Critical Contact
NIV mask fitting workshop

Therapeutic Care
October 2018

innovation you

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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"

Hess, D. (2011). Patient-Ventilator Interaction During Noninvasive Ventilation. Respir. Care, 56(2), 153167.

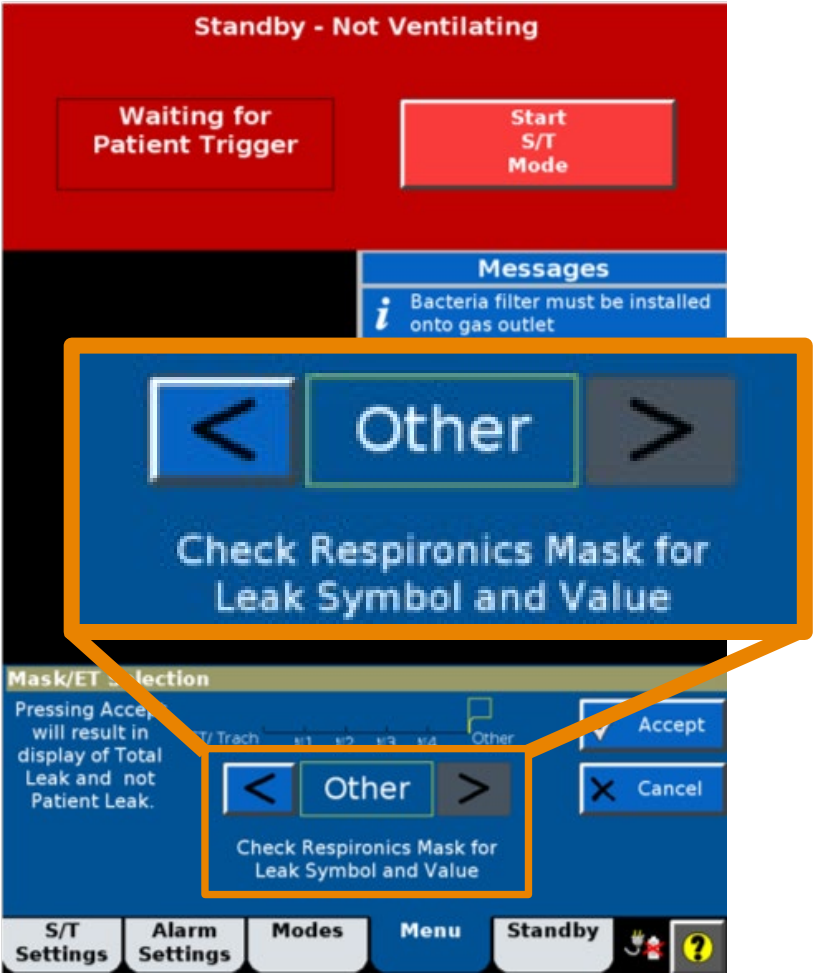
How can you achieve optimal NIV?

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

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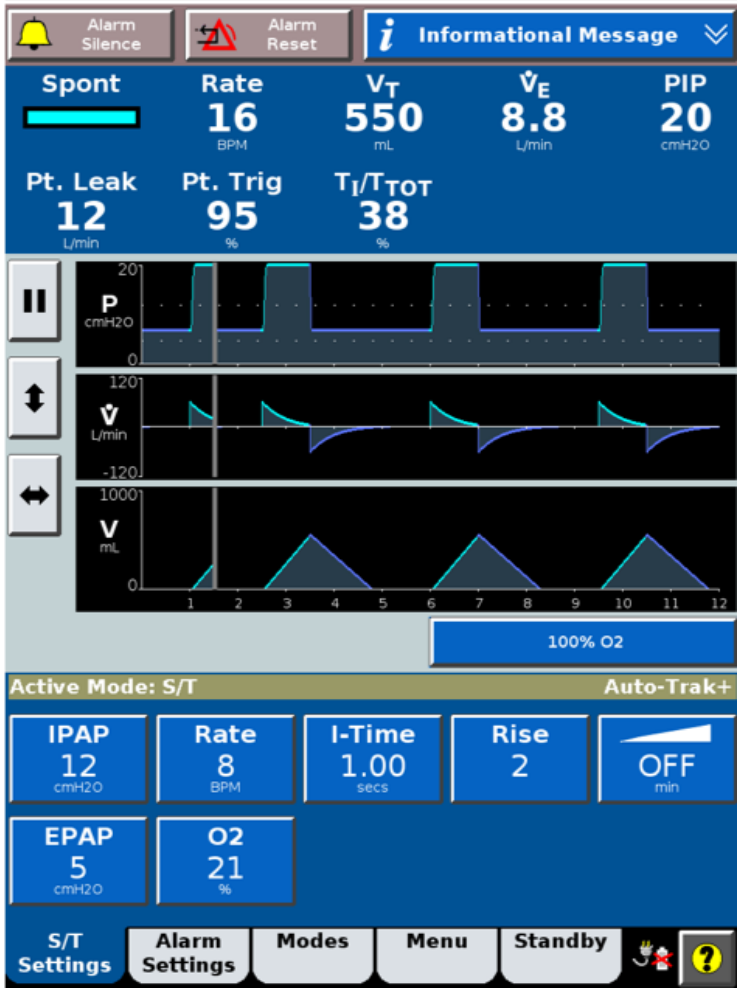
V60 with Auto-Trak

- 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.



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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

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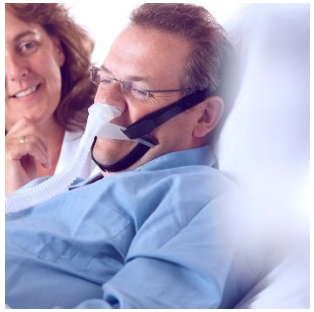
Mask and exhalation port selection

Mask selection considerations



Comparison	Total face	Oro-nasal	Nasal
Immediate ventilation required	▮	▮	
Mouth breather	▮	▮	
Claustrophobia/anxiety	▮		
Facial abnormalities	▮		▮
Lack of teeth	▮		
Eye irritation	▮		
Mouth access			▮
Long term NPPV		▮	▮

Le Jemtel, T., Padeletti, M., & Jelic, S. (2007). Diagnostic and therapeutic challenges in patients with coexistent Chronic Obstructive Pulmonary Disease and Chronic Heart Failure. JACC, 49(2), 171180.

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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:

Whisper Swivel — Philips Respironics Whisper Swivel

DEP — Philips Respironics Disposable Exhalation Port

PEV — Philips Respironics Plateau Exhalation Valve

Other — When using a Non-Philips Respironics exhalation device, select other

None — When no exhalation device is present, select None

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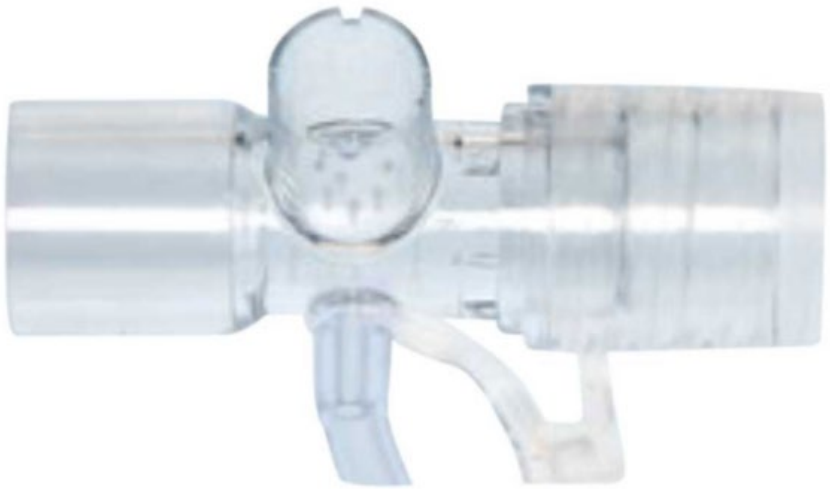

Filtered disposable exhalation port (FEP)

- 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 4cmH_2O is supplied with V60 to ensure sufficient CO_2 flushing.

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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

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Philips whisper swivel

- Intentional leak
- Fixed orifice with a variable flow.
  Note: A minimum EPAP of 4 cmH_2O 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

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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 CO_2 if there is a concern for rebreathing

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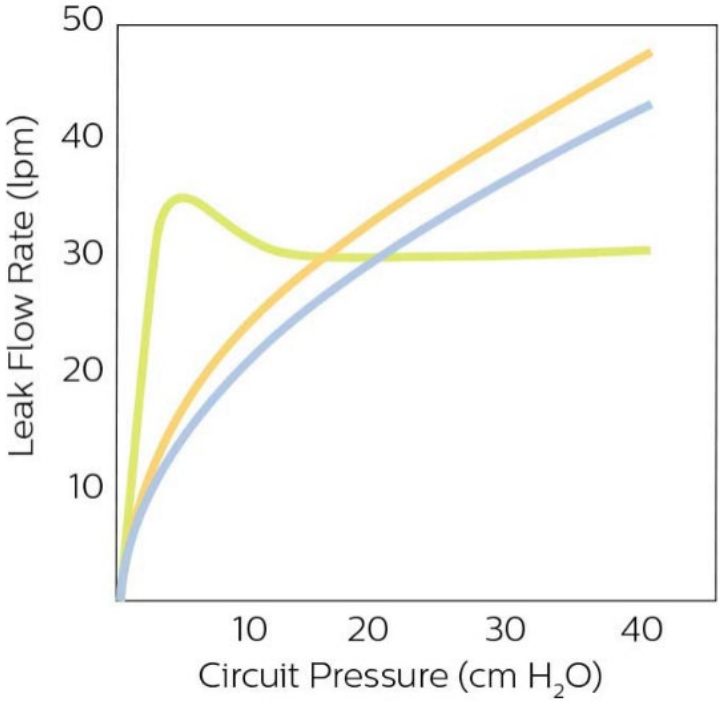
Comparison of exhalation port performance



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 CO_2 if there is concern for rebreathing

- Philips Whisper Swivel
- Disposable Exhalation Port (DEP)
- Plateau Exhalation Valve (PEV)

Ferguson, G., & Gilmartin, M. (1995). CO2 Rebreathing during BiPAP Ventilatory Assistance. AM. J. Respir. Crit. CAre. MEd., 151(4), 1126-35.

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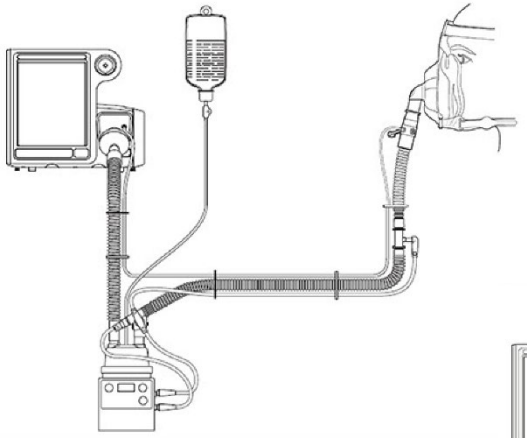
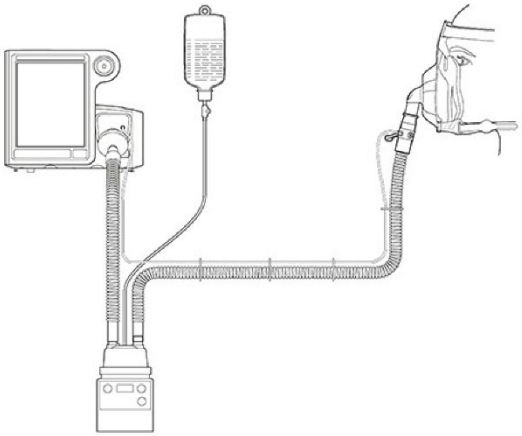
Selecting breathing circuits

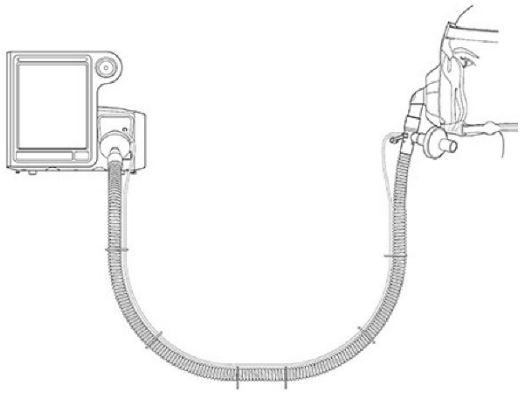
Select breathing circuit components



Heated wire humidification



Heated passover humidification



No humidification

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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.

Resptrepo, R., & Walsh, B. (2012). Humidification During Invasive and Noninvasive Mechanical Ventilation. Respir. Care, 57(5), 782-788

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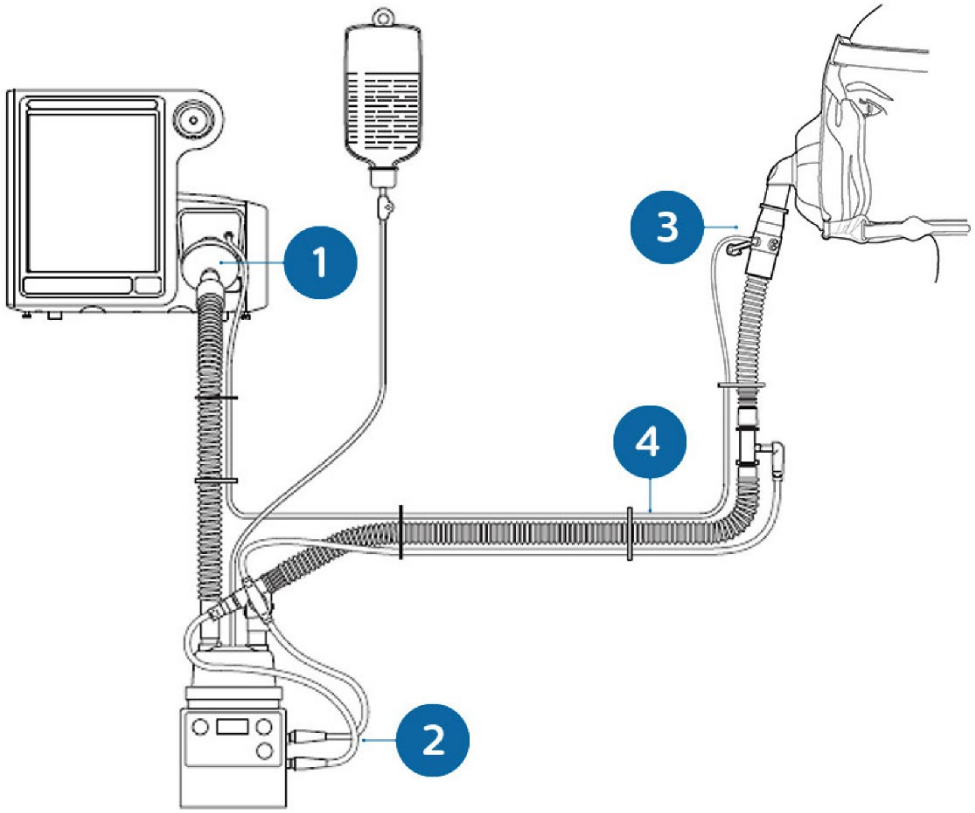
Heated wire humidification

Component key

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

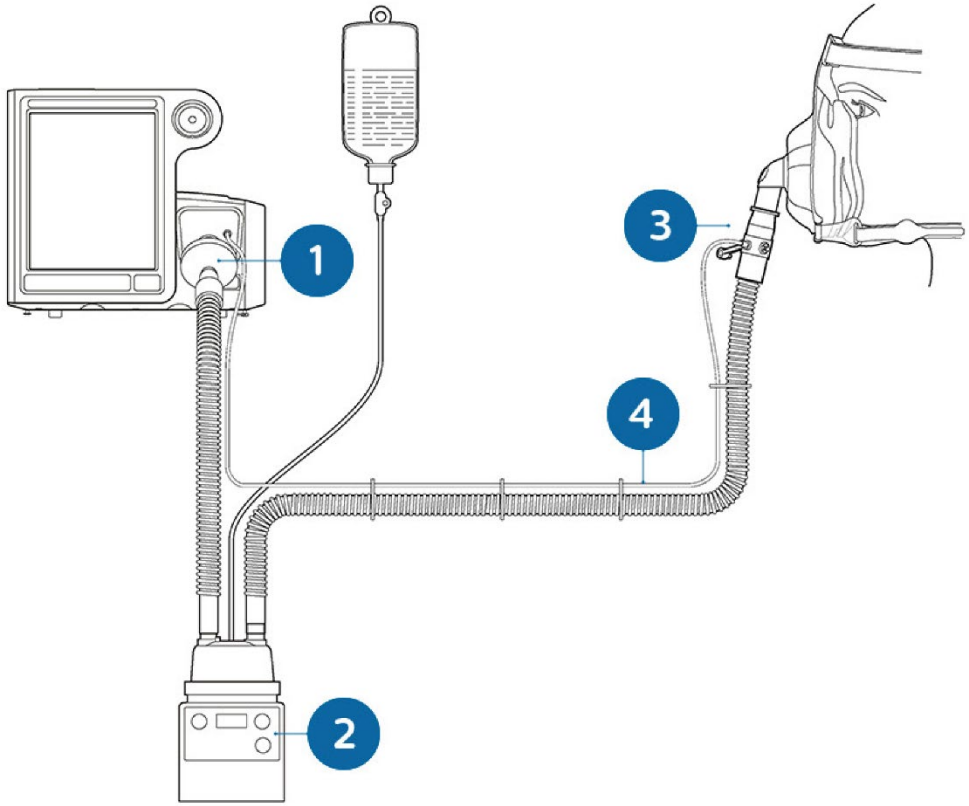


PHILIPS

Heated passover humidification

Component key

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



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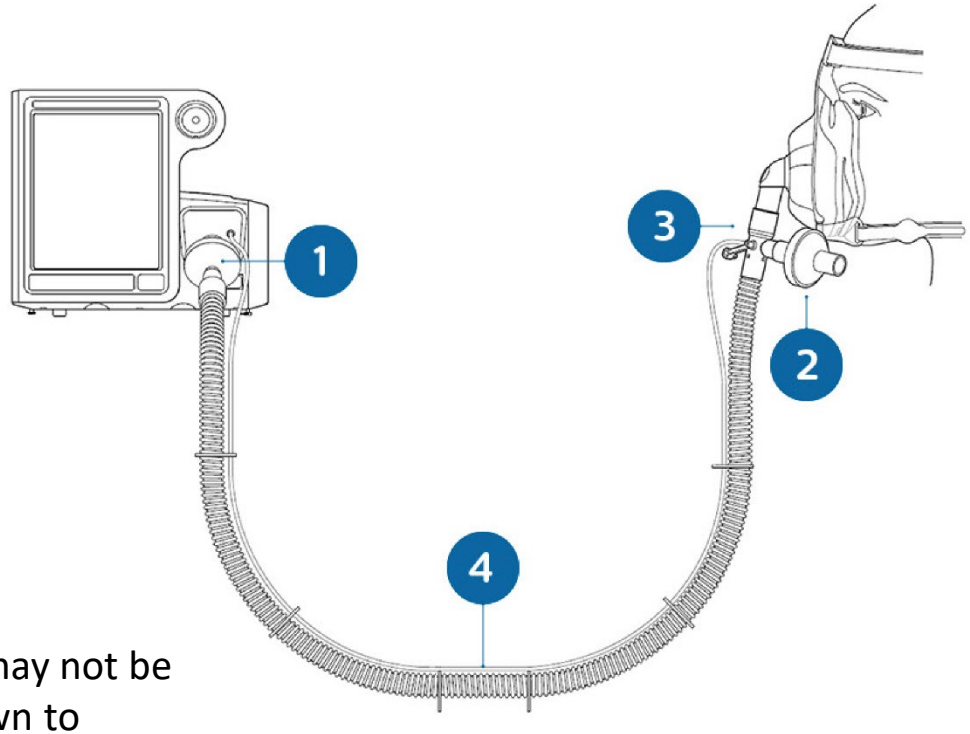
No humidification

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 ..

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Mask rotation practices

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.

Schallom M, Cracchiolo L, Falker A. Pressure ulcer incidence in patients wearing nasal-oral versus full-face noninvasive ventilation masks. American Journal of Critical Care Medicine. 2015;24(4):349-356.

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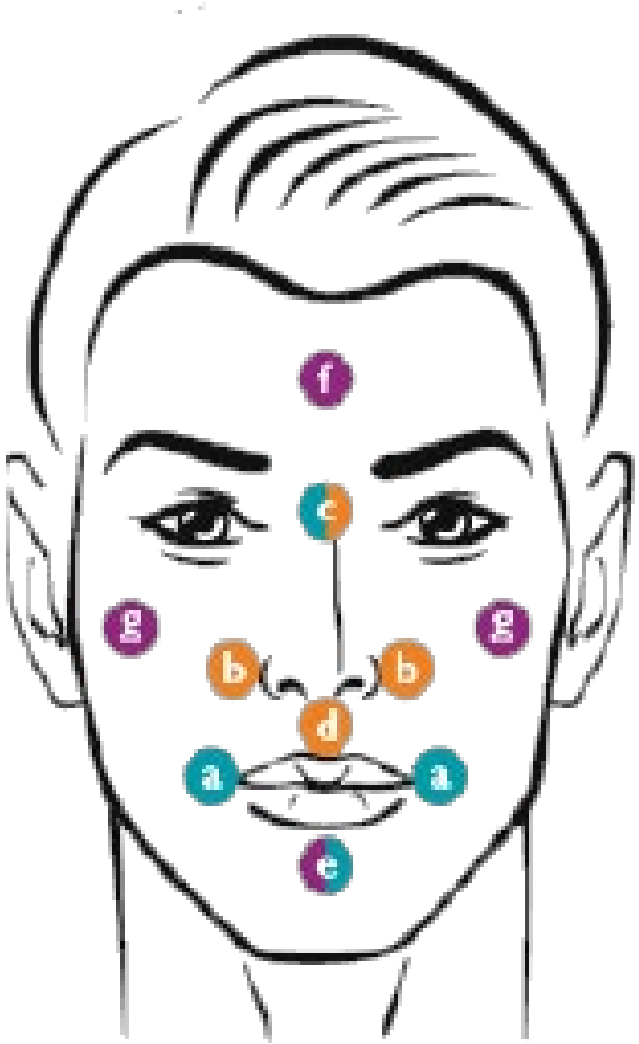
Selecting the right fit

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



Full face	Oro-nasal	Nasal
e, f, and g	a, c and e	b, c and d

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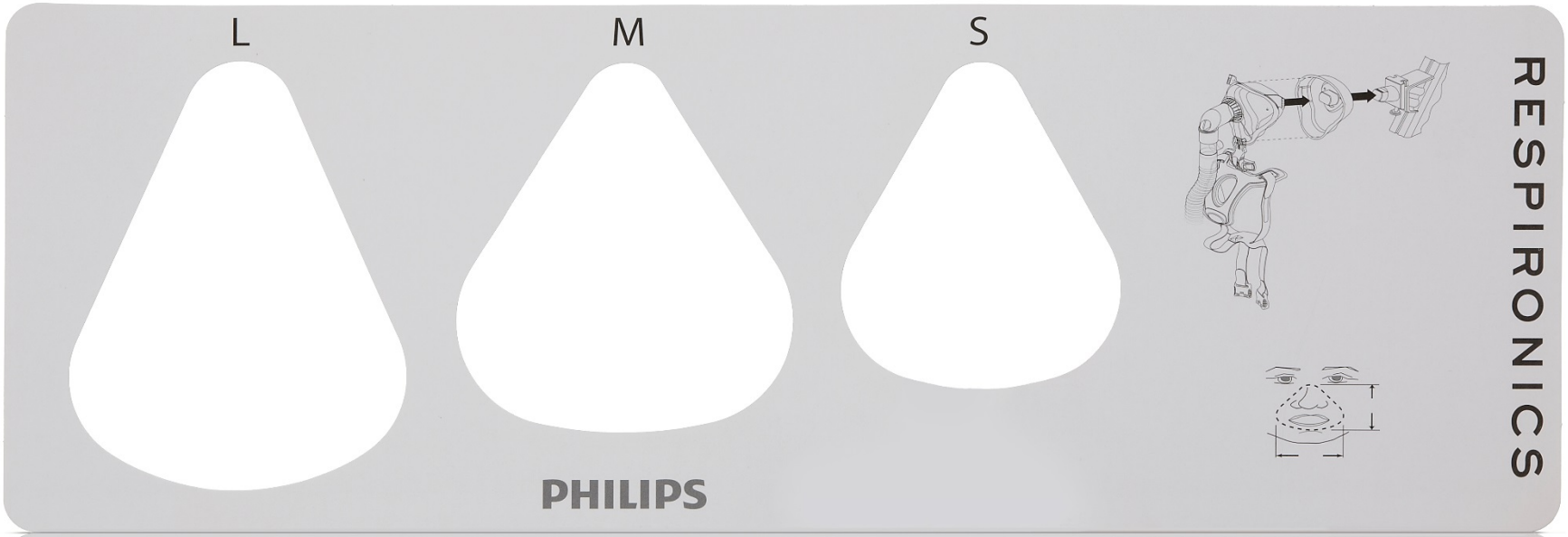
AF531 sizing gauge



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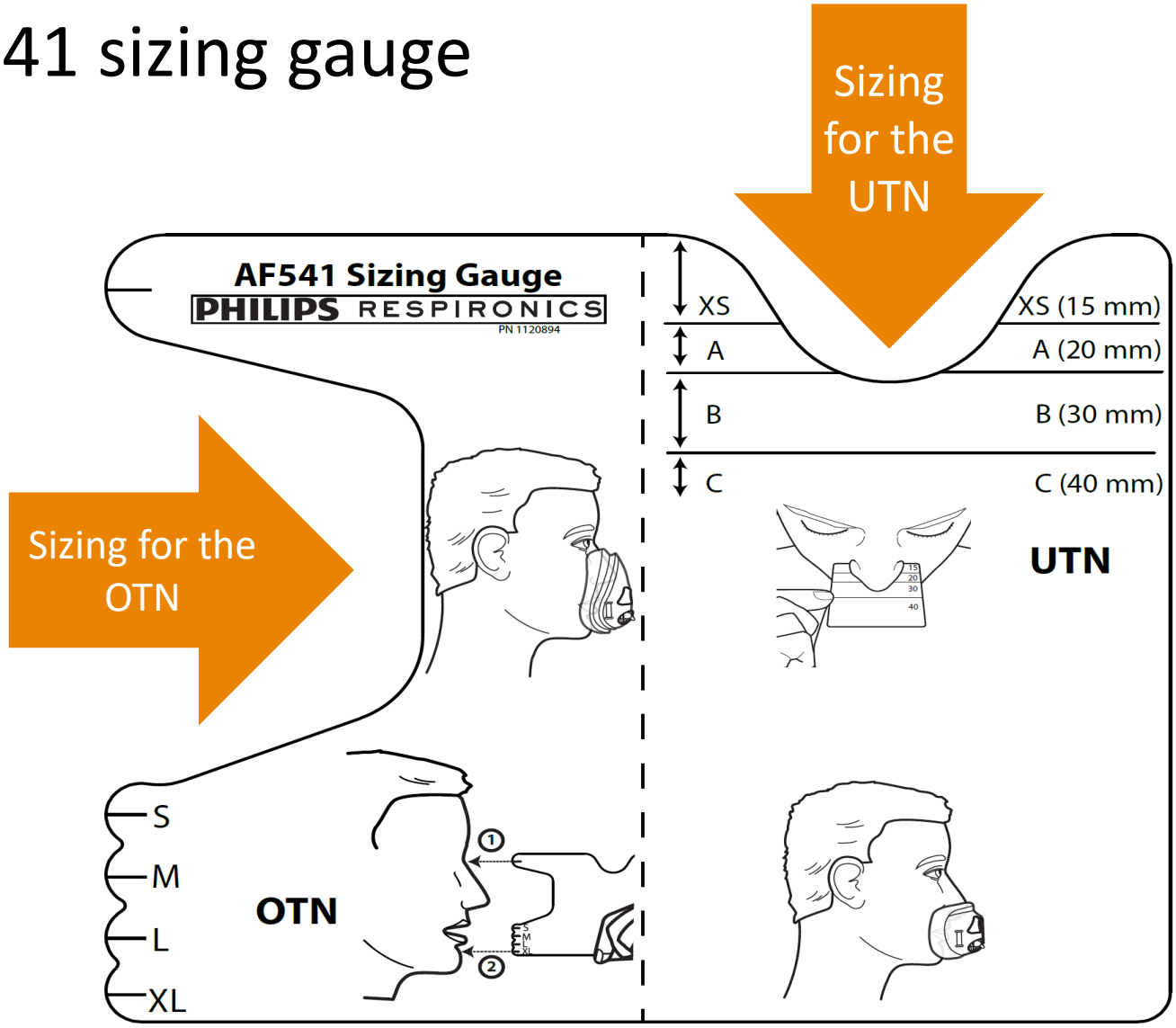
AF541 sizing gauge



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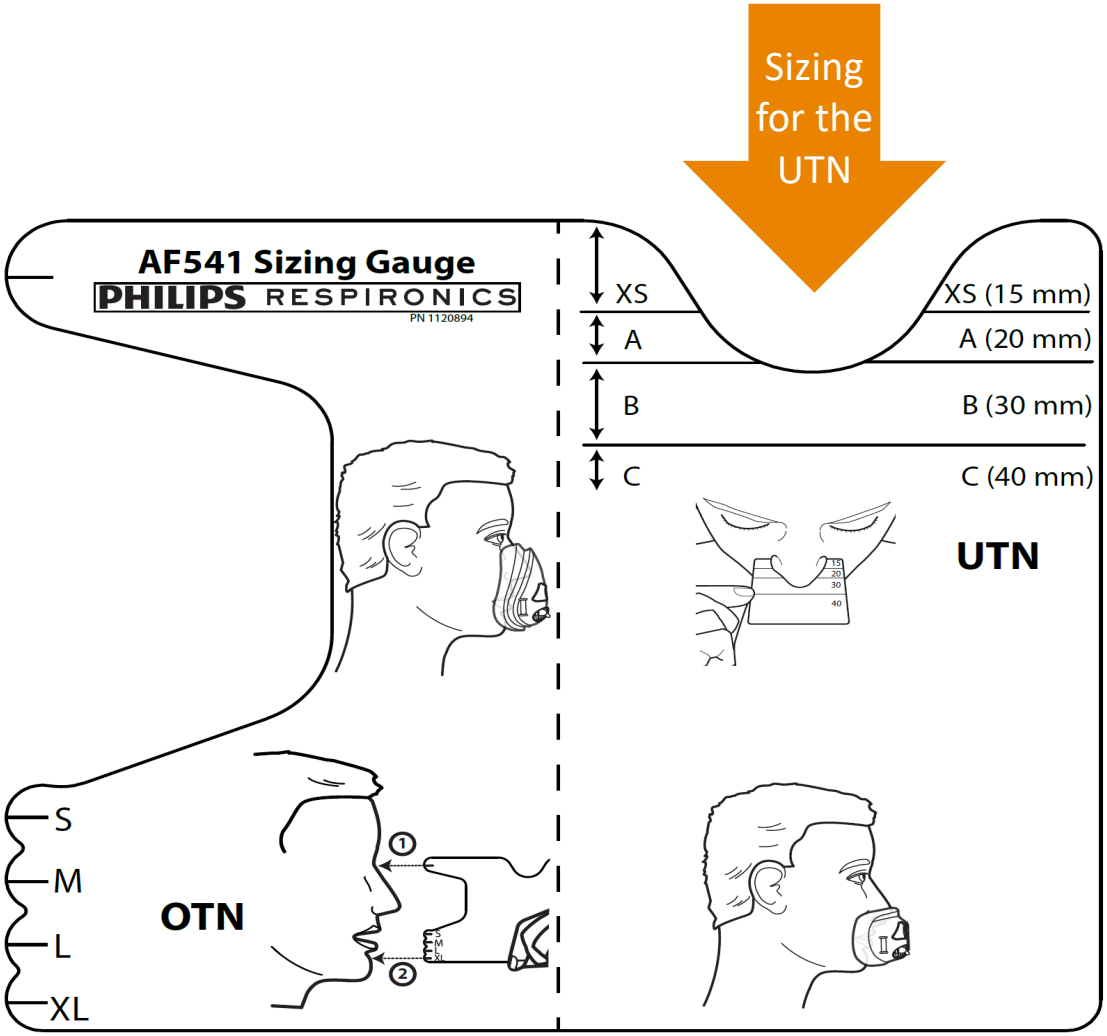
Sizing the under-the-nose cushion



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

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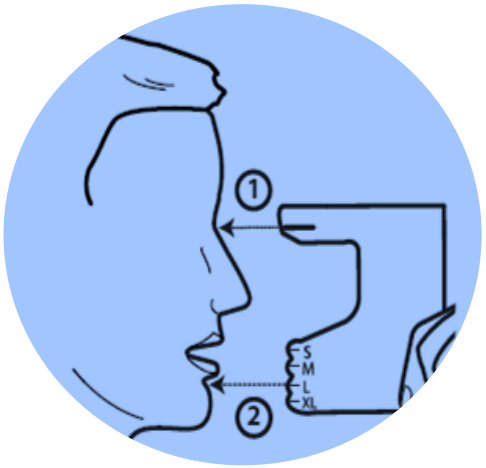
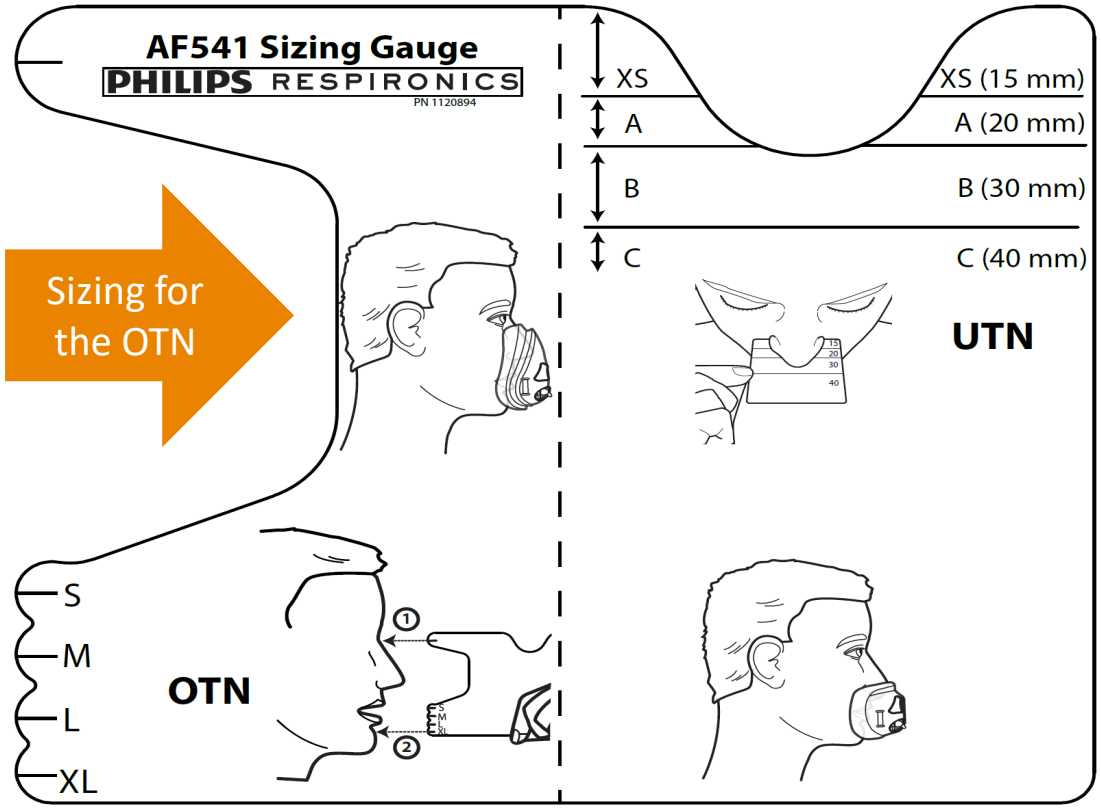
Sizing the over-the-nose cushion





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

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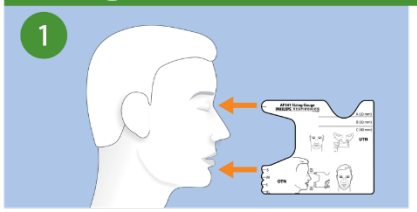
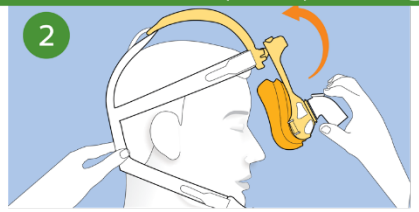
Achieving the right fit

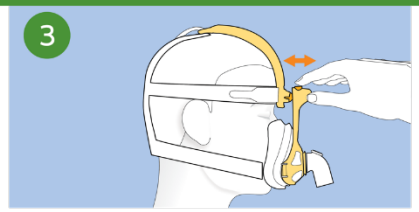
Fitting the **over-the-nose cushion** with CapStrap headgear



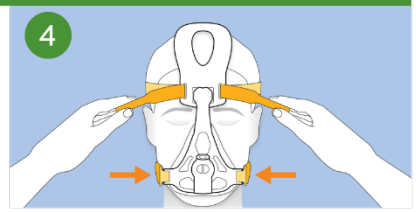
- Use the sizing guide to identify the correct over-the-nose cushion
- With patient mouth slightly open, line up the crease between the lip and the chin to define the right size



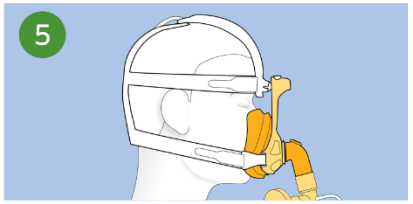
- Assemble cushion onto mask frame, attach to the CapStrap, and place on top of the patient's head
- Tilt the mask away from the face to position headgear on the crown of the head



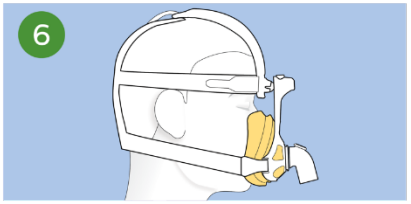
- Bring mask down to cover the patient's nose and mouth
- Press and hold the forehead adjuster button to slide the frame toward/ away from the face to manage leaks and maximize comfort



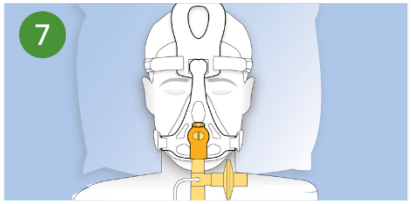
- Attach the talon clips to the mask
- Facing the patient, adjust both top headgear straps at the same time
- Repeat with bottom straps
- Then adjust crown strap at the back



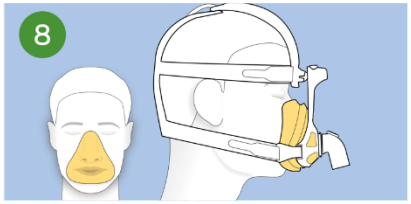
- Connect the mask to the patient circuit disposable exhalation port (DEP)



- Ensure the mask is comfortable on the face
- The bottom of the cushion should rest just above the chin with the mouth slightly open

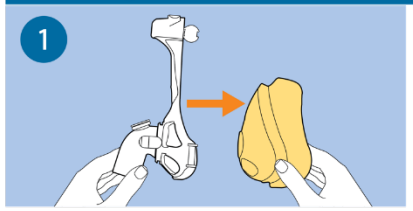


- With your patient at a 45-degree incline, continue noninvasive ventilation, instructing the patient to breath normally

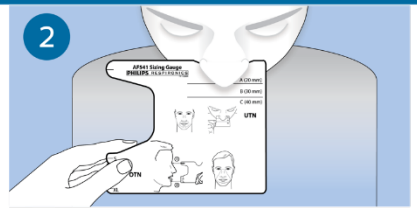


- Continue to assess the patient for skin irritation
- Continue to monitor for patient comfort

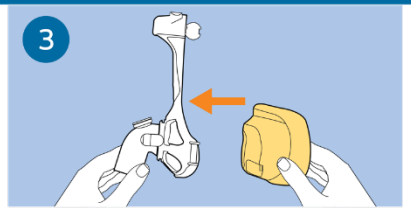
Fitting the **under-the-nose cushion** with CapStrap headgear



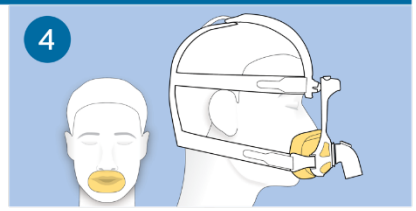
- Grasp the sides of the over-the-nose cushion
- Remove it from mask frame
- Place it in its Clean Clip Shell for future use



- Use the sizing gauge to identify the correct under-the-nose cushion



- Hold sides of under-the-nose cushion and push it onto the mask frame
- Follow steps 2 – 8 above to fit the under-the-nose cushion



- Remember that the bottom of the cushion should rest just above the chin with the mouth slightly open
- The cushion should rest under the patient's nose (never over the patient's nose)

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

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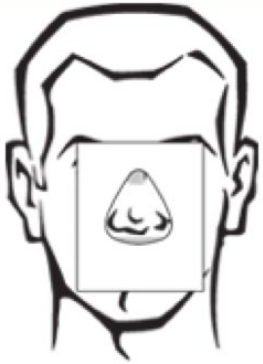
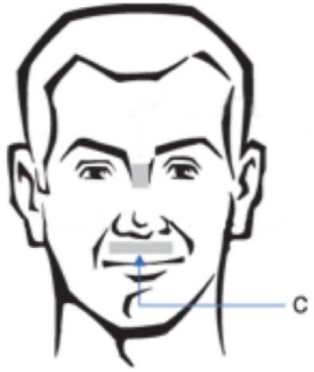
Mask Fitting

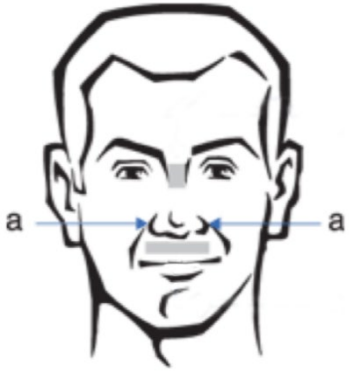
Nasal Mask



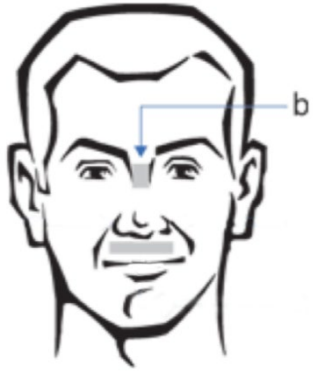
1. Always use a sizing gauge.



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.

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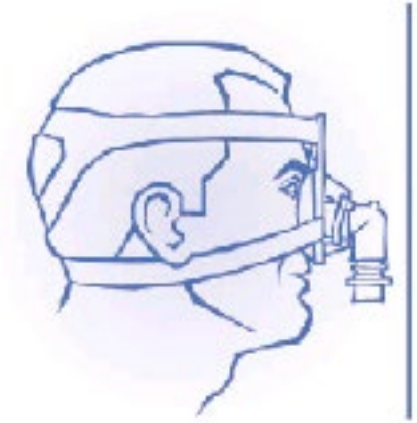
Mask fitting

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*

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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.

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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

Squardone, E., Frigerio, P., Fogliati, C., Gregoretti, C., Conti, G., Anonelli, M., Costa, R., Baiardi, P., Navalesi, P. Noninvasive vs invasive ventilation in COPD patients with severe acute respiratory failure.
Intensive Care Med (2004) 30: 1303-1310.

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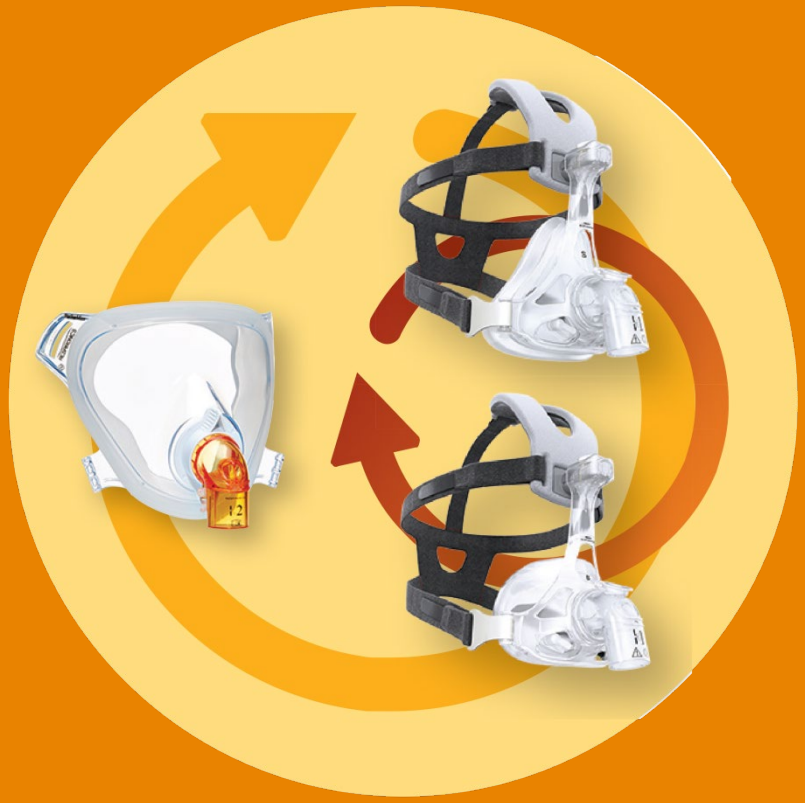
Mask rotation



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.

Schallom M, Cracchiolo L, Falker A. Pressure ulcer incidence in patients wearing nasal-oral versus full-face noninvasive ventilation masks. American Journal of Critical Care Medicine. 2015;24(4):349-356.

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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.

AF531

PerformTrak

AF541

Nava, S., Hill, N. Non-invasive ventilation in acute respiratory failure. Lancet 2009; 374: 250-259.

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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

PHILIPS

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

PHILIPS

PerformaTrak

- 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.

PHILIPS

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

PHILIPS

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

PHILIPS

Total face mask

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

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

Nava, S., Hill, N. Non-invasive ventilation in acute respiratory failure. Lancet 2009; 374: 250-259.

PHILIPS

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

PHILIPS

Nasal mask (covers nose and not mouth)

Advantages

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

Disadvantages

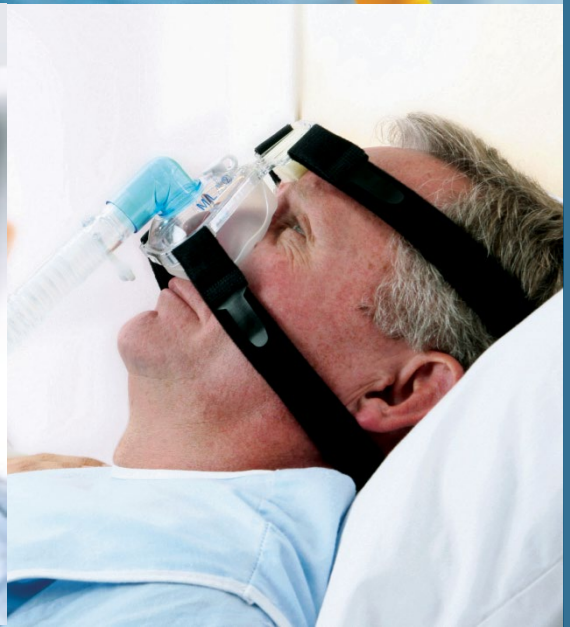
- Air leaks if mouth open
- Possible nasal skin damage
- Nasal passage must not be blocked

Contour deluxe

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

Nava, S., Hill, N. Non-invasive ventilation in acute respiratory failure. Lancet 2009; 374: 250-259.

PHILIPS



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

PHILIPS

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

PHILIPS

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.

PHILIPS

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

PHILIPS

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

Bronchoscopy

NIVO Aerosol

PHILIPS

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

PHILIPS

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

PHILIPS

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

PHILIPS

Keys to success

Manage airflow and pressure-related complications

Adverse effect	**Remedy**
Nasal congestion	Try humidification or speak to the physician for various remedies to assist with this problem
Nasal or oral dryness	Add humidification, nasal saline, oral/nasal hygiene, or decrease leak
Sinus or ear pain	Lower inspiratory pressure
Gastric inflation	Avoid excessive inspiratory pressures (over 20 cmH_2O)
Eye irritation	Check mask fit, readjust bottom headgear straps
Failure to ventilate	Use sufficient pressures, optimize patient-ventilator synchrony

Nava, S., et al. Interfaces and Humidification for Noninvasive Mechanical Ventilation. Resp. Care. Jan 2009. Vol 54-1.

PHILIPS

Manage mask-related complications

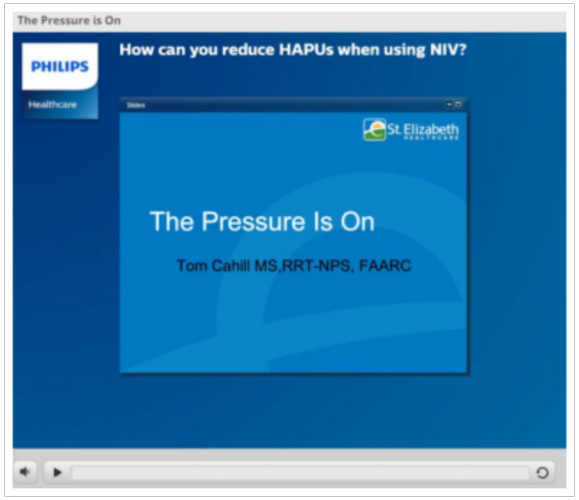
Adverse effect	Remedy
Discomfort	Check fit, adjust straps, change mask
Excessive air leaks	Realign mask, check strap tension, change to full face mask
Nasal bridge redness or ulceration	Use artificial skin, minimize strap tension, use spacer, alternate mask or use a PerforMax or Total face mask
Skin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

Nava, S., et al. Interfaces and Humidification for Noninvasive Mechanical Ventilation. Resp. Care. Jan 2009. Vol 54-1.

Best practices

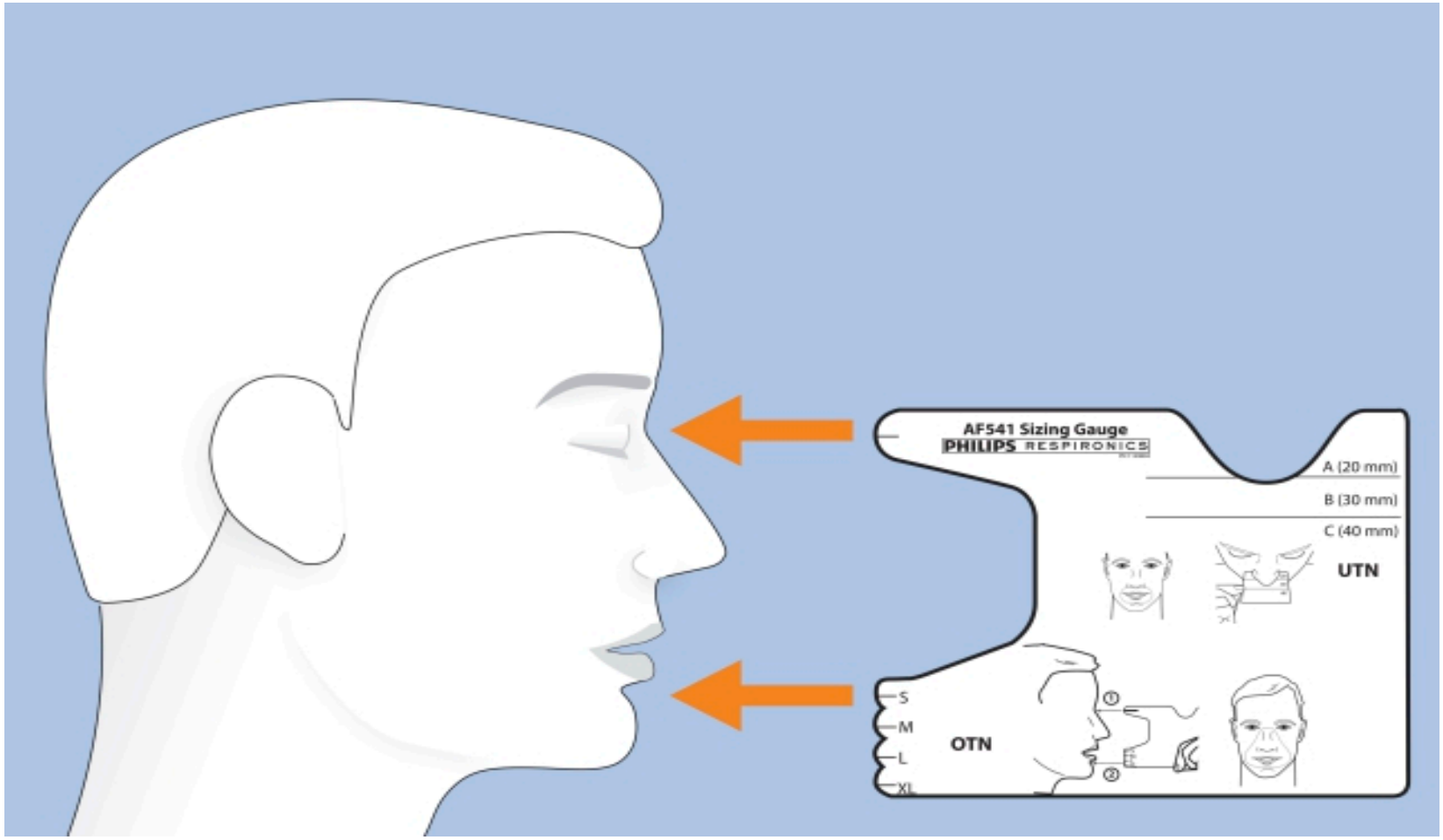
Saving Face

Strategies to reduce skin breakdown during NIV for patient care



PHILIPS

NIV success tips



PHILIPS

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

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View


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