Ventilation (Non-Invasive and Invasive Mechanical) – Clinical Practice Standard

1. Purpose

WA Country Health sites provide emergency care for patients, which include the provision of advanced respiratory support. This may include the use of non-invasive (NIV) and portable Invasive mechanical ventilation (IMV) in the short term whilst awaiting medical evacuation from an Emergency Department/Theatre to an Intensive Care Unit.

This document will establish minimum practice standards for acute management of NIV and IMV throughout WACHS, primarily in the Emergency Department, awaiting transfer to a tertiary ICU.

This Clinical Practice Standard should be used in conjunction with specific site departmental requirements, and manufacturer's manual guides and excludes devices used for sleep apnoea and outpatient services.

Further information relating to specialty areas including Child and Adolescent Health Service (CAHS), Women and Newborn Health Services (WNHS) can be found via healthpoint.hdwa.health.wa.gov.au

This policy is to be used in conjunction with:

- WACHS Adult Airway Management CPS
- WACHS Airway Suctioning CPS
- WACHS Assessment and Management of Interhospital Patient Transfers Policy
- WACHS Sedation for Mental Health Patients Awaiting Aeromedical Transfer Guideline
- WACHS Documentation CPS

For paediatric considerations refer to the 'WACHS endorsed for use in clinical practice' links:

- Kids Health WA Emergency Guidelines Post resuscitation Care
- PCH Bubble Continuous Positive Airway Pressure (CPAP)
- Paediatric Critical Care Manual – Critical Care Policy Set
- Women and Newborn Health Service (WNHS) Ventilation: Conventional

For neonate consideration use the following links:

- Newborns requiring assisted ventilation awaiting transfer, without Paediatric doctors, should be done under consultation with Neonatal Emergency Transfer Service WA (NETSWA) medical staff and NETSWA guidelines
- Neonatal and Paediatric Continuous Positive Airway pressure (CPAP) Guidelines
- WNHS Neonatology Continuous Positive Airway Pressure (CPAP)

Further information relating to specialty areas including Child and Adolescent Health Service (CAHS), Women and Newborn Health Services (WHNS) can be found via HealthPoint.

2. Scope

All emergency department medical & nursing staff that may have to care for patients with severe respiratory distress requiring respiratory support.

All health care professionals are to work within their scope of practice appropriate to their level of training and responsibility.

Further information may be found via HealthPoint or the Australian Health Practitioner Regulation Agency.

3. General Information

NIV is defined as ventilator support without the use of an invasive artificial airway e.g. endotracheal tracheal tube (ETT) or tracheostomy tube. NIV can often be initiated at an earlier stage than IMV, possibly preventing admission to an ICU and reducing lengths of stay.

IMV is for patients who are unable to protect their airway, and have poor respiratory rate and/or are at risk of respiratory failure.

Ventilation may take place with a bag valve mask, oxygen powered resuscitators and mechanical ventilators.

Staff are to comply with the specific requirements for hand hygiene, aseptic non-touch technique and personal protective equipment.
Refer to:
Personal Protective Equipment (PPE) Procedure
Infection Prevention and Control Policy

4. Procedural Information

Where care requires specific procedures that may vary in practice across sites, staff are to seek senior clinician advice and review the equipment manuals for technical/mechanical advice/terminology

- Modes of NIV– Spontaneous/Timed Modes
  - Continuous Positive Airway Pressure (CPAP)
    - ✓ CPAP provides continuous positive pressure throughout the spontaneous respiratory cycle, recruiting collapsed (atelectic) alveoli, resulting in increased functional residual capacity. It is predominately used in patients with type 1 respiratory failure (hypoxia without hypercapnia due to problems with airway recruitment/atelectasis such as occurs with pulmonary oedema or post-operative atelectasis.

- Bi-level Positive Airway Pressure Ventilation – also known as BiPAP*

  (original registered trademark of the supplier of the original machine)

  - ✓ BiPAP cycles between an upper pressure level (IPAP- inspiratory positive airway pressure) and a lower pressure level (EPAP- expiratory positive airway pressure.
  - ✓ BiPAP provides spontaneous ventilator assistance CPAP with the added benefit of decreasing the work of breathing and increases tidal volume and minute volume ventilation. It is used in the management of patients with type 2 (hypercapnia) respiratory failure
  - ✓ The most common application of BiPAP is for the management of acute exacerbations of Chronic Obstructive Pulmonary Disease (COPD). Other indications include chronic use in obesity hypoventilation (Pickwickian) syndrome, respiratory muscle weakness due to neuromuscular disease and reduction in thoracic compliance due to chest wall abnormalities and/or abdominal pathology

Modes of IMV-

- Combination modes-
  - Synchronised Intermittent Mandatory Ventilation (SIMV)
    - Patient receives a set number of breaths of a set tidal volume or pressure.
    - Between these mandatory breaths, the patient may initiate spontaneous breaths.
    - If pressure support (PS) is set then patient spontaneous breaths are supported
    - The tidal volume of the spontaneous breaths depends on the patient's own respiratory effort and if PS is applied
  - Synchronised Intermittent Mandatory Ventilation + Pressure Support (SIMV + PS) -
    - Patient receives a set number of breaths of a set tidal volume. Between these mandatory breaths, the patient may initiate spontaneous breaths. Patients spontaneous intermittent breaths are supported with pressure support
  - Controlled Modes (CMV)
    - ✓ The patient receives a pre-set number of breaths per minute of a pre-set volume/pressure. Any patient effort does not trigger an additional breath. The ventilator performs all the work of breathing

5. Mandatory Considerations

- The decision to initiate NIV or intubate and ventilate is ONLY to be determined by a medical officer (MO) who is experienced in the medical management of patients requiring advanced airway management. Alternatively follow site specific medical escalation of care protocols.
- NIV devices should not be used in patients where intubation and IMV is clinically indicated.
    - These cases potentially include patients who have minimal or no spontaneous respiratory effort, those who are unable to protect their airway, or have conditions where NIV is considered ineffective e.g. severe pneumonia, acute lung injury, Sepsis with impending or established multi organ failure.
- NIV is most effective for mild/moderate exacerbations of chronic respiratory failure.
- Patients who are weaning off ventilation or have tracheostomy in situ, or have sleep apnoea CPAP are excluded from this criteria.
- Resuscitation equipment is available and in working order.
- The patient's resuscitation status is to be made at the commencement of the treatment based on the patient's wishes, pre-morbid state and the reversibility of the acute illness.
- Refer to:
    - WACHS Not for Cardiopulmonary Resuscitation Policy
    - WACHS Advance Health Directive and Enduring Power of Guardianship

6. Indications for Procedure

Patient selection criteria for NIV

- Spontaneous breathing
- Ability to maintain airway
- Ability to clear secretions
- Ability to cooperate
- Ability to tolerate face mask

Patient selection criteria for intubation and IMV

- Bradypnea or apnoea/respiratory arrest
- Inability to protect own airway
- Persistent respiratory demand insufficiency that cannot be met by NIV interventions
- Acute lung injury
- Treated pneumothorax
- Facial surgery, trauma, malformations
- High risk of aspiration
- Decreased conscious level

Complications of Positive Pressure Ventilation include, but are not limited to:

- Decreased cardiac output, renal, hepatic and cerebral perfusion due to increased intrathoracic pressures reducing venous return - hypotension due to loss of preload
- Raised intracranial pressure
- Pulmonary barotrauma, volutrauma and chemotrauma
- Gastric distention
- Risk of aspiration
- Patient/ventilator dyssynchrony
- Air Leaks
- Mask/Tube discomfort
- Facial pressure areas
- Conjunctival/eye irritation

7. Clinical Communication

Clinical Handover

Information exchange is to adhere to the Department of Health Clinical Handover Policy using **the iSoBAR framework**.

At a minimum the plan must consider:

- Patient history and diagnosis for clinical conditions, medications, psychological and cultural factors that could impact observations
- Presence of comorbidities and treatment
- Frequency & specific observations

- Site requirements, patient communication/education and consent
- Any restriction to intervention associated with advanced Health Directives or Goals/Ceilings of Patient Care

Critical Information

Critical information, concerns or risks about a patient are communicated in a timely manner to clinicians who can make decisions about the care.

Documentation

An individualised management plan is to be documented in the patient's health records as soon as practicable, in regard to this CPS.

- Medical Officer to prescribe NIV/IMV ventilation therapy settings on MR 137 WACHS Mechanical Ventilation Order & Observation Chart or Critical Care Observation Chart
- The Medical Officer must prescribe on the appropriate medication chart (MR170 series) the analgesia, prophylaxis for Deep Vein Thrombosis and peptic ulcer therapies and fluid therapy as required. Sedation prescribed only if IMV ventilation is undertaken.

8. Patient Preparation and Education/Carer information

- Explain procedure to patient/significant other including rationale for use
- Obtain verbal consent from patient/next of kin prior to commencement if appropriate (emergency context may preclude this).
- Patient identification and procedure matching processes are undertaken.
- To maintain patient privacy and dignity
- Provide the opportunity for an accredited interpreter and/ or Aboriginal Liaison Officer where appropriate to the patient's language or communication requirements. (See WA Health Language Services Policy.)

9. Equipment Required

- Equipment must be appropriate for the age/size of the patient.
- Specific sites may have pre-prepared equipment packs where contents may vary.
- Equipment must be checked, serviced and calibrated in accordance with manufacturer's recommendations to ensure reliability and accuracy.

- Babypac Vision 100– Smiths Medical
- BiPAP Focus- Respironics,
- BiPAP Vision – Resmed
- Drager
    - Oxylog 1000
        - ✓ Oxylog 2000
        - ✓ Oxylog 2000+
        - ✓ Oxylog 3000 Plus
        - ✓ Babylog 8000 – Drager
    - Hamilton T1 –Hamilton Medical AG
    - Neopuff RD900AEU – Fisher & Paykel Healthcare
    - Positive Pressure Bi-Level – Respironics,
    - VPAP 111 ST-A - Resmed
    - V60 Philips

10. Staffing Requirements

- Medical support/Emergency Telehealth Services (ETS)
- Patients with acute respiratory failure require 1:1 nursing
- Staff must meet site specific requirements to care of patients requiring acute respiratory management
- Staff must have the experience in the care and treatment of patients undergoing ventilation (NIV & IMV) with current Advanced Life Support Competency

11. Ongoing Patient Requirements

The comfort and safety of patients receiving ventilation is paramount, regular eye, mouth and skin care needs to be attended to 2-4 hourly.
Observation of skin adjacent to the equipment should be observed for signs of pressure and appropriate barriers or dressings put in place to prevent pressure injury.
Refer to:
Patient Hygiene Clinical practice Standard
Pressure Injury Prevention and Management Policy

12. Ongoing Patient Management

A comprehensive full patient assessment before, during and after ventilation is essential, including but not limited to:

- Environmental Safety Checks – Clear working space, emergency equipment, current equipment in use, alarm limits
- Patient/family anxiety strategies – communication, information
- Neuro assessments including Glasgow Coma Scale (GCS), Richmond Agitation and Sedation Scale (RASS)
- Cardiovascular assessment including heart rate, rhythm, blood pressure, peripheral perfusion, temperature and IV maintenance
- Full respiratory system including physical assessment, ETT security, Sa02, PaO2 and ABG + ventilator settings as per prescription and appropriate alarm limits, humidification system in place (active, HME, tubing selection)
- GIT assessment including Intake/output (nausea & vomiting) – Naso Gastric T ube (NGT) assessment. Full abdominal assessment/bowel sounds etc
- Renal assessment including output (0.5ml/kg), urinalysis, fluid balance
- Skin assessment including visual inspection of skin around device/skin junctions – NGT, NIV mask on bridge of nose/around eyes, ETT & corners of mouth, NGT and nasal skin, and IV cannula
- Social worker assistance for patient/family/carers
- Investigations including blood tests - ABG, U&E, FBC, inflammatory markers. Chest x-ray (ETT & lung pathology),

13. Compliance Monitoring

Evaluation, audit and feedback processes are to be in place to monitor compliance.

Failure to comply with this policy may constitute a breach of the WA Health Code of Conduct (Code). The Code is part of the Employment Policy Framework issued pursuant to section 26 of the *Health Services Act 2016* (HSA) and is binding on all WACHS staff which for this purpose includes trainees, students, volunteers, researchers, contractors for service (including all visiting health professionals and agency staff) and persons delivering training or education within WACHS.

WACHS staff are reminded that compliance with all policies is mandatory.

14. Records Management

Health Record Management Policy

15. Relevant Legislation

(Accessible via: Western Australian Legislation or ComLaw) sites)

- *Carers Recognition Act 2004*
- *Disability Services Act 1993*
- *Health Practitioner Regulation National Law (WA) Act 2010*
- *Poisons Act 1964*
- Poisons Regulations 1965
- *Privacy Act 1988*
- *Public Sector Management Act 1994*
- *State Records Act 2000*

16. Relevant Standards

National Safety and Quality Health Service Standards (Second edition 2017) –

- Recognising and Responding to Acute Deterioration Standard – 8.1, 8.2, 8.3, 8.4, 8.6, 8.10

17. Related WA Health System Policies

- WA Clinical Alert (Med Alert) Policy
- Clinical and Related Waste Management Policy
- Clinical Handover Policy
- Clinical Incident Management Policy
- WA Health Consent to Treatment Policy
- Correct Patient, Correct Site and Correct Procedure Policy and Guideline for WA Health Services (2nd Edition)
- Implementation of the Australian Health Service Safety and Quality Accreditation Scheme and the National Safety and Quality Health Service Standards in Western Australia
- Recognising and Responding to Acute Deterioration Policy
- Resuscitation, Education and Competency Assessment Policy
- WA Health Consent to Treatment Policy
- Western Australian Patient Identification Policy 2014

18. Relevant WACHS documents

- Airway Suctioning Clinical Practice Standard
- Bladder Management Clinical Practice Standard
- Clinical Escalation of Acute Physiological Deterioration including Medical Emergency Response Policy
- Clinical Observation and Assessments CPS (physiological, neurovascular, neurological and fluid balance)
- Documentation CPS.
- Enteral Tubes and Feeding Clinical Practice Standard
- Inter-hospital Clinical Handover Form Procedure
- MR184 WACHS Inter-hospital Clinical Handover Form
- Oxygen Therapy and Respiratory Devices – Adults Clinical Practice Standard
- MR140A Adult Observation Chart
- MR140B Maternity Observation Chart
- MR144 WACHS Fluid Balance Worksheet
- MR170A WA Hospital Medication Chart
- MR1 WACHS Emergency Department Notes
- MR137 WACHS Portable Ventilation Order and Observation Chart

19. WA Health Policy Framework

Clinical Governance, Safety and Quality Policy Framework

20. Acknowledgement

Acknowledgment is made of the previous SMHS / WACHS site endorsed work used to compile this Non-Invasive Clinical Practice Standard 18 March 2015, and WACHS Mechanical Ventilator – Portable Policy 31 May 2017.

21. References

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22. Appendices:

Appendix 1: Non-Invasive Ventilation (NIV)
- Initial Set Up
- Application
- Alarms
- Ongoing Management

Appendix 2: Invasive Mechanical Ventilation (IMV)
- Controlled Modes
- Combination Modes
- Synchronised Modes
- Adaptive Support Modes
- Initial Set Up
- Application
- Settings & Alarms
- Ongoing Patient Management
- ETT Cuff Pressure Checking Procedure
- Sedation & Analgesia
- Richmond Agitation Sedation Score (RASS)
- Communication with a Ventilated Patient

Appendix 3: Definitions

This document can be made available in alternative formats on request for a person with a disability

Contact:	Project Officer Clinical Practice Standards (G. Cutler)		
Directorate:	Medical Services	**EDRMS Record #**	ED-CO-15-92912
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Appendix 1: Non-Invasive Ventilation (NIV)

CPAP – For treatment of Type 1 Respiratory Failure**,** Expiratory positive airway pressure (EPAP) should be titrated to achieve clinical effect & use sufficient O2 flow rate to attain target oxygenation.

BiPAP - cycles between an upper pressure and a lower pressure

EPAP - the starting level will be dependent upon various factors which may include coexistent oxygenation problems and the need to offset intrinsic PEEP* (in COPD) to improve work of breathing in patients with COPD.

Inspiratory Positive Airway Pressure (IPAP)- should commence at 5-10 cm H_2O above set EPAP and be titrated to achieve clinical effect in increments of 2cm H_2O

NIV initial set up

Patients requiring NIV outside of an Emergency Department or Intensive Care Unit should refer to their on-site specific medical escalation of care protocols

- Refer to relevant set up guides to the individual ventilator brands
- Perform the NIV ventilator and patient circuit check as per the manufacturer's instructions and prior to attaching to the patient
- Initial settings focus on achieving adequate tidal volumes (6-8ml/kg of ideal body weight)
- Additional support is provided to reduce respiratory rate to less than 25 breaths per minute
- FiO2 oxygen flow rate is adjusted to achieve adequate oxygen saturations 88-92% (for COPD), 94-98% for all others, as set by the medical officer
- Initial settings are low to improve patient compliance and are titrated upwards to reach therapeutic effect or patient tolerance
- Serial arterial or capillary blood gas measurements are essential to monitor the response to therapy and to guide further adjustments as clinically indicated
    - ✓ Prior to commencement, 1, 4 hourly after initiation of therapy or more frequently as clinically indicated
    - ✓ Increases of IPAP > than 5cm H^2O may alter haemodynamic status
- All NIV ventilator patients must be directly and continuously monitored until stable. Documentation on physiological parameters should be recorded between 15 minutes to hourly with increased frequency after commencing ventilation and after any changes in machine settings
- Add humidification as per doctors' orders and/or manufacturers specific guidelines
- Where possible the patient should be sitting or in semi-recumbent position to enhance chest expansion (patients with acute quadriplegia should be positioned supine if possible. Alternate positions may be recommended based on patient's clinical condition

Application

- Depending on the ventilator interface in use, apply mask correctly to the patients nose, mouth and nose or full face
- Apply mask, during first few minutes of treatment the mask should be held gently to the patients face. Provide reassurance and familiarisation
- Encourage the patient to breathe deeply. This will encourage the recruitment of alveoli, improve gas exchange and reduce respiratory effort
- The head straps can then be firmly but not tightly applied, as small leaks may be acceptable
- If using a fixed leak circuit, ensure the exhalation port is not blocked and the flow is unhindered
- Verify if the patient is able to breathe with reasonable comfort
- Reassure patient as needed and assist patient with methods of communication as verbal communication is more difficult whilst NIV therapy is insitu

Alarms

Alarms must be checked upon initial set up, at least once per shift, and with any patient deterioration.

Set patient alarm parameters

- Apnoea
- High Pressures (consider setting 5cmH20 above pMax/IPAP/PS)
- TiMax
- High and low minute volume
- Respiratory rate (high and low alarm levels)

Ongoing Monitoring/ Management

- Core observations (SPO2, Heart rate, Respiratory rate, Blood Pressure, Level of Consciousness and temperature)
  - Once stable these observations are recorded hourly (except temp 4 hourly) and increased if patients condition worsens
- Cmprehensive full patient assessment as a minimum at the beginning of each shift
- 1-2 hourly and PRN respiratory assessment
- Fluid balance recordings (urine output) 1 hourly
- Patients comfort and use of accessory muscles
- Coordination of respiratory effort with the ventilator
- Machine settings
  - CPAP, IPAP, EPAP, O2 Flow rate
- Consider supplemental O2 requirements during activities such as meals or mouth care
- Positive pressure via nasal, facial mask can cause air swallowing, causing vomiting and aspiration. Patients must be closely monitored and mask removed if vomiting commences
- A tight mask seal and/or head straps may cause friction and cause pressure injury, sacral areas are at increased risk with sitting up. Barrier dressings and pressure are care are required 2-4 hourly

Appendix 2: Invasive Mechanical Ventilation (IMV)

Controlled Modes (CMV):

- ✓ The patient receives a pre-set number of breaths per minute of a pre-set volume/pressure. Any patient effort does not trigger an additional breath. The ventilator performs all the work of breathing

Combination Modes:

Synchronised Intermittent Mandatory Ventilation (SIMV)

- Patient receives a set number of breaths of a set tidal volume/pressure volume. Between these mandatory breaths, the patient may initiate spontaneous breaths. The tidal volume of the spontaneous breaths depends on the patient's own respiratory effort

Synchronised Intermittent Mandatory Ventilation + Pressure support (SIMV + PS)

- Patient receives a set number of breaths of a set tidal volume. Between these mandatory, the patient may initiate spontaneous breaths. Patients spontaneous intermittent breaths can be supported with pressure support

Adaptive Support Ventilation[14]

- All Hamilton Medical Ventilators feature a ventilation mode Adaptive Support Ventilation (ASV). ASV adjusts respiratory rate, tidal volume, and inspiratory time continuously depending on the patient's lung mechanics and effort. In no respiratory effort patients the ASV delivers tidal volume & rates dependent on different lung pathophysiology. In patients with spontaneous effort it decreases the work of breathing and improves patient/ventilator synchrony.

IMV initial set up[13]

Patients requiring mechanical ventilation must be allocated to an area that has immediate access to emergency resuscitation equipment including oxygen, end-tidal C02 monitoring and suction capabilities. A suitable environment would be an emergency department resuscitation bay, or similar critical care area, where the ability exists to promptly access medical assistance and/or ETS via Video Conference especially if no doctor is available onsite. A MER must be followed outside of these areas if clinical experts not in attendance.

- Refer to relevant set up guides to the individual ventilator brands
- Refer to specific site ventilator manual/instructions for all ventilator settings and system checks prior to connecting the patient to the ventilator start up checks prior to attaching to the patient

- Patient may experience significant cardiovascular alteration during and post intubation and must be monitored at all times
- Manual ventilation equipment, including bag-valve-mask device and adjunct airway items must be available, accessible and functioning at the patient's bedside at all times. The equipment must remain with the patient during all transport
- The ventilator is connected to mains power and oxygen outlet when not in transit. During transport the team must ensure adequate portable oxygen is available, allowing for delays or deterioration requirements
- Ventilated patients require oral & tracheal airway suctioning to maintain a clear airway. Refer to WACHS Airway Suctioning Clinical Practice Standard.

Application

- Correct ETT placement is assessed before connecting patients to the ventilator and continuously observed. Checks of the ETT and ventilator tubing must occur with any patient deterioration
- The airway is properly secured to prevent dislodgement but not cause pressure injury with material tape or specific ETT ties
- Correct positioning of the tube is confirmed by measuring where the ETT sits at teeth/lips, and ETT cuff recording
- Monitoring the end tidal C02 (EtC02) recordings
- Check post x-ray after intubation
- A Heat Moisture Exchanger (HME)/bacterial filter or active humidification must be used
- All ventilator connections are secure and well anchored, with no kinks in the ventilator tubing, ETT or catheter mount
- Patients should be nursed at 300 unless otherwise contraindicated
- NGT on straight drainage to decompress abdominal pressure and prevent aspiration

Settings & Alarms

All observations must be documentation on the MR137 or critical care chart and should include:

- Ventilation mode & settings –minimum hourly check
  - Prescription of settings by medical officer
  - Commencement of ventilation, handover, shift or staff change, patient deterioration, discretion of senior clinician
- Respiratory Rate
- Tidal Volume or Inspiratory Pressure

- Minute Volume
- Airway pressures (peak inspiratory and expiratory pressure, Pmax)
- Positive End Expiratory Pressure
- Pressure Support
- Inspiratory Time or I:E ratio

Ongoing patient monitoring/management

- Basic monitoring requirements for the mechanically ventilated patient are continuous 3-5 lead ECG, continuous oxygen saturation, ETCO2 monitoring, haemodynamic status – HR, Heart Rhythm, BP, temperature, Level of Consciousness (sedation score - Richmond Agitation Score (RASS),
- ETT placement at lips/teeth (right, middle or left of mouth)– especially after repositioning of patient
- ETT cuff pressure & check
- Daily repositioning of the endo tracheal tube (ETT) and changing of the securing tape – this must be performed by 2 staff members trained to do so. During repositioning the tube can become displaced/dislodged and the patient then requires urgent re intubation
- Full respiratory assessment including auscultation of breath sounds, and respiratory characteristics
- Arterial Blood Gases via arterial line
- Strict fluid balance record

At no time is a ventilated patient to be left without a suitably trained nurse or doctor in attendance

ETT cuff pressure checking procedure

Adequate cuff pressure prevents aspiration of pharyngeal contents and maintenance of tidal volumes. Over inflation of cuff can damage tracheal mucosa and cause longer term issues

- Suction oropharyngeal secretions prior to checking ETT cuff pressure – 12 – 14F if unable to use yankauer sucker in mouth space
- Measure cuff pressure using cuff manometer at commencement of shift and if cuff leak suspected (audible cuff leak)
- Maintain cuff pressure at 20-30 H20 or minimal amount to prevent audible cuff leak
- If excessive cuff pressure is required to prevent air leak, notify medical officer

Sedation and analgesia

- Patients intubated often require sedation and therefore a Richmond Agitation Sedation Sore (RASS) should be completed and documented. Refer to: Richmond Agitation Sedation Score

Richmond Agitation Sedation Score

Score	Term	Description
+4	Combative	Overtly combative/violent. Immediate danger to staff – punching, thrashing around the bed
+3	Very agitated	Pulls on or removes tube/s, catheter, or has aggressive behaviour towards staff – purposeful or localising
+2	Agitated	Frequent non-purposeful movement or patient ventilator dysychrony – non localising
+1	Restless	Anxious or apprehensive but movements not aggressive or vigorous – plucking, chewing ETT
0	Alert & calm	
-1	Drowsy	Not fully alert but sustained (>10 seconds) awakening with voice commands and making eye contact
-2	Light Sedation	Briefly (< 10 seconds) awakens with eye contact to voice
-3	Moderate sedation	Any movement (but no eye contact) to voice
-4	Deep sedation	No response to voice, but any movement to physical stimulus – coughs with turning, bites or sucks with mouth care
-5	Unrousable	No response to voice or physical contact

- Patients sedated to reduce risk of harm or violence awaiting transfer for psychiatric care, Refer to:
  WACHS Sedation for Mental Health Patients Awaiting Aeromedical transfer Guidelines
  Sedation Process for Mental Health Patients Flowchart

Communicating with a ventilated patient and family/carer

Post ventilation continue to explain the purpose of the ventilation to the patient and/or family and always explain what you are doing, in the simplest terms, (patients who appear unconscious may still hear). If the patient is not sedated provide pen and paper or use simple sign language (pointing at objects), using closed questions requiring a yes/no answer.

Arrange for family/carers to speak with the medical officer regarding the patient's condition and prognosis, also arrange for support from clergy/social worker if desired/available.

23. Definitions

CMV	Also known as Intermittent Positive Pressure Ventilation (IPPV) – Patient receives a set number of breaths and set tidal volume. The patient is not able to breath spontaneously
SIMV	Synchronised Intermittent Mandatory Ventilation – patient receives a set number of breathes, which are synchronised with patients own respiratory effort
SIMV + PS	SIMV as above + Pressure Support (also known as Adapted Ventilation Support) Patients own breathes can be assisted by the ventilator
Tidal Volume Vt	Volume in mL per breath, calculated at 6-8mL/kg
Minute Volume MV	Volume in mL per minute – Vt x Resp rate = MV
Frequency f	Ventilated breath frequency
PEEP	Positive End Expiratory Pressure -Measured in cmH20. The aim is to keep alveolar open at the end of expiration to improve gaseous exchange
PMax	Maximum Airway Pressure – measured in mBar. 1 mBar = 1cmH20.
EPAP	Expiratory Positive Airway Pressure – Applies/controls positive pressure only during expiration (valve partially closes during expiration increasing positive pressure) – similar to PEEP
IPAP	Inspiratory Positive Airway Pressure **– (**should commence at 5-10 cm H_2O above set EPAP) and be titrated to achieve clinical effect in increments of 2cm H_2O . The higher pressure during inspiration will help open up the airways and make it easier to breath in
ASV	Adaptive Support Ventilation – can act as both Pressure Support and Pressure Controlled Ventilation. Adjusts respiratory rate, tidal volume and inspiratory time continuously depending on the patients lung mechanics and effort – Hamilton T1 ventilator setting
Fi02n	Fraction Inspiratory Oxygen Concentration: i.e. 21%, 50%, 100%
I:E	Inspiration to Expiration Time: Normal setting 1:2
Ventilator dysychrony	Dysychrony is the effect of the patient's respiratory demands not being appropriately met by the ventilator. The patient's own breathing interferes with the ventilator breaths and increases their work of breathing