Kittitas County Prehospital EMS Protocols

SUBJECT: BILEVEL & CONTINUOUS POSITIVE AIRWAY PRESSURE (BiPAP & CPAP)

BiPAP & CPAP are alternative methods to maintain oxygenation in some patients. BiPAP/CPAP should never be used if a patient is in severe distress that requires Intubation.

- BiPAP is the preferred device for ALS providers.
- **CPAP is an allowed procedure for all EMTs with a transport agency. MPD approved training and protocol acknowledgement is required. Equipment is optional for BLS transport agencies.**

BLS/ILS (CPAP)

Advise receiving hospital ASAP when patient is placed on CPAP so preparation can be made for patient arrival.

Indications

1. Acute Congestive Heart Failure
2. Acute hypoxic respiratory failure (including asthma)
3. Severe worsening COPD
4. Patient's preference to avoid intubation

Contraindications

1. Respiratory Arrest, inability to maintain airway or respiratory drive
2. Pediatric patients less than 12 years of age
3. Facial deformity
4. Hemodynamic instability/Systolic BP<100 mmHg
5. Inability to clear secretions or active vomiting
6. Inability to tolerate mask or maintain adequate seal
7. Patient unable to follow directions due to altered mental status
8. Suspected pneumothorax/chest trauma
9. Uncontrolled Upper GI bleeding
10. Presence of tracheostomy or recent esophageal anastomosis

Initiating CPAP Therapy

1. Explain therapy to patient.
2. Attach CPAP device to oxygen source per manufacturer's instructions.
3. Prepare circuit to apply to patient.
4. Initiate setting at pressure of 5 cmH_2O, may increase to maximum of 10 cmH_2O, titrate to clinical effect. Initiate therapy with pressure (PEEP) prior to increasing FiO_2.
5. Apply mask manually, then tighten straps to stop any leaks.
   a. Any leaks will be manifested with the sound of air hissing when patient is not breathing.
      i. Press the mask firmly on patient's face and hissing should stop.
      ii. Re-adjust straps if necessary.
   b. Oxygen supply will be rapidly consumed if there is a mask leak.

6. Reassess patient status frequently. Therapy goal is a SpO_2 of 94-98% and decreased work of breathing.
7. If patient is failing CPAP therapy, consider BVM assisted ventilations.
8. Call for ALS rendezvous if available

ALS

BI-LEVEL VENTILATION (BiPAP)

Indications

1. Respiratory distress and hypoxia consistent with CHF, pulmonary edema, COPD, or hypoxemic respiratory failure.
2. May be used for preoxygenation of select patients prior to intubation.

Contraindications

1. Respiratory Arrest, inability to maintain airway or respiratory drive
2. Pediatric patients less than 12 years of age
3. Facial deformity
4. Hemodynamic instability/Systolic BP<100 mmHg
5. Inability to clear secretions or active vomiting
6. Inability to tolerate mask or maintain adequate seal
7. Patient unable to follow directions due to altered mental status
8. Suspected pneumothorax/chest trauma
9. Uncontrolled Upper GI bleeding
10. Presence of tracheostomy or recent esophageal anastomosis

Adverse Effects/Complications

1. Barotrauma Increased, intra-thoracic pressure, decreased venous return to the heart, decreased cardiac output (Presenting as hypotension & tachycardia)
2. Gastric insufflation which may result in vomiting
3. Drying of mouth and nasal passages
4. Skin and facial irritation from mask and harness
5. Non-invasive ventilation associated pneumonia

Procedure

1. Assemble equipment per manufacturer's recommendations.
2. If available, place $EtCO_2$ monitoring nasal cannula on patient under mask.
3. Explain the process to the patient.
4. Select non-invasive ventilation mode on the ventilator (NIV or NPPV)
5. Set initial CPAP/PEEP/EPAP to 5 cmH_2O
6. Set initial PS to 10 cmH_2O or IPAP 15 cmH_20

7. Once ready to initiate BiPAP, manually place the mask on the patient, allow patient to become comfortable with the mask, then secure the harness firmly around the patient's head.
8. Alternate increasing CPAP/PEEP/IPAP and FiO_2 to maintain SpO_2 of 94-98%, or >90% in asthmatics & patients with chronic respiratory conditions (ARDSNET Scale).
9. If the patient is hypercapnic ($EtCO_2$ > 45 mmHg) increase PS/IPAP in increments of 5 cmH2O to achieve $EtCO_2$ of 35-45 mmHg. Some COPD patients have baseline hypercapnia and elevated $EtCO_2$ is permissible.
10. Check for air leaks, adjusting the mask and harness as needed.
11. Continuously reassess the efficacy of ventilations via physical findings (e.g., chest rise, auscultation, skin signs) and monitoring equipment (e.g., PIP's, $ETCO_2$, SpO_2) keeping in mind that $EtCO_2$ monitoring may be unreliable in BiPAP patients.
12. If high pressure alarm sounds, immediately reassess equipment for kinked tubing, and coach patient on their breathing, if appropriate.
13. If low pressure alarm sounds, immediately reassess for leaks or disconnection.

Considerations

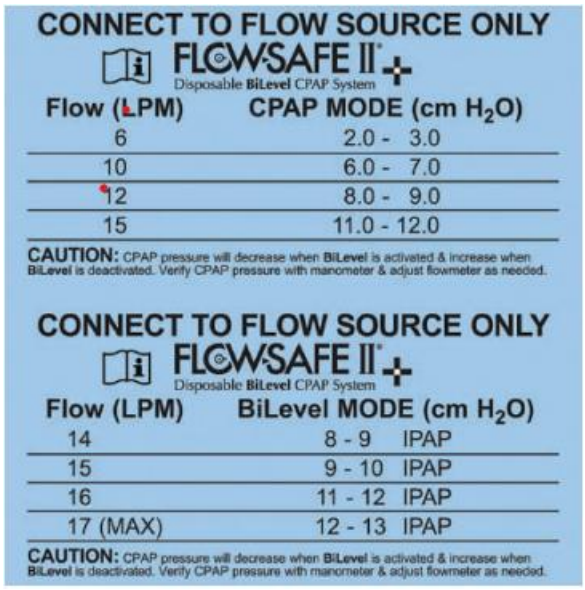
1. All BiPAP patients must have continuous waveform capnography, pulse oximetry, and ECG monitoring.
2. BiPAP can be very uncomfortable. Provide reassurance and coaching to the patient.
3. BiPAP patients can deteriorate rapidly, be prepared to intubate if the patient's mental or respiratory status declines.
4. Consider administering a light dose of Fentanyl or Lorazepam to aid with air hunger or anxiety.

FLOWSAFE II+ Instructions
Equipment

FLOWSAFE II+ is the preferred (MPD approved) device in Kittitas County
BiPAP/CPAP unit, face mask with tubing

Procedure

1. Explain the procedure to the patient.
2. Ensure adequate oxygen supply to BiPAP or CPAP device (see FLOWSAFEII+ chart below).

a. 

CONNECT TO FLOW SOURCE ONLY

FLOW-SAFE II Disposable BiLevel CPAP System

Flow (LPM)	CPAP MODE (cm H_2O)
6	2.0 - 3.0
10	6.0 - 7.0
12	8.0 - 9.0
15	11.0 - 12.0

CAUTION: CPAP pressure will decrease when **BiLevel** is activated & increase when **BiLevel** is deactivated. Verify CPAP pressure with manometer & adjust flowmeter as needed.

CONNECT TO FLOW SOURCE ONLY

FLOW-SAFE II Disposable BiLevel CPAP System

Flow (LPM)	BiLevel MODE (cm H_2O)
14	8 - 9 IPAP
15	9 - 10 IPAP
16	11 - 12 IPAP
17 (MAX)	12 - 13 IPAP

CAUTION: CPAP pressure will decrease when **BiLevel** is activated & increase when **BiLevel** is deactivated. Verify CPAP pressure with manometer & adjust flowmeter as needed.

3. Place the patient on continuous pulse oximetry.
4. Ensure ECG monitor in place (for ALS only).
5. Place $EtCO_2$ nasal cannula on patient under mask to monitor $EtCO_2$.
6. Place CPAP mask over patient's mouth and nose.
7. Secure the mask with provided straps or other provided devices.
8. Use <u>5 - 10cmH_2O of PEEP valve</u>
    a. 5 cmH_2O max for COPD and Asthmatic patients
    b. 10 cmH_2O max for other qualifying patients
9. Check for air leaks.
10. Monitor and document the patient's respiratory response to treatment.
11. Check and document vital signs every 5 minutes.
12. Administer appropriate medications per protocols based upon signs and symptoms present (per ALS or BLS protocol).
13. Consider low dose Fentanyl or Lorazepam for anxiety.
14. Continue to coach patient to keep mask in place and adjust as needed.
15. Contact ED to advise them of BiPAP initiation.
16. If respiratory status deteriorates, remove device, and consider intermittent positive pressure ventilation via BVM and/or placement of endotracheal tube (for ALS only).

Special Considerations & Removal Procedure for C-PAP

1. BiPAP & CPAP therapy needs to be continuous and should not be removed unless the patient cannot tolerate the mask **<u>or</u>** begins to vomit **<u>or</u>** experiences respiratory arrest.
2. Intermittent positive pressure and/or placement of an endotracheal tube should be considered if the patient is removed from BiPAP or CPAP therapy (ALS only).
3. If patient is to be removed from BiPAP/CPAP and mechanically ventilated, the device replacing BiPAP/CPAP (BMV or transport ventilator) must have the ability to set and maintain PEEP at the appropriate pressure for the patient's condition.

BIPAP NOTES (FLOWSAFEII+):

- This device is flow driven. This will result in the device being very "oxygen hungry".
- Mask utilized is a non-vented mask. Masks can be used with the KVH BiPAP with a whisper swivel in line to ensure exhaled Co2 is blown off.
- System has no leak detection or leak compensation. Paramedics will need to ensure a good fit and shave facial hair if needed in the field.
- System can be used for both CPAP and BiPAP.

GENERAL NOTES:

- CPAP is an optional procedure, at agency's request, for EMT-IV Technicians with an ALS transport agency in Kittitas County. EMT-IVs affiliated with ALS transport agencies must receive and maintain MPD approved training and protocol acknowledgement.
- BiPAP is NOT an approved procedure for EMTs in WA State.