



# Prince Sultan Military Medical City

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وزارة الدفاع  
MINISTRY OF DEFENSE

Departmental Policy	Dept.: Choose an item.	Policy No: 1-2-9451-03-018 Version No: 03
Title: Medical Gases- Application in Adult ICS areas of PSMMC		JCI Code: FMS
Supersedes: 1-2-9451-03-018 Version No: 02; 11 June 2019	Issue Date: 31 May 2023	Effective Date: 21 May 2023
	Revision Date: 20 May 2026	Page 1 of 5

## 1. **INTRODUCTION**

Prince Sultan Military Medical City is a Tertiary level Hospital, and hospitalized patients receive both critical as well as non-critical type of care. Treating patients using the Medical gases is an integral part of patient care on routine basis, irrespective of the clinical area. Formatting this policy facilitates the effective communication among healthcare workers and ensures the optimal care of the patient is rendered.

## 2. **PURPOSE**

2.1 To ensure proper gas utilization according to the need for each patient with a safe practice at PSMMC.

## 3. **APPLICABILITY**

3.1 All ICS staff

## 4. **RESPONSIBILITIES**

4.1 All sections of this Policy applies to All ICS Staff (i.e. Physicians, Nurses and RCP's)

## 5. **POLICY**

5.1 RCP is responsible for the following:

5.1.1 Able to make a distinction among different color-coded Respiratory gas cylinders

5.1.2 Assure that the used cylinder is identified without any mistake

5.1.3 Not to use a mislabeled or confusing color-coded cylinder

5.1.4 Assure that the cylinder is ready with proper regulator and the absence of leak

5.1.5 Assure that the used flowmeter is correctly chosen before connecting oxygen tubing to the flow meter (Resuscitation bag, mask, nasal cannula etc.).

5.2 A gas cylinder must never stand in a vertical position without being in an appropriate carrier.

5.3 Empty cylinders must be labelled or separated from full cylinders.



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- 5.4 Always follow the regulator manufacturer's instructions for attaching the regulator to an oxygen cylinder.
- 5.5 Always be certain the valve, regulator, and gasket are free from oil and grease contamination, which can contribute to ignition in oxygen systems.
- 5.6 Ensure safe storage, transportation and handling of medical gas cylinders around the site.
- 5.7 Medical gas department must coordinate with Respiratory Care Department for planned and emergency interruption of oxygen and air supply

## 6. **DEFINITION OF TERMS**

- 6.1 **ICS:** Intensive Care Services
- 6.2 **ICU:** Intensive Care Unit
- 6.3 **RCP:** Respiratory Care Practitioner
- 6.4 **RCD:** Respiratory Care Department
- 6.5 **PSI:** Pounds Per Square Inch (Unit of Pressure)
- 6.6 **Cracking of Cylinder:** The procedure: Before attaching regulators, always "crack" cylinder valves (open the valve just enough to let gas escape for a very short time) to expel foreign matter from the outlet port of the valve.
- 6.7 **NO:** Nitric Oxide
- 6.8 **NO<sub>2</sub>:** Nitrogen Dioxide
- 6.9 **He:** Helium
- 6.10 **HeO<sub>2</sub>:** Heliox (Gas mixture: Helium + Oxygen)
- 6.11 **SFM:** Simple Face Mask
- 6.12 **NRM:** Non Rebreathing Mask

## 7. **PROCEDURES**

- 7.1 Deliver the required gas to each area based on unit request
- 7.2 Verify the chosen gas by label and color code
- 7.3 Make sure the gas cylinder is properly secured





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- 7.4 Remove the protective cap or wrap and inspect the cylinder valve to ensure that is free of dirt, debris or oil.
- 7.5 Alert others around you, that you will 'CRACK' the cylinder valve.
- 7.6 Turn the cylinder valve away from anyone.
- 7.7 Quickly open and close the valve
- 7.8 Inspect the inlet of the device visibly to be attached to ensure that it is free of dirt and debris.
- 7.9 Securely tighten- but do not apply force- the device into the cylinder outlet.
- 7.10 Be certain that the regulator or reducing valve is in the closed position.
- 7.11 Turn the gauge away from you.
- 7.12 Open the cylinder valve slowly and completely then turn it back quarter to half turn.
- 7.13 Ensure that there is no leak by observing the pressure gauge.
- 7.14 Read the pressure available on the gauge and assess if it is appropriate for the patients need:
  - 7.14.1 If patient is receiving oxygen through Low flow oxygen device: (e.g. Nasal Cannula, SFM, etc.)
    - 7.14.1.1 Change the oxygen cylinder if the pressure reading is  $\leq 150$  PSI
  - 7.14.2 If patient is receiving oxygen through High Flow Oxygen device (e.g. NRM, Venturi Device etc.)
    - 7.14.2.1 Change the oxygen cylinder, if the pressure reading is  $\leq 500$  PSI
  - 7.14.3 If patient is being transported:
    - 7.14.3.1 Make sure adequate supply of oxygen is carried, depending upon:
      - 7.14.3.1.1 Duration/ or Time it takes to transport the patient
      - 7.14.3.1.2 Availability of oxygen at the procedure area
      - 7.14.3.1.3 Setting /or amount of oxygen patient is prior the transport.
    - 7.14.3.2 Any patient transported on Mechanical ventilator, the cylinder pressure MUST be  $\geq 500$  PSI.
- 7.14 Estimating duration of cylinder gas flow for Oxygen
  - 7.14.4 Factors affecting duration of flow
    - 7.14.4.1 Gas flow
    - 7.14.4.2 Cylinder size
    - 7.14.4.3 Cylinder pressure at start of therapy



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## 7.14.5 Formulas:

7.14.5.1 Cylinder factor for oxygen cylinder size:  $D=0.16$ ,  $E=0.28$ .  $G=2.41$ ,  
 $H\&K=4.14$

7.14.5.2 Duration of flow (min) = Pressure (psig) x Cylinder factor / Flow  
(L/min)

## 7.15 Role of Respiratory Therapists

- 7.15.4 Recommend appropriate treatment
  - 7.15.5 Proper medical gas used
  - 7.15.6 Regulators, flowmeters, & additional equipment
  - 7.15.7 Monitor outcomes
  - 7.15.8 Observe adverse reactions
  - 7.15.9 Troubleshoot equipment
  - 7.15.10 Effective communication with Medical Gas Department for continuing un-interrupted delivery of medical gases at critical clinical areas.
- 7.16 Two types of washers are commonly used to enhance the seal at the cylinder valve/regulator interface.
- 7.17 For Transporting, Storage and handling of Medical gas cylinders, please refer to the Appendix B of this policy.
- 7.18 In Clinical areas especially inside the critical areas, if there is a fire, the Head Nurse/or Charge Nurse would be responsible to shut-off the Oxygen Valve.



## 8. REFERENCES

- 8.1 Egan's Fundamental of Respiratory Care, Chapter 37, Edition 10<sup>th</sup>, 2013.
- 8.2 Medical Gas Program Policy: PSMMC "Policy No. 1-1-8018-05-039"
- 8.3 Medical Gases Procedure for Medical Gas Shutdown Policy "Policy No: 1-1-8018-05-041"

## 9. APPENDICES


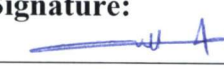
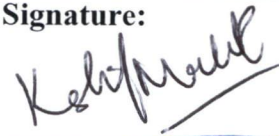
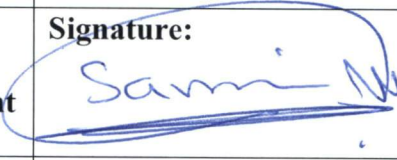




- 9.1 Appendix A: Medical Gas: Identification, Safety, Filling, Measuring, Storage & Usage



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### 10. ORIGINATING DEPARTMENT

Intensive Care Services Department-Respiratory Care Services

<b>Compiled by:</b> • Mrs. Ekhlās Al Hefdhī Team Leader & Chairman of Respiratory Care Services Policy and Procedure Committee	<b>Signature:</b> 	<b>Date:</b> 17-4-2023
• Mrs. Bodour Al Dossari Head of Respiratory Care Services	<b>Signature:</b> 	<b>Date:</b> 20/4/2023
<b>Reviewed by:</b> Dr. Muhammad Kashif Malik Consultant & Head, CQI&PS Division, Intensive Care Services	<b>Signature:</b> 	<b>Date:</b> 2/APRIL/2023
<b>Reviewed by:</b> Dr. Samir Mohammed Bawazir Director, Continuous Quality Improvement & Patient Safety (CQI&PS)	<b>Signature:</b> 	<b>Date:</b> 27.4.2023
<b>Authorized by:</b> Brig. Gen. Dr. Adnan Al Ghamdi Director of Intensive Care Services (ICS)	<b>Signature:</b> 	<b>Date:</b> 26-4-2023
<b>Authorized by:</b> Brig. Gen. Dr. Abdulrahman Al Robayyan Director of Medical Administration	<b>Signature:</b> 	<b>Date:</b> 08/05/23
<b>Authorized by:</b> Brig. Gen. Dr. Rashed Al Otaibi Executive Director for Health Affairs Chairman, Senior Medical Management Team (SMMT)	<b>Signature:</b> 	<b>Date:</b> 11.5.2023
<b>Approved by:</b> Maj. Gen. Khalid Abdullah Al Hadaithi General Executive Director of Prince Sultan Military Medical City	<b>Signature:</b> 	<b>Date:</b> 21.5.2023



# Prince Sultan Military Medical City

## Intensive Care Services RESPIRATORY CARE DEPARTMENT



**TABLE 37-2**

### Color Codes for Medical Gas Cylinders

Gas	United States	Canada
Oxygen	Green	White*
Carbon dioxide	Gray <sup>1</sup>	Gray
Nitrous oxide	Blue	Blue
Cyclopropane	Orange	Orange
Helium	Brown	Brown
Ethylene	Red	Red
Carbon dioxide-oxygen	Gray/green	Gray/white
Helium-oxygen	Brown/green	Brown/white
Nitrogen	Black	Black
Air	Yellow*	Black/white
Nitrogen-oxygen	Black/green	Pink

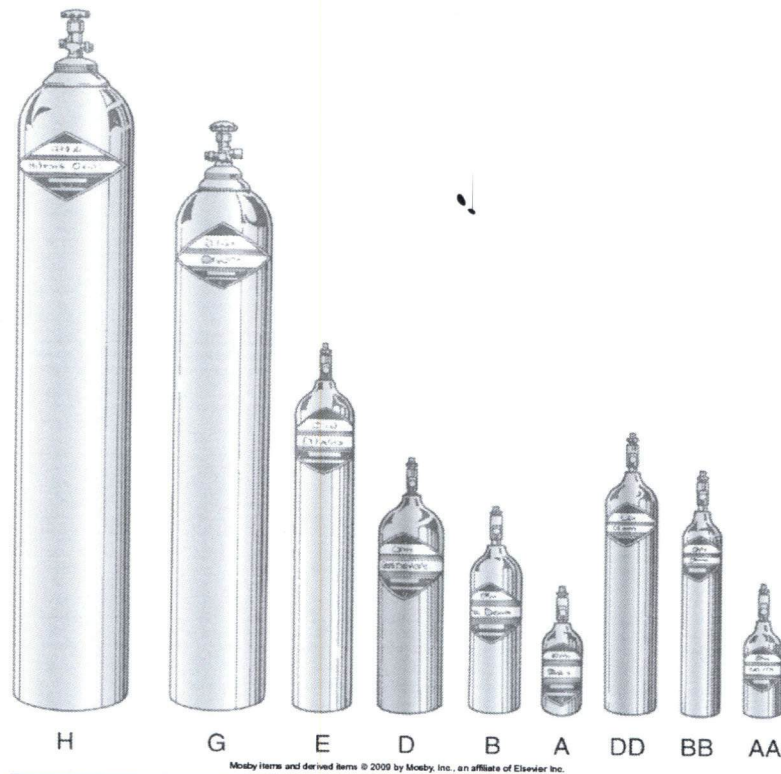
\*Vacuum systems historically are identified as white in the United States and yellow in Canada. For this reason, the Compressed Gas Association (CGA) recommends that white not be used for any cylinders in the United States nor that yellow be used in Canada.

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## Intensive Care Services RESPIRATORY CARE DEPARTMENT



Gas	Symbol	Material	Color	Details
Oxygen	O <sub>2</sub>	Hot welded	White Color Cylinder	Label reads "Medical grade Oxygen USP"
		Aluminum Cylinder	Silver body with green head	
		Seamless steel	Full cylinder in Green color	
Air	Air	Stainless steel	Grey or Black Cylinder	Label reads "Medical grade air USP"
Heliox	HeO <sub>2</sub>		Pink Color Cylinder	Label reads Helium-Oxygen mixture USP and indicates the mixture. Mixture used at RCD of PSMMC is 80/20. The CGA connector for non-hypoxic mixtures (contain at least 20% Oxygen) is CGA 280.
			Brown Color-Cylinder body & Upper section white	
Nitric Oxide	NO		Yellow or Pink and teal cylinder with teal color top	Label reads iNO max for inhalation 800 PPM





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## Intensive Care Services RESPIRATORY CARE DEPARTMENT



### 1. Markings & identification of Cylinders

- 1.1 Color coded & marked with metal stamping on shoulder
- 1.2 Stamping indicates size, normal filling pressure, serial number, ownership, & method of manufacturer
- 1.3 Safety tests are conducted every 5 or 10 years
- 1.4 Results of pressure testing are stamped on tank

### 2. Cylinder storage

- 2.1 Store in racks or chain to wall
- 2.2 Do not store combustible material in vicinity of cylinders
- 2.3 Store away from sources of heat
- 2.4 Store flammable gases separately from gases that support combustion
- 2.5 Keep cylinder cap in place if cylinder is not in use
- 2.6 Post "NO SMOKING" signs near storage units
- 2.7 Store liquid O2 containers in cool, well-ventilated area

### 3. Cylinder use

- 3.1 Secure cylinders at patient's bedside
- 3.2 Do not use flammable materials (e.g., oil) on regulators, cylinders, fittings, or valves
- 3.3 "Crack" or open cylinder valve slightly to remove dust before attaching regulator
- 3.4 Post "NO SMOKING" signs when O2 is used