

NGN NCLEX 2026

RESPIRATORY • OXYGENATION

PRIORITY CONCEPT

Non-Invasive Oxygen Therapy

Supplemental O₂ delivery without intubation — from nasal cannula to BiPAP. Master the device-FiO₂ match, the COPD ceiling, and the safety rules that show up on every exam.

SOURCE DISCLOSURE: Diane's "Oxygen Therapy" project notes cover nasal cannula basics only (NC max 6 L/min, COPD 2.5 L/min, humidification, combustion safety, hypoxia signs). This infographic expands the topic to the full non-invasive device spectrum (masks, Venturi, HFNC, CPAP/BiPAP) using *Saunders Comprehensive Review for the NCLEX-RN 2026*, *ATI RN Adult Medical-Surgical Nursing*, AARC Clinical Practice Guidelines (2024), and GOLD COPD guidelines (2024 update).

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Definition & Overview

Non-invasive oxygen therapy = delivery of supplemental O_2 *without* an artificial airway (no ETT, no trach). The patient breathes spontaneously while receiving enriched oxygen via cannula, mask, or positive-pressure interface.

- ▶ **Goal:** correct hypoxemia and maintain adequate tissue oxygenation while treating the underlying cause.
- ▶ **O_2 is a drug** — it requires a prescription, has a therapeutic range, side effects, and toxicity.
- ▶ **Lowest FiO_2 that maintains target SpO_2** is always the rule. More is not better.

$\geq 95\%$

SpO_2 GOAL — MOST ADULTS

88–92%

SpO_2 GOAL — COPD / CO_2 RETAINER

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Pathophysiology — Why Hypoxia Hurts

When PaO_2 falls, cells switch from aerobic to anaerobic metabolism. Lactic acid accumulates, ATP collapses, organs fail. The brain and heart are the first to scream.

1 ↓ PaO_2 in alveoli (V/Q mismatch, shunt, diffusion defect, hypoventilation)



2 ↓ O_2 saturation of hemoglobin → ↓ O_2 delivery to tissues



3 Sympathetic surge: *tachycardia, tachypnea, restlessness, anxiety* (EARLY)



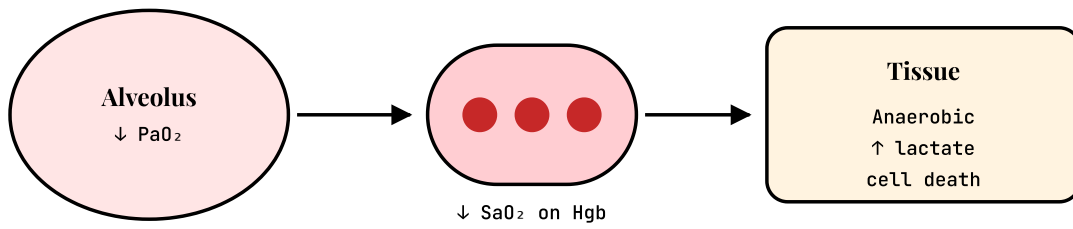
4 Anaerobic metabolism → lactic acidosis → cellular dysfunction



5 Brain hypoxia: confusion → ↓ LOC → coma (LATE)



6 Cardiac: dysrhythmias, *bradycardia*, hypotension → arrest



Alveolus → RBC → Tissue: where oxygen delivery breaks

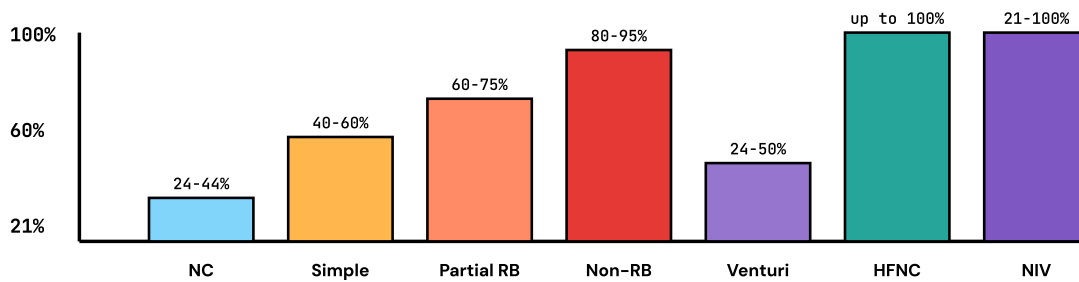
THE O₂ DELIVERY CASCADE

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Devices, Flow Rates & FiO₂

The single most testable concept in this topic. Match the device to the patient's need — and never exceed the device's safe range.

DEVICE	FLOW	FI _O ₂	BEST USED FOR / KEY TEACHING
Nasal Cannula (NC)	1-6 L/min	24-44%	Stable, low-need patients. Humidify if >4 L/min. Skin breakdown q6-8h check (nares + behind/top of ears).
Simple Face Mask	5-10 L/min	40-60%	Min 5 L/min required to flush expired CO ₂ from mask. Short-term use.
Partial Rebreather Mask	6-11 L/min	60-75%	Reservoir bag must stay partially inflated on inspiration . Patient rebreathes ~1/3 of exhaled air.
Non-Rebreather Mask (NRB)	10-15 L/min	80-95%	Highest FiO ₂ short of intubation. One-way valves. Bag must stay inflated at all times. Emergencies, trauma, CO poisoning.
Venturi Mask	4-12 L/min	24-50% precise	Most accurate FiO₂ via color-coded adapters. Drug of choice for COPD — exact dose control.
High-Flow Nasal Cannula (HFNC)	up to 60 L/min	up to 100%	Heated + humidified. Used for severe hypoxemia, COVID, post-extubation. More tolerable than NIV.
CPAP (continuous positive)	PEEP 5-20 cmH ₂ O	21-100%	OSA, cardiogenic pulmonary edema. Single constant pressure. Patient must breathe spontaneously.
BiPAP (bilevel positive)	IPAP > EPAP	21-100%	COPD exacerbation, acute hypercapnia, CHF. Two pressures — inhale + exhale. Reduces work of breathing.



FIO₂ DELIVERY RANGE BY DEVICE (APPROXIMATE)

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Signs & Symptoms — Hypoxia vs. O₂ Toxicity

EARLY HYPOXIA (COMPENSATING)

- **Restlessness** ← #1 earliest sign
- Tachycardia
- Tachypnea
- Anxiety, irritability
- Headache
- Mild ↑ BP
- Pale, cool skin

LATE HYPOXIA (DECOMPENSATING)

- Cyanosis (late + unreliable)
- **Bradycardia**
- Bradypnea / shallow respirations
- Hypotension
- Confusion → stupor → coma
- Dysrhythmias, cardiac arrest

OXYGEN TOXICITY (FiO₂ >50% for >24–48 hrs)

- **EARLY:** non-productive cough, substernal chest pain, nasal stuffiness, headache, fatigue
- **LATE:** dyspnea, pulmonary edema, atelectasis, ARDS, fibrosis

- **PREVENTION:** use the lowest FiO_2 that achieves the target SpO_2 .

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Priority Nursing Interventions (ABC Framework)

AIRWAY / BREATHING

- Position **high-Fowler's** (HOB 60–90°) to maximize lung expansion
- Suction PRN — clear secretions to deliver O_2 to alveoli
- Encourage deep breathing & coughing
- Assess respiratory rate, depth, effort, accessory muscle use q1–4h
- Monitor SpO_2 continuously on high-acuity patients

CIRCULATION / SAFETY

- Vital signs + LOC q4h or per acuity
- ABG when changing FiO_2 or status declines
- Verify O_2 flow rate **at least once per shift**
- Humidify O_2 at flow >4 L/min (prevents dry mucosa, epistaxis)
- Skin assessment **q6–8h**: nares, top + behind ears, cheeks/forehead under mask
- Pad pressure points; rotate mask seal if able

⚠ **COPD SPECIAL RULE** Start **LOW AND SLOW**: 1–3 L/min NC or 24–28% Venturi mask. Titrate to SpO_2 88–92%. Reassess respiratory rate, LOC, and ABG within 30–60 min of any change. *High FiO_2 can suppress the hypoxic drive → CO_2 narcosis → respiratory arrest.*

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Pharmacology — Oxygen as a Drug

Oxygen has dose, route, indications, contraindications, side effects, and toxicity. Treat it like any other prescription.

DRUG / CLASS	MECHANISM	KEY ADVERSE EFFECTS	NURSING CONSIDERATIONS
Oxygen (supplemental gas)	$\uparrow \text{FiO}_2 \rightarrow \uparrow$ alveolar $\text{PO}_2 \rightarrow \uparrow$ arterial O_2 saturation $\rightarrow \uparrow$ tissue delivery	Mucosal drying, epistaxis, skin breakdown, absorption atelectasis, O_2 toxicity, CO_2 narcosis in COPD, ROP in neonates	Verify HCP order. Use lowest effective FiO_2 . Humidify >4 L/min. Titrate to SpO_2 target. Monitor ABG when adjusting.
Adjuncts: bronchodilators (albuterol, ipratropium)	β_2 agonists relax bronchial smooth muscle $\rightarrow$ bronchodilation	Tachycardia, tremor, hypokalemia, dry mouth (ipratropium)	Often nebulized with O_2 . Assess breath sounds + HR before and after.
Corticosteroids (methylprednisolone, prednisone)	$\downarrow$ airway inflammation in COPD/asthma exacerbations	Hyperglycemia, immunosuppression, mood changes, GI bleed	Monitor glucose, infection signs. Never abruptly stop long-term use.

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NCLEX Test Traps ⚠

✗ WRONG

COPD patient with SpO₂ 84% →
"Crank O₂ to 6 L/min NC for fastest
correction"

✓ RIGHT

Start 1–2 L/min NC (or 24–28%
Venturi). Titrate to SpO₂ 88–92%.
Reassess RR + LOC. High FiO₂ can
blunt the hypoxic drive.

✗ WRONG

Simple face mask at 3 L/min for
"comfort"

✓ RIGHT

Simple mask requires **minimum 5
L/min** to flush exhaled CO₂ from the
mask. <5 L = CO₂ rebreathing.

✗ WRONG

NRB reservoir bag is deflated on
inspiration — "that's normal"

✓ RIGHT

NRB bag must **stay inflated**. If it
collapses, increase flow until it stays
partly full at the end of inspiration.

✗ WRONG

"Oxygen is explosive — turn it off
and patient can smoke."

✓ RIGHT

O₂ does **not** explode — it **supports
combustion**. Even with O₂ off, the
device/tank must be physically
removed before any smoking is
permitted. *No smoking, period.*

✗ WRONG

✓ RIGHT

Cyanosis is the first sign of hypoxia

Restlessness is the earliest sign.
Cyanosis is a **late** finding and unreliable in dark skin or anemia.

✗ **WRONG**

Apply petroleum jelly (Vaseline) to dry lips of a patient on O₂

✓ **RIGHT**

Use **water-based** lubricant.
Petroleum + O₂ + spark = fire risk.
Same for facial lotions/ointments.

✗ **WRONG**

Patient on NC at 6 L/min complains of nosebleeds and dry mouth —
"expected, no action"

✓ **RIGHT**

Flows >4 L/min must be **humidified**.
Add humidifier bottle; assess nares q6–8h; offer oral care.

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Patient & Family Education

- ▶ **FIRE SAFETY:** No smoking in the home. Keep O₂ ≥10 feet from open flames, stoves, candles, fireplaces, electric heaters.
- ▶ **No petroleum products** (Vaseline, mineral oil, oil-based lotions) on face, lips, or hands. Use water-based lip balm and lotions.
- ▶ No **aerosol sprays** (hair spray, deodorant, perfume) near O₂ source.
- ▶ Wear **cotton clothing** — synthetics generate static sparks.
- ▶ Post "**No Smoking — Oxygen in Use**" sign on the home door.
- ▶ Have a **working smoke detector** and a fire extinguisher; know two escape routes.
- ▶ Do **not adjust flow rate** without the HCP's instructions — O₂ is a drug.
- ▶ Inspect **nares, ears, and face** daily for redness/breakdown; reposition tubing q2–4h.
- ▶ Keep a **backup O₂ tank** charged and accessible during power outages.
- ▶ Notify HCP for: worsening dyspnea, confusion, blue lips/fingertips, fever, productive cough with color change.

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Memory Boosters & Mnemonics

RAT → BED — Hypoxia Progression

Early signs of hypoxia are *RAT*; late signs are *BED*.

Restlessness • Anxiety • Tachycardia/Tachypnea
Bradycardia • Extreme restlessness/cyanosis • Dyspnea / ↓ LOC

"30-60-90" — Mask FiO₂ Ladder

Quick benchmark for the three common masks.

Simple mask ≈ 30-60% • Partial rebreather ≈ 60-75% • Non-rebreather
≈ 80-95%

"Venturi = Vital for COPD"

The Venturi delivers the most **precise** FiO₂. When the question features a COPD patient who needs an exact percentage (e.g., 28%), the answer is almost always Venturi.

"Combustion, Not Explosion"

O₂ does not blow up — it *feeds* fire. Anything that can spark, smoke, or burn is the enemy: cigarettes, candles, gas stoves, petroleum products, synthetic fabric static, wool blankets.

"88-92 for COPD, 95+ for everyone else"

Two SpO₂ goals. Memorize both and which patient gets which.

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NGN Clinical Judgment Scenario (NCJMM 6-Step)

Case: A 68-year-old man with long-standing COPD presents to the ED with a 3-day worsening cough, increased sputum, and dyspnea. On arrival: alert, RR 28, HR 112, BP 148/86, SpO₂ **83% on room air**, audible wheezes. The ED physician orders supplemental oxygen.

STEP 1 • RECOGNIZE CUES

Significant: SpO₂ 83% (severe hypoxemia), RR 28 (tachypnea), HR 112 (tachycardia), wheezes, productive cough, COPD history. The patient is showing **early hypoxia signs** with a known CO₂ retainer history.

STEP 2 • ANALYZE CUES

Acute COPD exacerbation with hypoxemia. Risk: aggressive O₂ → blunted hypoxic drive → CO₂ narcosis. Goal: correct hypoxemia *without* tipping into hypercapnia. Target SpO₂ **88–92%**, not 100%.

STEP 3 • PRIORITIZE HYPOTHESES

#1 — Acute hypoxemic respiratory failure from COPD exacerbation (priority). #2 — Possible bacterial bronchitis/pneumonia. #3 — Risk of CO₂ retention with high-FiO₂ therapy.

STEP 4 • GENERATE SOLUTIONS

Apply **Venturi mask at 28% FiO₂** (or NC 2 L/min) → titrate to SpO₂ 88–92%. Position high-Fowler's. Administer prescribed nebulized bronchodilator. Obtain ABG. Continuous SpO₂. Reassess RR, LOC, work of breathing q15 min.

STEP 5 • TAKE ACTION

Start **Venturi 28%**. Position upright. Give albuterol nebulizer. Draw ABG. Monitor for: rising RR, falling LOC, somnolence (*early CO₂ narcosis*). If SpO₂ remains <88%

despite Venturi 50%, escalate to **BiPAP** (typical NIV indication for acute COPD exacerbation with hypercapnia).

STEP 6 • EVALUATE OUTCOMES

Effective: SpO₂ rises to 88–92%, RR ↓ to 18–22, HR ↓, patient alert and conversing, ABG shows improving pH and PaCO₂. Ineffective / worsening: SpO₂ still <88%, RR >30 or falling <10, ↑ somnolence, ABG with rising PaCO₂ + falling pH
→ **escalate to BiPAP or intubation.**

Diane's NGN NCLEX 2026 Visual Study Library

Non-Invasive Oxygen Therapy · Respiratory / Oxygenation Cluster · Paired with interactive flashcard deck