

**Continuous Non-invasive Mechanical Ventilation (NIMV) Checklist:**

*Instructions:* For each patient on continuous NIMV, please fill out this checklist with a dry-erase marker during daily rounds. This checklist does not apply to patients requiring nocturnal NIMV only.

1) Have the physician, nurse, and respiratory therapist discussed the continuous NIMV plan together during rounds?

[ ] Yes [ ] No

2) How many hours has the patient been on continuous NIMV during the following time periods:

a) The past 24 hours? \_\_\_\_\_

b) Since initiation? \_\_\_\_\_

3) Is there an ongoing indication for continuous NIMV?

[ ] Yes [ ] No

Indication, if applicable: \_\_\_\_\_

4) Has the care team discussed specific criteria for discontinuing NIMV during rounds?

[ ] Yes [ ] No

Criteria decided: \_\_\_\_\_

5) Does the patient meet criteria for escalation to ICU level of care?

[ ] Yes [ ] No

Criteria decided: \_\_\_\_\_

6) What are the barriers to stopping NIMV? \_\_\_\_\_

**Please reference the attached OSUWMC Clinical Practice Guideline for “Use of NIMV in Respiratory Failure.”**

## Guideline Goal:

To standardize initiation, maintenance, and discontinuation of non-invasive mechanical ventilation (NIMV). Provide objective parameters to guide clinicians in recognizing inadequate response to NIMV and initiating escalation of care.

This guideline is intended for acutely decompensating patients requiring short-term (hours to days) therapy of mechanical ventilation. Patients with chronic respiratory failure who require chronic nocturnal CPAP/BiPAP are covered by another policy ([CPAP/BiPAP policy](#)).

This guideline does not apply to patients already on NIMV being downgraded or transferred from a higher level of care. Delivery of NIMV in these patients is covered under “continuation of NIMV” (See page 2).

## Key Points:

- NIMV is an intervention associated with risks and complications and should be delivered in a high level care setting such as PCU or ICU.
- Patients receiving NIMV require vigilant monitoring and care due to high risk of deteriorating and tenuous respiratory status.

## Definitions

Term	Definition
Continuous Positive Airway Pressure (CPAP)	Continuous pressure (ordered in cm H2O) with optional supplemental oxygen
Bilevel Positive Airway Pressure (BiPAP)	Two pressure levels (ordered in cm H2O) with optional supplemental oxygen
Non-Invasive Mechanical Ventilation (NIMV)	Continuous use of CPAP or BiPAP for the treatment of respiratory failure
Progressive Care Unit (PCU)	Intermediate level of care
Intensive Care Unit (ICU)	Highest level of care

## NIMV Indications

### 1) Acute respiratory insufficiency due to:

- Acute respiratory failure post discontinuation of invasive ventilation
- Pneumonia
- Pulmonary edema
- Exacerbation of COPD or reactive airway disease
- Neuromuscular disease with exacerbation
- Exacerbation of chronic respiratory failure

### 2) Chronic respiratory failure due to any cause (i.e. neuro-muscular, COPD, morbid obesity, etc.).

## NIMV Contraindications\*

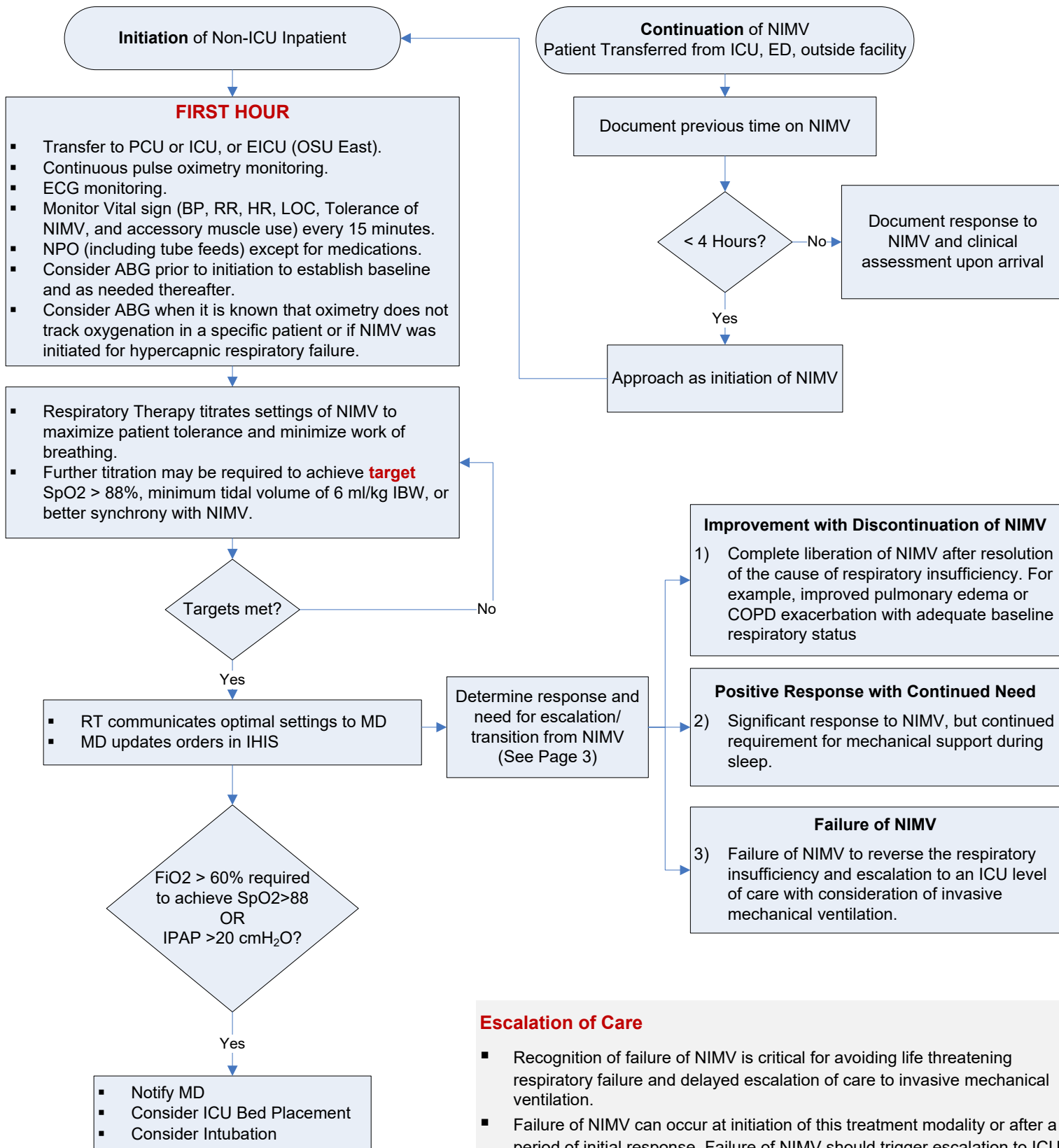
- Impaired level of consciousness (RASS less than or equal to -3)
- Recent Facial trauma, oropharyngeal, skull, and/or upper GI surgery (within 14 days unless cleared by surgeon)
- Known or suspected tympanic membrane rupture
- Untreated pneumothorax
- ARDS

- Inability to clear secretions and/or protect upper airway
- Ongoing vomiting
- Active Upper GI bleed and/or active hemoptysis/epistaxis
- Hemodynamic instability
- Upper extremity restraints

\*Notes: Overriding a contraindication requires the attending physician to appropriately document the reasoning in IHIS. All team members must evaluate for the presence or late emergence of new or previously unrecognized contraindication for NIMV such as restraints or inability to protect the airway.

**Note**

- Physician/Licensed Independent Provider (LIP), RN, and RT should be present for initiating NIMV or as soon as possible.
- Initiation of NIMV, however, **should not be delayed** while awaiting transition to a higher level of care.
- On a Med/Surg floor, a STAT/ERT nurse should be involved in the initiation of NIMV and monitoring prior to transfer to a higher level of care.
- In a PCU, initiation of NIMV may involve the STAT/ERT nurse as needed.



The following assessment of response to NIMV is critical to determine the patient's trajectory and need for escalation to an ICU level of care. **The ordering provider will work with RT and RN to determine the patient's response and need for escalation.**

Time Interval	Actions	Adequate Response to NIMV	Inadequate Response to NIMV
1 <sup>st</sup> hour	<ul style="list-style-type: none"> <li>All team members should be present to facilitate assessment of response in the first hour and escalate care to invasive ventilation and ICU transfer if needed.</li> <li>See Algorithm (page 1)</li> </ul>	<ul style="list-style-type: none"> <li>Decrease in RR by 20-30% (e.g., RR from 40 to 30 BPM).</li> <li>Decreased use of accessory muscles (visual assessment).</li> <li>Maintained SpO<sub>2</sub> &gt; 88%.</li> <li>Improvement/stability in HR and BP.</li> </ul>	Failure to initially respond: <ul style="list-style-type: none"> <li>Persistent dyspnea</li> <li>Tachypnea</li> <li>Accessory muscle use</li> <li>Intolerance of NIMV despite titrating initial settings and changes in interface</li> </ul>
1-4 hours	<ul style="list-style-type: none"> <li>RN Monitor vital signs (i.e., BP, RR, HR, level of consciousness (LOC), tolerance of NIMV and accessory muscle use) every 30 minutes</li> <li>The RT or RN may recommend follow up ABGs if not done in the first hour, or if additional setting changes were made in the first 4 hours.</li> </ul>	<ul style="list-style-type: none"> <li>Patient continues to appear comfortable on NIMV.</li> <li>Continued decrease/stability in RR.</li> <li>Decreased use of accessory muscles (visual assessment).</li> <li>Maintained SpO<sub>2</sub> &gt; 88%.</li> <li>Improvement/stability in HR and BP.</li> </ul>	<ul style="list-style-type: none"> <li>Intolerance of interface and/or pressure settings</li> <li>Minimal improvement in ABG and/or SpO<sub>2</sub> in the first hour</li> <li>Tachyarrhythmia or hypotension</li> </ul> Escalation to ICU level of care and consideration of invasive mechanical ventilation.
4-12 hours	<ul style="list-style-type: none"> <li>Reassessment intervals can be reduced after 4 hours if the patient has not failed NIMV.</li> <li>Oral intake will be determined based on tolerance of breaks after the first 4 hours of NIMV initiation.</li> <li>Time of breaks from NIMV can be coordinated by RN and RT and documented by either.</li> <li>The RT will document at 4 hours the optimal pressure settings, patient's interaction with NIMV and assessment of response to NIMV.</li> <li>If NIMV settings were different from the initial order, the RT will inform the MD to update the order.</li> </ul>	<ul style="list-style-type: none"> <li>The patient continues to appear comfortable on NIMV and has decreased WOB and persistent improvement/ stability in RR, HR and BP.</li> <li>The patient should tolerate at least a total of 1 hour break of NIMV in the first 12 hours.</li> <li>The patient should be stable and tolerate transitioning vital signs to every 2 hours with eventual transition to every 4 hours.</li> <li>Absence of nausea or vomiting may eliminate the need for NG tube.</li> <li>Improved gas exchange may be verified by ABGs or SpO<sub>2</sub>.</li> </ul>	Marginal response to NIMV, but with evidence of slow deterioration or inability to take recommended breaks: <ul style="list-style-type: none"> <li>Despite increased NIMV settings</li> <li>Work of breathing is still high</li> <li>Persistent tachycardia or hypotension</li> <li>Persistent / decreased LOC</li> <li>Intolerance of the interface</li> <li>Agitation</li> </ul>
12-24 hours	<ul style="list-style-type: none"> <li>Documentation by RT including time on NIMV, duration of breaks, minute ventilation, WOB, and patient interaction and tolerance of breaks off NIMV.</li> <li>RN documentation to include assessment of respiratory status, LOC, and evaluation of skin integrity under mask interface.</li> <li>If the patient did not tolerate a minimum of 2 hours break from NIMV in the first 24 hours, the MD must be notified to initiate transfer to ICU.</li> </ul>	<ul style="list-style-type: none"> <li>The patient continues to appear comfortable on NIMV with stable vital signs; decreased WOB; persistent improvement/ stability F<sub>i</sub>O<sub>2</sub> requirement; and stable to improved LOC.</li> <li>The patient should tolerate at least 2 hours off NIMV in the first 24 hours (ideally during the daytime hours).</li> <li>Tube feeds (TF) or oral intake can be started if the patient tolerated 1 hour break of NIMV during the first 12 hours. Ideally, TF would be started at low rate/sub-target over the second 12 hour period.</li> </ul>	Escalation to ICU level of care and consideration of invasive mechanical ventilation.
Daily	<ul style="list-style-type: none"> <li>RT documentation: NIMV duration, duration of breaks, and tolerance.</li> <li>RN documentation: LOC, respiratory status, and evaluation of skin integrity under the mask</li> <li>MD documentation: NIMV settings, duration, tolerance of breaks, continuation plans and necessity in daily notes, including updating NIMV orders in IHIS as needed.</li> <li>Any discontinuation of NIMV, replacement of NIMV, and changes in the settings must be documented.</li> <li>Team members should discuss NIMV during daily multidisciplinary rounds and address NIMV settings, patient's response, tolerance, expected duration of NIMV, and contingency plan.</li> <li>If patient refuses NIMV, document refusal and notify MD.</li> </ul>	<ul style="list-style-type: none"> <li>The patient should tolerate progressively decreasing the hours of NIMV use.</li> <li>Continued comfort and tolerance of the interface; adequate sleep with NIMV, and adequate nutritional intake should be assessed by appropriate care team members.</li> </ul>	Persistent inability to wean off NIMV over days can still be managed in the progressive care unit with consideration of consultative care as appropriate (i.e., pulmonary; cardiology; or critical care consultation), as well as transition to an ICU level of care.  Patients previously weaned to nocturnal only NIMV should be monitored for new episodes of respiratory failure evidenced by increasing hours of use.

## References

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- Roberts M, et al. The use of non-invasive ventilation in the management of patients with chronic obstructive pulmonary disease admitted to hospital with acute type II respiratory failure. *British Thoracic Society* October 2008
- Williams JW, et al. Noninvasive positive-pressure ventilation (NPPV) for acute respiratory failure. AHRQ. July 2012. *AHRQ Publication* No.12-EHCO89-EF
- Keenan SP et al. Clinical practice guidelines for the use of noninvasive positive-pressure ventilation and noninvasive continuous positive airway pressure in the acute care settings. *CMAJ*. 2011;183(3):E195-214

## Quality Measures

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- Rate of NIMV patients with a Code Blue or ERT
- Number of patients on NIMV in a non-ICU setting greater than 48 hours
- Average hours of NIMV use (ICU vs. Non-ICU)

## Order Sets

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- MED: Nocturnal CPAP/BiPAP or NIMV

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## Guideline Approved

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