

Fraction of Inspired Oxygen (FiO₂)

For all supplemental oxygen delivery devices, the patient is not just breathing the direct oxygen, but rather is breathing a **combination** of room air plus the oxygen from the supplemental device. Different devices deliver to the patient more or less of a % of what is coming in from the tank.

Fraction of Inspired Oxygen (FiO₂) for a nasal cannula and a Venturi mask are given in the tables below. For other oxygen delivery systems, such as masks, tents, there is more oxygen that "blows by" or is lost, therefore higher flow rate setting on the oxygen tank are needed to achieve the same FiO₂. A tracheostomy would require different calculations as well.

Example:

with a **nasal cannula**, we assume that the fraction of oxygen that is inspired (above the normal atmospheric level or 20%) increases by 4% for every additional liter of oxygen flow administered.

For a Nasal Cannula:

Oxygen tank FLOW RATE in liters / min	FiO₂ -- Fraction of Inspired Oxygen value
0 (no oxygen, just room air)	.20
1 L / min	.24
2 L / min	.28
3 L / min	.32
4 L / min	.36
5 L / min	.40
6 L / min	.44

For a Venturi Mask:

Oxygen tank FLOW RATE in liters / min	FiO₂ -- Fraction of Inspired Oxygen value
0 (no oxygen, just room air)	.20
4 L / min	.24 - .28
6 L / min	.31
8 L / min	.35-40

Table 1 Comparison of oxygen delivery by standard cannula versus reservoir cannula

Parameter	Flow, L/min									
	Air	0.5	1	2	3	4	5	6	7	
Fraction of inspired oxygen delivered via										
Standard cannula	0.21	0.23	0.24	0.28	0.31	0.34	0.37	0.41	0.44	
Reservoir cannula	0.21	0.29	0.31	0.35	0.38	0.41	0.45	0.48	0.51	
Savings ratio	4:1	3:1	2:1	1.7:1	1.5:1	1.4:1	1.3:1	ND	ND	
Percent savings	75	67	50	41	33	29	23	ND	ND	

*Calculations are based on a respiratory rate of 20 breaths/min and an inspiratory to expiratory ratio of 1:2. Values through 2 L/min have been experimentally confirmed.⁷ ND indicates not determined.