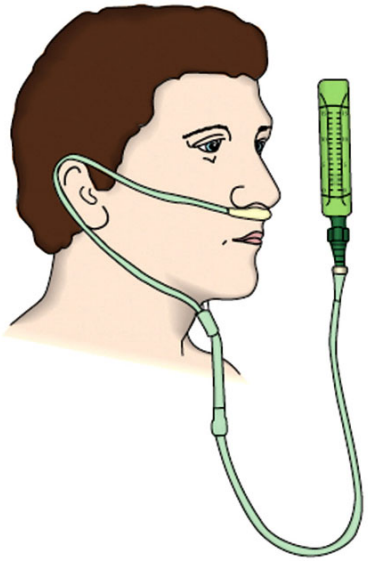
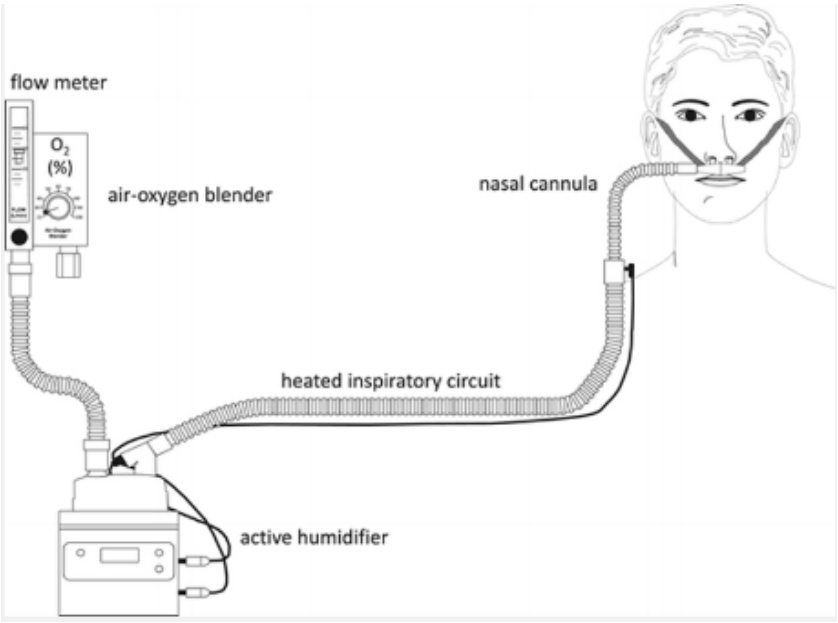
Oxygen Delivery Systems

Nasal Cannula



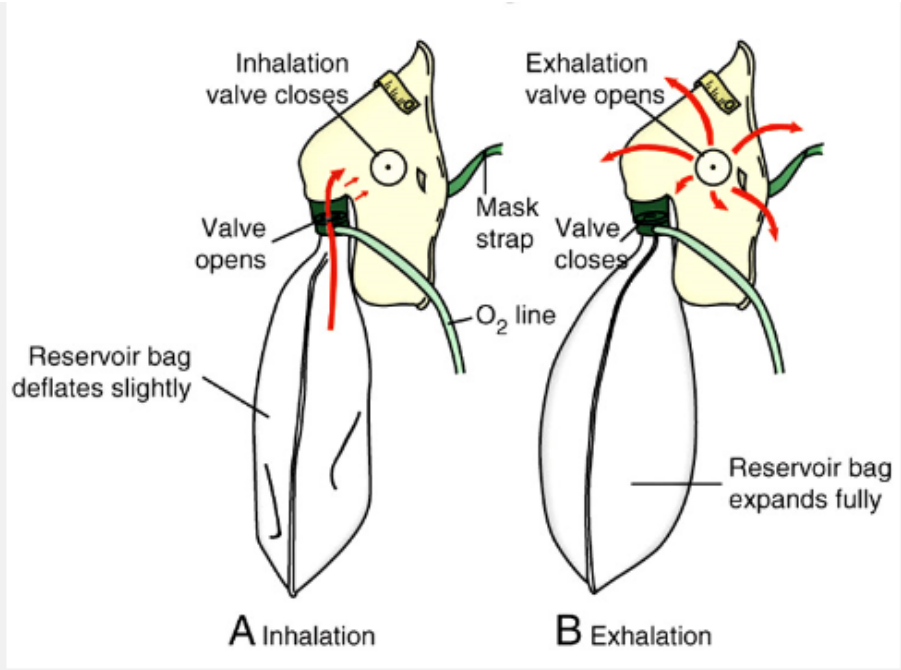
- 1-6 L/min
- 4-6L should be humidified.

High-Flow Nasal Cannula Oxygen Therapy



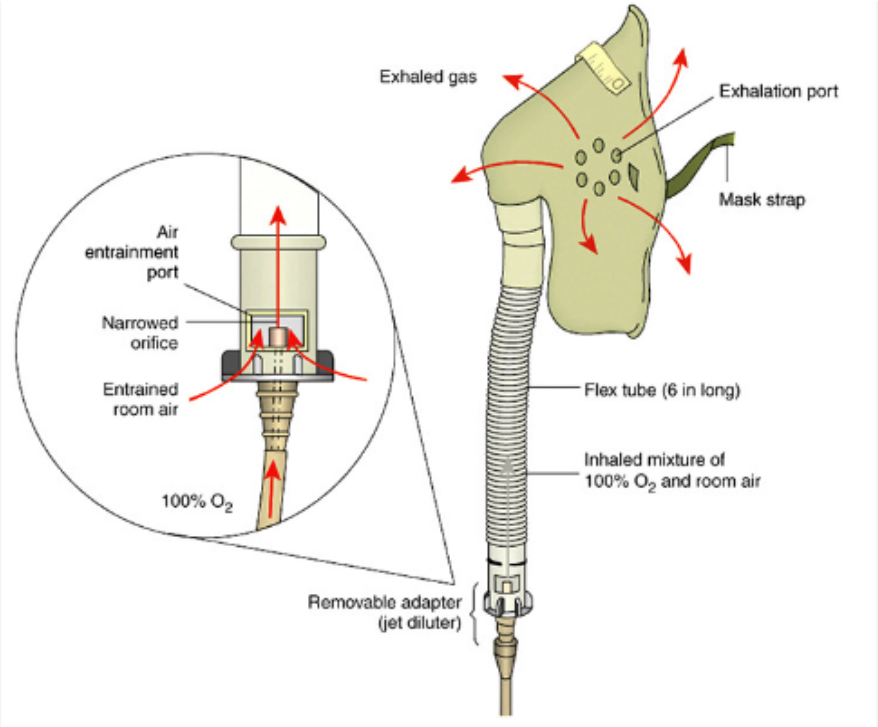
Principle setup of high-flow nasal cannula oxygen therapy. An air-oxygen blender, allowing from 0.21 to 1.0 fraction of inspired oxygen, generates up to 60 L/min flow. The gas is heated and humidified through an active heated humidifier and delivered via a single-limb heated inspiratory circuit. The patient breathes the adequately heated and humidified medical gas through nasal cannulas with a large diameter. (From Nishimura, M. [2015]. High-flow nasal cannula oxygen therapy in adults. *Journal of Intensive Care, 3*[1], 15.)

Nonrebreather Mask



(*Top*) Nonrebreather mask in place, attached to an oxygen flowmeter. (Bottom) Arrows indicate the direction of gas movement on (**A**) inhalation and (**B**) exhalation. (From Pierce, L.N.B. [2007]. *Management of the mechanically ventilated patient* [2nd ed.]. St. Louis: Saunders.)

Venti Mask



Air entrainment mask (also known as a *Venturi mask* or *Venti mask*). Oxygen flowing rapidly through a narrowed orifice creates an area of low pressure that entrains room air through the air entrainment port. (From Pierce, L.N.B. [2007]. *Management of the mechanically ventilated patient* [2nd ed.]. St. Louis: Saunders.)

Table 1 Oxygen Delivery Devices

Oxygen delivery Device	Oxygen flow (L/min)	FIO_2	Advantages	Disadvantages
Nasal Cannula[a,b,d]				
Nasal cannula in place, attached to oxygen flowmeter	1 2 3 4 5 6	24% 28% 32% 36% 40% 44% [FIO_2 = 20% + (4 × oxygen liter flow)]	• Well tolerated and comfortable • Patient may eat and drink without removing • May be used with humidity	• May cause pressure injuries around nose and ears; minimize by placing padding between cannula tubing and skin • Decreased effectiveness with mouth breathing • May dry and irritate nasal mucosa
Nonrebreather Mask[a,d]				
(Note that masks labeled "nonrebreather" by some manufacturers are actually partial rebreathers)	10-12 Set rate high enough to prevent collapse of reservoir bag	80%-100%	Highest FIO_2 delivery for a nonintubated patient	• Insufficient oxygen flow may lead to rebreathing of carbon dioxide; reservoir bag should never completely collapse • Considered confining by some patients; mask must fit snugly for optimal FIO_2 • Limits access to face for coughing, eating, drinking, blowing nose, and delivery of oral and facial nursing care • Aspiration of vomitus possible • Difficulty with fitting when gastric tube is present • May cause drying of eyes • Possible sticking of valves, limiting benefit and causing carbon dioxide rebreathing
Air Entrainment Mask[a,b]				
(Also known as *Venturi mask* or *Venti mask*)	• FIO_2 changed by adjusting air entrainment port and oxygen flow rate (per directions on each device) • Provides FIO_2 of 24%-50%		• Precise control of FIO_2 • Useful in patients with COPD where excessive oxygen delivery may suppress respiratory drive	• Considered confining by some patients • Limits access to face for coughing, eating, drinking, blowing nose, and delivery of oral and facial nursing care • Aspiration of vomitus possible • Difficulty with fitting when gastric tube is present • May cause drying of eyes
High-flow Nasal Cannula[b,c]				
	• Flow rates up to 60 L/min • FIO_2 of 21%-100%		• Provides humidified and warmed oxygen • More comfortable than BiPAP or CPAP • May provide some positive pressure • No risk of barotrauma	• Does not maintain positive pressure consistently • Does not maintain airway if patient has decreased mental status • Tubing and machinery are cumbersome and may not be available in all facilities

BiPAP, bilevel positive airway pressure; *COPD*, chronic obstructive pulmonary disease; *CPAP*, continuous positive airway pressure; *FIO_2*, fraction of inspired oxygen

a. Proehl, J.A. (Ed.). (2009). *Emergency nursing procedures* (4th ed.). St. Louis: Saunders.

b. Miller, K. (2015). Oxygen administration: What is the best choice? Retrieved July 9, 2019, from http://www.rtmagazine.com/2015/10/oxygen-administration-best-choice

c. Nishimura, M. (2015). High-flow nasal cannula oxygen therapy in adults. *Journal of Intensive Care, 3*(1), 15.

d. Thandar Htun, A., Min Thein, W. (2016). Oxygen therapy. *International Journal of Novel Research in Healthcare and Nursing, 3*(2), 8-14.