




Institution Name: Directorate of Specialized Medical Care, MoH

Document Title: Policy and Procedure of Patient - Ventilator System Check (PVSC)

Approval Process

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Acronyms:

ABG	Arterial Blood Gas
FDO2	Fractional Concentration of Oxygen Delivered
FIO2	Fraction of Inspired Oxygen
HME	Heat and Moisture Exchanger
IMV	Intermittent Mandatory Ventilation
MoH	Ministry of Health
OVP	Operational Verification Procedure
PEEP	Positive End Expiratory Pressure
PVSC	Patient- Ventilator System Check
RR	Respiratory Rate
VT	Tidal Volume



Policy and Procedure of Patient - Ventilator System Check (PVSC)

1. Introduction

Continuous Mechanical Ventilation is a supportive measure that maintains cardiopulmonary function until the underlying cause of the respiratory failure is resolved. However, the application of positive pressure does alter normal physiology and affects the function of many body systems. To simplify monitoring, a patient-ventilator system check has been introduced.

Maintenance of the patient-ventilator system is the primary role of the respiratory care practitioner in the intensive care unit. Patient-ventilator system checks should include monitoring the patient's response to ventilation, evaluating function of the ventilator, maintaining ventilator settings according to physician orders, setting appropriate alarms, maintaining the integrity of the ventilator circuit and humidifier, and documenting all of the above. The concept of ventilator checks has been expanded and thus, the name changed to patient-ventilator system check to emphasize the importance of evaluating the patient.

2. Scope

This policy is applicable to all Respiratory Therapist/ Respiratory Care Services in all MOH healthcare institutions with critical care setting.

3. Purpose

The purpose of this policy is:

- 3.1 To review the rationale for performing patient-ventilator system checks and measurements.
- 3.2 To provide a documented evaluation of a mechanical ventilator and of the patient's actual response to mechanical ventilatory support.

4. Definitions

4.1. Patient-ventilator system check: is a documented evaluation of a mechanical ventilator and of the patient's response to mechanical ventilatory support. This procedure is often referred to simply as a ventilator check.

4.2. Ventilation: Exchange of air between the lungs and the air (ambient or delivered by a ventilator), in other words, it is the process of moving air in and out of the lungs. It's most

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important effect is the removal of carbon dioxide from the body, not on increasing blood oxygen content. Ventilation is measured as minute ventilation in the clinical setting, and compliance is calculated as $RR \times VT$. In a mechanically ventilated patient, the CO₂ content of the blood can be modified by changing the tidal volume or the respiratory rate.

- 4.3. Oxygenation: Interventions that provide greater oxygen supply to the lungs, thus the circulation. In a mechanically ventilated patient, this can be achieved by increasing the fraction of inspired oxygen or the positive end-expiratory pressure (PEEP)
- 4.4. PEEP: The positive pressure that will remain in the airway at the end of the respiratory cycle (end of exhalation) that is greater than the atmospheric pressure in mechanically ventilated patients.
- 4.5. Tidal volume: Volume of air moved in and outside the lungs in each respiratory cycle.
- 4.6. FiO₂: Percentage of oxygen in the air mixture that is delivered to the patient.
- 4.7. Flow: Speed in liters per minute at which the ventilator delivers breaths.
- 4.8. Compliance: Change in volume divided by change in pressure. In respiratory physiology, total compliance is a mix of lung and chest wall compliance as these two factors cannot be separated in a live patient.

5. Policy

- 5.1. All data relevant to the patient-ventilator system check (ventilator check) shall be recorded on the appropriate ventilator flow sheet at the time of performance.
- 5.2. A mandatory patient-ventilator system check (ventilator check) shall be performed every four hours for any patient who is on mechanical ventilation for life support.
- 5.3. The ventilator flow sheet is to be included as part of the patient's official medical record and shall include patient information and observations indicative of the ventilator's operation/ settings at the time of ventilator check.
- 5.4. A check shall also be performed:
 - 5.4.1. Prior to obtaining arterial blood gas specimen for analysis
 - 5.4.2. Following changes in ventilator settings
 - 5.4.3. Any time the ventilators performance is questionable following an acute deterioration of the patient's condition.



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5.5 The patient-ventilator system check should serve to help prevent the occurrence of problematic incidents, warn of impending or trending events, and assure the maintaining of proper ventilator settings in accordance with a physician's order

6. Procedure

6.1 A ventilator checklist label must be displayed for each ventilator that will show a clear documentation of an operational verification procedure (or ventilator self- test) testing was performed prior to or at the time the ventilator was first applied to the patient.

6.1.1. The purpose of the OVP or self-test is to assure the proper internal functioning of the ventilator.

6.2 An operational verification procedure should be performed at bedside prior to connection to the patient; after the patient circuit has been changed or disassembled for any reason.

6.3 The respiratory therapist will verify and document the ventilator is functioning and properly connected to the patient.

6.4 The respiratory therapist must verify written documentation of all orders for mechanical ventilator settings and changes by an authorized practitioner in the patient's chart

6.5 The patient-ventilator system check must include the following patient information and observations indicative of the ventilator's operation/settings at the time of the ventilator check:

6.5.1 Patient's Name

6.5.2 Diagnosis

6.5.3 Endotracheal or tracheostomy tube size and position

6.5.4 Documentation of last time patient circuit changed

6.5.5 Date of patient-ventilator system check

6.5.6 Time of patient-ventilator system check

6.5.7 Current ventilator settings

6.5.7.1 Mode of ventilation

6.5.7.2 Set ventilator frequency

6.5.7.3 Set FIO₂ / measured (FDO₂) (fractional concentration of oxygen delivered) with an appropriate calibrated analyzer

6.5.7.4 Peak, mean, baseline airway pressures and auto-Peep (if applicable)

6.5.7.5 Set PEEP



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- 6.5.7.6 Set peak inspiratory pressure limit and pressure support level, (if applicable)
- 6.5.7.7 Set tidal volume (if applicable)
- 6.5.7.8 Delivered tidal volume (measured or calculated)
- 6.5.7.9 Set sigh variables (if applicable)
- 6.5.7.10 Set minute ventilation (if applicable)
- 6.5.7.11 Set minimum ventilation (if applicable)
- 6.5.7.12 Set inspiratory flow rate and waveform (if applicable)
- 6.5.7.13 Set continuous flow rate (for IMV, if applicable)
- 6.5.7.14 Set I-E ratio, % inspiration, or inspiratory and expiratory times
- 6.5.7.15 Set Sensitivity threshold (if applicable)
- 6.5.7.16 Humidifier temperature settings (if applicable) or presence of HME
- 6.5.8 Documentation of alarm settings and activation of appropriate alarms
- 6.5.9 Description of any equipment failure and subsequent measures taken
- 6.6. Patient ventilator system checks must include clinical observations indicative of the patient's response to mechanical ventilation. The clinical observations should include an evaluation of the patient's
 - 6.6.1 Breath sounds
 - 6.6.2 Spontaneous respiratory rate, volume, and pattern
 - 6.6.3 Compliance (Dynamic and Static)
 - 6.6.4 Chest motion
 - 6.6.5 Pallor, skin color
 - 6.6.6 Level of consciousness
 - 6.6.7 Endotracheal-tube cuff pressure, apparent stability and position of tube (if a tracheostomy tube is present – note cuff pressure, patency and positioning)
 - 6.6.8 Secretions
 - 6.6.9 Condition of any ancillary equipment (chest tube, manual resuscitator)
 - 6.6.10 Results of weaning parameters performed
 - 6.6.11 Any problematic effects from disconnection from ventilator during bedside procedures
 - 6.6.12 Documentation of patient-ventilator synchrony during assisted or supported breaths



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6.6.13 Documentation of oxygenation and ventilation status (ABG, end tidal CO₂, transcutaneous saturation)

6.7. Signature/initials (along with credentials) of therapist performing patient-ventilator system check

7 Responsibilities

7.1. Respiratory Therapists are responsible for:

7.1.1 Comply with Universal Precautions

7.1.2 Possess a complete understanding of the setup, technical operation, maintenance, and troubleshooting of the ventilator, circuit, and humidifying device

7.1.3 Understand cardiopulmonary physiology and pathophysiology processes

7.1.4 Properly assess patient

7.1.5 Recognize any adverse reaction and appropriately respond to adverse events

7.1.6 Properly interpret the results of ABG analysis and recommend those ventilator variables which can be initiated or modified to achieve the desired blood gas results



8 Document History and Version Control

Document History and Version Control			
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9 Related Documents:

There is no related document for this policy



10 References:

Title of book/ journal/ articles/ Website	Author	Year of publication	Page
Ventilator Management; StatPearls [Internet].	Andres L. Mora Carpio; Jorge I. Mora.	January 19, 2019.	
AARC Clinical Practice Guidelines, Respiratory Care		1992	37:882-886)
Patient-Ventilator Interaction; Respiratory Care	David J Pierson	February 2011,	56 (2) 214-228;
https://books.google.com.om/books?isbn=817225220X Verma – 2006; Principles and Practice of Critical Care		2006	181
Monitoring ventilator function. Crit Care Clin	Branson RD.	1995 Jan;	11(1):127-43. Review
Ventilator Alarms: Challenges and Opportunities for Improvement; Biomed Instrum Technol.	Stokes JE, Manzoor SH, Cvach MM.	2017 Sept./Oct.;):390-397. 10.2345/0899-8205-51.5.390.