecting breathing circuits
Select breathing circuit components

- Heated wire humidification
- Heated passover humidification
- No humidification
AARC clinical practice guidelines

“While there is not clear consensus on whether or not additional heat and humidity are always necessary when the upper airway is not by-passed, such as in noninvasive mechanical ventilation (NIV), active humidification is highly suggested to improve comfort.”

- Humidification of inspired gas during mechanical ventilation is mandatory when an endotracheal or tracheostomy tube is present, but optional with NIV.
- Use of an HME is contraindicated in patients on NIV with large mask leaks, as the patient does not exhale enough tidal volume to replenish heat and moisture to adequately condition the inspired gas.
- Active humidification is suggested for NIV, as it may improve adherence and comfort.
- Passive humidification is not recommended for NIV.

Heated wire humidification

Component key

1. Mandatory main flow bacteria filter
2. Heated wire circuit
3. Exhalation port
4. Proximal pressure line
Heated passover humidification

Component key

1. Mandatory main flow bacteria filter
2. Heated passover humidification
3. Exhalation port
4. Proximal pressure line
No humidification

Component key

1. Mandatory main flow bacteria filter
2. Optional exhalation port filter
3. Exhalation port
4. Proximal pressure line

Note: For NIV use of <2 hours, humidification may not be needed, however, humidification is known to improve patient comfort and secretion mobilization.

Restrepo, R., Walsh, B. Humidification during invasive and noninvasive mechanical ventilation. Respiratory Care. May 1, 2012. Vol. 57 no.5 782-788..
Mask rotation has been proven to decrease skin breakdown by varying the pressure points on the skin. Alternating cushions on the Philips AF541 mask offloads pressure points on the skin to better support your mask rotation strategies.

Selecting the right fit
Facial landmarks

Mask fitting landmarks

a. Sides of mouth
b. Sides of nostrils
c. Bridge of nose
d. Below the nose tip, above the lip
e. Below the lower lip
f. Forehead
g. Cheekbones
AF531 sizing gauge
AF541 sizing gauge

Sizing for the UTN

Sizing for the OTN
Sizing the under-the-nose cushion

To measure the size of the under-the-nose cushion:

1. Place the sizing guide directly under the nares slightly touching the cheeks
2. Note the size as A, B, or C
Sizing the over-the-nose cushion

To measure the size of the over-the-nose cushion:

1. Have the patient slightly open his or her mouth
2. Place the top of the sizing gauge on the bridge of the nose
3. Fix the lower part of the gauge in the hollow crease under the lower lip
4. Note the mark that is aligned to the hollow crease
Achieving the right fit

Fitting the **over-the-nose cushion** with CapStrap headgear

1. Use the sizing guide to identify the correct over-the-nose cushion
2. Assemble cushion onto mask frame, attach to the CapStrap, and place on top of the patient’s head
3. Bring mask down to cover the patient’s nose and mouth
4. Attach the talon clips to the mask

Available sizes: over-the-nose (S, M, L, XL); under-the-nose (A, B, C)

- With patient mouth slightly open, line up the crease between the lip and the chin to define the right size
- Tilt the mask away from the face to position headgear on the crown of the head
- Press and hold the forehead adjuster button to slide the frame toward/away from the face to manage leaks and maximize comfort
- Face the patient, adjust both top headgear straps at the same time
- Repeat with bottom straps
- Then adjust crown strap at the back

5. Connect the mask to the patient circuit disposable exhalation port (DEP)
6. Ensure the mask is comfortable on the face
7. With your patient at a 45-degree incline, continue noninvasive ventilation, instructing the patient to breathe normally
8. Continue to assess the patient for skin irritation
- The bottom of the cushion should rest just above the chin with the mouth slightly open
- Continue to monitor for patient comfort

Fitting the **under-the-nose cushion** with CapStrap headgear

1. Grasp the sides of the over-the-nose cushion
2. Use the sizing gauge to identify the correct under-the-nose cushion
3. Hold sides of under-the-nose cushion and push it onto the mask frame
4. Remember that the bottom of the cushion should rest just above the chin with the mouth slightly open

- Remove it from mask frame
- Place it in its Clean Clip Shell for future use
- Follow steps 2 – 8 above to fit the under-the-nose cushion
- The cushion should rest under the patient’s nose (never over the patient’s nose)
Mask Fitting
Nasal Mask

1. Always use a sizing gauge.
2. Place the bottom of the mask below the point of the nose, just above the upper lip (c).
3. The mask cushion should cover the nose and rest on the outer edges of the nares (a).
4. Make sure the mask is not sitting on top of the lip (b). Stabilize the mask and bring it upward until it rests at the bridge of the nose. Secure the headstrap.
Mask fitting
Nasal Mask

Mask fitting and headgear adjustment

A. Bottom strap too tight: *Leaks into eyes, top lip irritation*

B. Correctly placed

C. Top strap too tight: *Leaks at mouth*
Mask Fitting
Oro-Nasal Mask

Where possible, two people are better at fitting the mask

1. Always use a sizing gauge. Size with mouth slightly open

2. Coach patient and explain each step. Do not place too high on bridge of nose. Start with headgear at largest setting.

3. Connect to ventilator at low pressure levels. Adjust upper and lower straps together for a snug fit (upper straps first). Do no overtighten. Slip two fingers underneath straps to check.

4. When fitted, check for leaks. Adjust the forehead arm as appropriate. Some air leaking is normal. If there are excessive air leaks, adjust.

5. Reposition mask if necessary by gently pulling the cushion away from nose and then back to initial fit. Mask should “float” on face. Rotate masks when necessary. Most common mistake is over-tightening the headgear.
Air leak guidelines

- Monitor and check the mask periodically
- Assess interface for patient comfort and excessive leaks.
- The patient may pull on the mask or inadvertently move the mask out of place, which could result in increased leak and decreased tidal volume.
- Ventilators that provide leak compensation allow the clinician to apply less pressure to the patient’s face.
Mask options
Considerations for mask selection

Did you know?

Up to 37.5% of NIV failures are related to the mask intolerance and discomfort\(^6\)

Mask rotation has been proven to decrease skin breakdown by varying the pressure points on the skin.

Alternating cushions on the Philips AF541 mask offloads pressure points on the skin to support mask rotation.

Oro-nasal mask

Advantages
• Few air leaks
• Little co-operation required
• Can be adjusted for comfort

Disadvantages
• Vomiting
• Claustrophobia
• Makes speaking and coughing difficult
• Patient discomfort.

Oro-Nasal masks
AF531
AF541
PerformaTrak
AF811
AF421
AF531 Oro-Nasal Mask

- CapStrap headgear provides an excellent fit and simple reapplication
- Supports your infection control efforts with the CleanClip system
- Adapts to multiple ventilators with interchangeable elbows
AF541 Oro-Nasal Mask

• Allows alternation between over-the-nose and under-the-nose cushions which offloads skin pressure points and supports mask rotation strategies
• Push-button forehead pad adjustment, CapStrap headgear, and snap-in-place elbows and talon clips contribute to efficient workflow
• Discharge kit configures mask to work with home NIV systems
Adjustable forehead support

- Adjustable forehead support minimizes mask force on bridge of nose while maintaining effective seal
- Uses dual-density forehead pads for patient comfort and mask stability.
- Dependable fit gives patients an easy and sensible full face mask option.
AF811 Gel Mask

• Cushion uses a gel pad with a silicone flap for increased comfort
• CapStrap headgear system simplifies mask application and routine patient care
• Available in three sizes to fit a wide patient population
• Sizing gauge on packaging and size indicator on mask
AF421 Oro-Nasal Mask

• Supports your infection control efforts with CleanClip
• Oral access feature for oral care
• Leak symbols for ease of ventilator setup
• Available with EE leak 1, SE standard elbow, and EE leak 2 elbow for wide ventilator application
• Available in four sizes to fit a wide patient population
Total face mask

Advantages
• Minimum air leaks
• Little co-operation required
• Easy fitting and application

Disadvantages
• Vomiting (risk of aspiration)
• Claustrophobia
• Makes speaking difficult

Total face masks
PerforMax
• Pediatric
• Adult
PerforMax

- Need for immediate ventilation
- Claustrophobic patient
  - Optical grade plastic provides a clear unobstructed view
- Patient comfort - no nasal bridge pressure points
- Also available in a pediatric version
Nasal mask (covers nose and not mouth)

Advantages
• Possibility of speaking and drinking
• Allows coughing
• Reduces danger associated with vomiting

Disadvantages
• Air leaks if mouth open
• Possible nasal skin damage
• Nasal passage must not be blocked

* Nasal masks may be more appropriate in non-acute patients, especially during the first few hours of ventilation

Nasal masks

- Contour Deluxe
- AP111
- PN841
Contour Deluxe

- Dual-density foam forehead pads provide patient comfort and mask stability
- With only three sizes, clinicians can quickly fit a wide range of patients
- Hook-n-loop grab tabs allow quick, easy removal and adjustment of headgear
AP111 nasal interface

- Ideal for chronically ill patients in respiratory distress who may prefer a noninvasive ventilation interface as comfortable and unobtrusive as what they use at home
- Cushions sit below the nares and above the lip
PN841

- A convenient leak correction dial, child-friendly fabric patterns, and a range of sizes provide a positive experience for pediatric patients.
- Cushion, frame, and headgear specifically designed for the specific sizing and bone structure of pediatric patients.
Customer success story

LeBonheur Children's Hospital and Philips team-up to enhance care for pediatric NIV (noninvasive ventilation) patients.

View the full story on YouTube
LeBonheur Children’s Hospital

Results from case studies are not predictive of results in other cases. Results in other cases may vary.
Specialized elbows
Accessories
Other devices
Specialized elbows

- Bronchoscopy elbow
  - Provides NIV ventilation during bronchoscopy procedures
- NIVO aerosol elbow
  - Provides concentrated aerosol delivery within a mask
CapStrap

• Provides excellent stability and simplifies initial setup by keeping the mask in place while adjusting patient’s straps
• Allows for quick removal and simple re-application during oral care and medication delivery
• Available on several Philips masks:
  – AF541
  – AF531
  – AF811
  – PerformaTrak
CapStrap benefits

- Switch from Over The Nose (OTN) AF541 to Under The Nose (UTN) AF541 cushion
- Interchangeable CapStrap headgear stays on the patient’s head
- Remove OTN AF541 cushion and snap on UTN AF541 cushion
Clean Clip shell and Clean Clip sidecar

Clean Clip shell
- Hold your Philips mask during mask rotation, oral care, or a break in therapy

Clean Clip sidecar
- Docking station for interchangeable cushions during mask rotation
Keys to success
Manage airflow and pressure-related complications

<table>
<thead>
<tr>
<th>Adverse effect</th>
<th>Remedy</th>
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<tbody>
<tr>
<td>Nasal congestion</td>
<td>Try humidification or speak to the physician for various remedies to assist with this problem</td>
</tr>
<tr>
<td>Nasal or oral dryness</td>
<td>Add humidification, nasal saline, oral/nasal hygiene, or decrease leak</td>
</tr>
<tr>
<td>Sinus or ear pain</td>
<td>Lower inspiratory pressure</td>
</tr>
<tr>
<td>Gastric inflation</td>
<td>Avoid excessive inspiratory pressures (over 20 cmH₂O)</td>
</tr>
<tr>
<td>Eye irritation</td>
<td>Check mask fit, readjust bottom headgear straps</td>
</tr>
<tr>
<td>Failure to ventilate</td>
<td>Use sufficient pressures, optimize patient-ventilator synchrony</td>
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## Manage mask-related complications

<table>
<thead>
<tr>
<th>Adverse effect</th>
<th>Remedy</th>
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</thead>
<tbody>
<tr>
<td>Discomfort</td>
<td>Check fit, adjust straps, change mask</td>
</tr>
<tr>
<td>Excessive air leaks</td>
<td>Realign mask, check strap tension, change to full face mask</td>
</tr>
<tr>
<td>Nasal bridge redness or ulceration</td>
<td>Use artificial skin, minimize strap tension, use spacer, alternate</td>
</tr>
<tr>
<td></td>
<td>mask or use a PerforMax or Total face mask</td>
</tr>
<tr>
<td>Skin irritation or rashes</td>
<td>Use skin barrier lotion and/or topical corticosteroids, change to mask</td>
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<td></td>
<td>made from a different material, properly clean mask</td>
</tr>
<tr>
<td>Claustrophobic reactions</td>
<td>Try nasal mask or PerforMax or Total face mask, sedate judiciously</td>
</tr>
</tbody>
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Best practices

Saving Face
Strategies to reduce skin breakdown during NIV for patient care
Summary of Optimal NIV

Should be able to define
- Right patient
- Right equipment
- Right mask/fit

Complete System
- Equipment that works together
- Dedicated vent with leak compensation, Auto-Trak, monitoring, FiO2, Alarms
- Circuit with humidification
- Masks and elbows
Click to view the bibliography