

CONTINUING EDUCATION INSERVICE

Prehospital & Emergency Department CPAP

Mercury Medical Flow-Safe II Disposable CPAP System

For EMR, EMT, AEMT, Paramedic, ED nursing and ED providers. CPAP is base EMT scope in Montana — this course is written so a provider who has never touched the device can apply it safely, without being thin for the people who already can.

Course element	Detail
Title	Prehospital & ED CPAP: the Flow-Safe II
Target audience	EMR, EMT, AEMT, Paramedic, ED RN, ED provider
Delivery	Live instructor-led with hands-on skills station, plus self-study packet
Equipment	Mercury Medical Flow-Safe II; T-piece nebulizer; T-piece EtCO2; nasal EtCO2 cannula
Prepared	4 September 2026; revised 19 October 2026
Sources	Manufacturer labeling, NASEMSO v3.0, Montana ECP Scope of Practice, NHTSA 2019, ERS/ATS, GOLD, NAEMSP, primary trial literature

READ THIS FIRST

This packet ships ready to teach. Its blanks carry defaults, by design.

No national or international body publishes a starting CPAP pressure, and Montana no longer publishes state treatment protocols. Every pressure, threshold and policy value in this course is therefore a local medical direction decision. Each one is collected in Appendix C, and each ships with a working default, so this packet teaches as written from the day it is printed. The service replaces any default with its own value whenever it chooses, and that value governs from then on. Two fields have no default. The onboard cylinder designation must be read off the stamp before anyone quotes an oxygen duration, and the mask-removal time threshold waits on a baseline measured across your own staff. Inventing either one would be dishonest.

How to use this packet

Everything here is labeled by who needs it. You are never guessing whether a section applies to you.

Label	Who it is for	What it means
CORE	Everyone, EMR through physician	Required. If you read only the CORE boxes you can safely apply and monitor this device. Nothing outside CORE is needed to use it.
DEEPER	Anyone who wants the mechanism	Optional background — physiology, evidence, guideline conflicts. Skipping it is not a competency gap.
EMR PANEL	EMRs	CPAP is not in EMR scope in Montana. This is what you can and should do on a CPAP call.
ED PANEL	ED nursing and providers	What changes at the doors — handoff, transition, and the decisions EMS cannot make.
STOP	Everyone	Safety-critical. Read every one.

Numbers in this document are tagged so you can see where each one comes from: FACT (stated by a named source), DERIVED (calculated here, arithmetic shown), CITED (quoted from a primary source), UNKNOWN (nobody publishes it — the owner of the answer is named). An untagged number would be a defect. If you find one, it is an error and we want to hear about it.

1. What CPAP actually does

CORE — EVERY PROVIDER

CPAP means Continuous Positive Airway Pressure. It holds a steady pressure in the airway through the entire breathing cycle — while the patient breathes in, and while they breathe out. It never stops pushing.

Three things that pressure does:

- It props open alveoli that have collapsed or filled. More lung surface is available to exchange oxygen. This is the main reason the oxygen saturation comes up.
- It pushes fluid out of the way. In a patient drowning in their own pulmonary edema, pressure in the airway pushes back against fluid leaking into the alveoli.
- It does part of the work of breathing. A patient fighting to open a stiff, wet lung gets help holding it open, so their own muscles do less. This is why patients often look better before their numbers change.

What CPAP does NOT do:

- It does not breathe for the patient. One continuous pressure gives no extra push on inhalation. The patient must be breathing on their own — the manufacturer's indication says so in plain words: it is for "spontaneously breathing patients."
- It does not clear CO₂ by itself. It adds no breath, so CO₂ comes down only when the patient's own breathing gets easier and more effective. In pulmonary edema that often happens fast. In a COPD patient who is tiring out, expect less. Section 3 covers why.

Say it this way and you will not get it wrong: CPAP is a splint, not a breath.

DEEPER — BACKGROUND, OPTIONAL

The hemodynamics, for anyone who wants them.

Positive intrathoracic pressure reduces venous return, which drops right ventricular preload. It also reduces left ventricular transmural pressure, which is a reduction in LV afterload. In acute cardiogenic pulmonary edema both of those are working in your favour simultaneously — you are unloading a failing left ventricle at the same time you are recruiting alveoli. That combination is why CPAP works faster in flash pulmonary edema than in anything else you will use it for.

The same mechanism is the reason for the hypotension warning. The 2021 ESC heart failure guideline states it directly: NIV "decreases venous return and right and left ventricular preload. It may also decrease cardiac output and BP and should therefore be used with caution in patients with reduced preload reserve and hypotension." Same guideline: "Blood pressure should be monitored regularly during non-invasive positive pressure ventilation." CITED

In a preload-dependent patient — hypovolaemia, right ventricular infarct, tamponade physiology — the pressure that helps a wet left ventricle can drop the cardiac output out from under a patient who needed that venous return. This is the mechanism behind the blood pressure check in Section 6.

2. Which patients get CPAP, and which do not

CORE — EVERY PROVIDER

The patient who benefits most, and the picture to look for:

Acute cardiogenic pulmonary edema. Sudden severe shortness of breath, often worse lying flat, crackles, sometimes frothy or pink sputum, often hypertensive, often a cardiac history. This is where the evidence is strongest and where you will see the fastest response.

Also used, with important limits covered in Section 3:

- COPD exacerbation
- Asthma / bronchospasm
- Pneumonia and other causes of severe respiratory distress

The common thread is severe respiratory distress in a patient who is awake, cooperative and breathing on their own. NASEMSO's national guideline puts it plainly: NIV "should be administered for severe respiratory distress." CITED

2.1 The trigger — when do you actually reach for it?

CORE — EVERY PROVIDER

The cleanest field trigger is this: the patient cannot hold their oxygen saturation on a non-rebreather, or you can see that they are not going to. Either half is enough on its own.

Do not wait for the number. Pulse oximetry lags, and it lags worst in exactly the patients we meet out here — the cold ones and the poorly perfused ones. A saturation that still looks acceptable on a patient using every accessory muscle they own is a number that is about to move. Work of breathing tells you first. A patient who is tiring is a patient who will desaturate, and by the time they do, you have given away the head start this therapy needed.

Notice that this is not a diagnosis question. You are not deciding whether this is heart failure or COPD before you act. You are deciding whether this patient can keep oxygenating themselves. If the answer is no, or not for much longer, they need pressure.

2.2 Manufacturer contraindications — the operative rule for this device

STOP — SAFETY CRITICAL

The Mercury Medical Flow-Safe II Directions For Use (#83-900-0390 Rev. 9, 09/2024) lists seven contraindications. This is the device labeling and it is the rule we work to. CITED

- Respiratory arrest
- Unconscious
- Cardiogenic shock
- Pneumothorax
- Facial anomalies
- Facial trauma

- Airway obstruction

Read the first two together. This device needs a patient who is breathing and who can cooperate. An unconscious patient cannot tell you they need to vomit and cannot pull the mask off. That is the whole reason those two are on the list.

DEEPER — BACKGROUND, OPTIONAL

Why hospital practice looks more permissive than that list, and what to do about it.

You will encounter clinicians who use NIV in patients this list excludes. They are not being reckless. The British Thoracic Society / Intensive Care Society 2016 guideline states: "There are few absolute contra-indications to a trial of NIV but some adverse features, especially when combined, require more caution and more intense monitoring." It goes further: "Adverse features should not, on their own, lead to withholding a trial of NIV," and summarises that the presence of adverse features is "an indication for more intense monitoring and placement within HDU/ICU rather than a contra-indication per se." CITED

BTS also notes where the conventional list came from: these criteria "have most often been employed as exclusion criteria in clinical trials rather than being definitively shown to result in a worse outcome." On coma specifically, it cites Diaz et al. reporting similar outcomes with NIV in patients with a GCS under 8 as in more alert patients.

The difference is not evidence, it is setting. A hospital pushing those boundaries has a physician at the bedside, an ICU bed, and an airway team in the building. A two-person crew forty minutes from a critical access hospital has none of that. So: the manufacturer list is our field rule, and anything outside it goes to medical control as a case-by-case conversation — not to individual judgement at 0300 on a gravel road.

On vomiting, BTS gives the screen that actually matters and we have adopted it: "The key issue is whether the NIV mask can be rapidly removed, that is, an assessment of whether the patient can signal the need to vomit."

CORE — EVERY PROVIDER

What is NOT on that list — and why you are sure that it is.

Three things most of us were taught as CPAP contraindications appear nowhere on the manufacturer's list and nowhere in the guideline literature either. We went and looked: eleven primary guideline documents, read directly rather than summarised.

- A systolic under 100. No body publishes a blood-pressure threshold for CPAP. Not one, across all eleven documents. FACT
- Rib or lung injury. ERS/ATS 2017 goes the other way — it SUGGESTS NIV for chest trauma patients with acute respiratory failure, explicitly covering rib fracture and flail chest, where pain is controlled and the hypoxaemia is not severe. CITED
- Hemothorax. The word does not appear once in any of the eleven. It is not that they call it safe — nobody addresses it at all. FACT

So where did they come from? Two places, and both are worth knowing, because knowing the origin is what makes this stick.

The blood-pressure number came from our own old paperwork. The Montana Prehospital Treatment Protocols carried numeric CPAP limits, and Montana retired that document. It is the same species of rule as the 10 cm H₂O EMT cap in Section 4 — real once, and not any more.

The rest came out of research design. BTS says it plainly: these criteria “have most often been employed as exclusion criteria in clinical trials rather than being definitively shown to result in a worse outcome.” CITED Somebody planning a study decided not to enrol those patients. The exclusion list got copied onto a teaching slide. Decades later we teach it as physiology.

What this does NOT mean. Cardiogenic shock IS on the manufacturer's list. A hypotensive patient still gets a blood pressure every two to three minutes and the steps in 6.2 if it drops. Pneumothorax IS on the list, so a chest-trauma patient still gets examined for one. The point is not that these patients are fine. It is that “that is a contraindication” and “that patient needs watching harder” are different statements, and only the second one is true here.

2.3 Treat the cause first

CORE — EVERY PROVIDER

NASEMSO's Respiratory Distress guideline excludes these causes. Each has its own guideline and its own first treatment. Start there, not with the mask. CITED

- **Respiratory distress from acute trauma.** Fix the chest first: a semi-occlusive dressing on an open wound; needle decompression of a tension pneumothorax (ALS).
- **Anaphylaxis.** IM epinephrine in the anterolateral thigh: 0.3 mg at 25 kg and up, 0.15 mg under 25 kg. NASEMSO calls it the primary treatment.
- **Bronchiolitis (wheezing under 2 years of age).** Suction the nose and mouth, and give oxygen. Nebulized epinephrine if that does not work. Then CPAP: NASEMSO says it can be given.
- **Croup.** Nebulized epinephrine for stridor at rest, plus dexamethasone. Then CPAP: NASEMSO says it should be given for severe distress.
- **Epiglottitis.** Keep them calm, upright, in their position of comfort. Oxygen as tolerated, nothing in the mouth, early transport.
- **Foreign body aspiration.** Relieve the obstruction first with standard choking maneuvers, then reassess what is left.
- **Submersion / drowning.** Oxygen, and positive-pressure ventilation if they are struggling. Then CPAP: NASEMSO says consider it, in the awake patient only.
- **Lower airway obstruction from malignancy.** Nothing in the field fixes it: oxygen, position of comfort, transport. NASEMSO calls it very rare.

Bronchiolitis, croup and drowning are the three where the other guideline brings CPAP back second, in its own word: can, should, consider. Children in detail are in Section 11. Sources: NASEMSO v3.0 pp. 67, 151, 156, 190, 209, 334. It publishes no treatment for epiglottitis, choking or malignancy; those three lines are standard care. CITED

3. The COPD problem — read this section twice

CORE — EVERY PROVIDER

Our device delivers CPAP only. It has no BiLevel mode. That matters most in COPD, and here is why in plain language.

The COPD patient in trouble usually has a CO₂ problem, not just an oxygen problem. They cannot move enough air out to clear carbon dioxide. For a patient who is tiring, the surest help is on the way IN — a bigger breath — and that is what BiLevel gives, with a higher pressure on inhalation and a lower one on exhalation.

CPAP is one pressure, all the time. It gives no extra push on inhalation. It still helps a COPD patient — it splints airways open so they empty better, and it offloads the trapped pressure they are fighting against, which lowers their work of breathing. So CO₂ falls only if their own breathing gets better. CPAP adds no breath of its own, the way BiLevel does.

Three practical consequences you act on:

- Expect less, and slower. A COPD patient will not turn around the way a flash pulmonary edema patient does.
- Start watching for failure earlier. Use the ladder in Section 7 sooner than you would in a pulmonary edema patient.
- Titrate up to 13 — and if climbing is not helping, stop climbing. No amount of extra flow turns CPAP into BiLevel, and past 13 there is nothing left in the device.

That last point is the one to carry: this device has a ceiling, and a COPD patient is the one most likely to reach it. Section 7 is where you go when they do.

DEEPER — BACKGROUND, OPTIONAL

The guideline conflict, stated honestly, because you will hear both sides.

The pulmonary bodies recommend BiLevel for COPD and do not recommend CPAP for it. The ERS/ATS 2017 guideline: "We recommend bilevel NIV for patients with ARF leading to acute or acute-on-chronic respiratory acidosis (pH $\leq$ 7.35) due to COPD exacerbation. (Strong recommendation, high certainty of evidence.)" CITED In the entire GOLD 2026 Report, CPAP appears only in the context of obstructive sleep apnea — GOLD never recommends CPAP for a COPD exacerbation. FACT

The EMS body disagrees, or at least is broader. NAEMSP's 2022 position statement: "NIV should be used in the management of prehospital patients with respiratory failure, such as those with chronic obstructive pulmonary disease, asthma, and pulmonary edema," and "NIV is a safe intervention for use by Emergency Medical Technicians." NAEMSP's definition of NIV explicitly includes CPAP. CITED

Both can be true. The pulmonary guidelines are answering "what is the best modality for hypercapnic COPD in a hospital" — the answer is BiLevel. NAEMSP is answering "is it safe and useful for an ambulance crew to apply positive pressure to a COPD patient in the field" — the answer is yes. We own a CPAP device, we are in the second situation, and the honest framing is that CPAP is a useful bridge that is not the definitive modality.

One more distinction worth carrying: ERS/ATS also recommends against NIV in a COPD exacerbation that is not acidotic ("Prevention of hypercapnia in COPD exacerbation — Conditional recommendation against"). The COPD indication is respiratory failure, not breathlessness by itself. CITED

4. Who may do this — Montana scope

CORE — EVERY PROVIDER

Montana changed this in 2025. If you learned CPAP rules before then, some of what you know is out of date. And before the levels: Montana attaches no age, weight or size qualifier to CPAP at any level. Nothing in scope turns on how old the patient is — the limit is whether the mask seals, which is Section 11.

Level	CPAP?	Endorsement needed?
EMR	NOT in scope	—
EMT	In scope	None
AEMT	In scope	None
Paramedic	In scope	None

Source: Montana ECP Scope of Practice Document, Department of Labor & Industry, Emergency Care Provider Program, documents effective 9/1/2025. CITED

Two things that are now **WRONG** and you may still hear:

- "CPAP needs the EMT Airway Endorsement." It did, from 2014 until 2025. The Department removed it in writing, stating CPAP "falls within EMT scope." The Airway Endorsement still exists — it now covers supraglottic airways. The old 2014 endorsement document is still live on the state website and is a trap.
- "EMTs are capped at 10 cm H₂O." That came from the Montana Prehospital Treatment Protocols (rev. 11/2020), which Montana no longer uses. Effective 9/1/2025 Montana adopted the NASEMSO National Model EMS Clinical Guidelines v3.0 instead, and those publish no CPAP pressure at all.

What did not change: your medical director may narrow your scope — ARM 24.112.502(5) and (6), transferred from 24.156.2771 under SB 518 — but may not expand it. The Scope of Practice Document says the same thing in its own words: a local medical director "may not alter or expand DLI-approved Montana Scope of Practice without first seeking DLI approval." If our service sets a limit, that limit is real even though the state does not set one.

EMR PANEL

CPAP is not in your scope in Montana. That does not make you a bystander on this call.

A CPAP application is genuinely a two-to-three-person job done well, and the things below are the difference between a smooth application and a failed one:

- Recognize the patient early and say so — the sooner CPAP goes on, the better it works.
- Stage the oxygen. Check cylinder pressure and do the duration math before the mask comes out.
- Stage suction within arm's reach of the patient's head and confirm it works. This is the single highest-value thing you can do on this call.
- Hold the mask seal while another provider adjusts the harness — a held seal is better than a rushed strap.
- Coach the patient. Talk them through it, keep them calm, keep them breathing with it. This is not a lesser job; intolerance is a leading cause of CPAP failure.

- Watch for the removal triggers in Section 7 and call them out loud. Anyone in the room can and should stop this therapy.

You may not initiate or titrate the device. You may absolutely take it off a patient who is vomiting or deteriorating — removal is not a scope-restricted act, it is airway protection.

5. The device

CORE — EVERY PROVIDER

Mercury Medical Flow-Safe II. Everything it needs is in the bag except an oxygen source.

It has no batteries, no motor and no alarms. Oxygen flows through it, a valve holds back pressure, and a gauge on the front tells you what the patient is getting. That is the whole machine.

Spec	Value	Tag
Maximum pressure the device generates	13 cm H ₂ O at flush flow	FACT
Pressure relief valve pops at	25 cm H ₂ O (±5)	FACT
Manometer accuracy	±3 cm H ₂ O up to 15; ±5 above 15	FACT
FiO ₂ delivered	28% to 100%; approx. 70–75% typical adult	FACT
Peak flow to the patient	71.5 to 115 LPM depending on setting	FACT
Weight	80 g nominal, less mask and harness	FACT
Masks stocked here	Large Adult and Small Adult/Medium ONLY	FACT
Reuse	Single patient, multiple use. Do not clean or sterilize.	FACT
MR safety	MR Conditional to 3.0 Tesla	FACT

One thing about that FiO₂ figure that changes how you read a poor response: FiO₂ falls as the patient breathes harder. This is an open system — the faster and deeper they breathe, the more room air is entrained. Mercury's published table shows FiO₂ dropping into the low 30s and 40s at high tidal volume and high respiratory rate. The sickest, most tachypneic patient gets the LOWEST oxygen concentration, not the highest. FACT If the sat is not coming up on a patient breathing 40 times a minute, this is part of why.

Those last two matter operationally. "Do not clean, soak, rinse or sterilize" — it is disposable, one patient, then it goes in the trash. And it can go into a 3T MRI suite, which occasionally matters in the ED.

STOP — SAFETY CRITICAL

13 and 25 are two different numbers and they are not alternatives.

13 cm H₂O is the most pressure this device will ever generate, even wide open. 25 cm H₂O is where a safety valve blows to protect the patient. You will never therapeutically reach 25. If someone tells you the device "goes to 25," they have confused the relief valve with the output.

The consequence: 13 cm H₂O is a real ceiling on this therapy. There are patients who need more pressure than this device can produce. When one of them is in front of you, the answer is escalation — not a higher flowmeter setting.

5.1 Flow to pressure — the table you actually use

CORE — EVERY PROVIDER

Set the flowmeter, read the gauge, adjust. Both tables below are the manufacturer's, printed on the same

sheet.

You want this pressure	Set the flowmeter here
5 cm H ₂ O	8 – 9 LPM
7.5 cm H ₂ O	10 – 12 LPM
10 cm H ₂ O	13 – 14 LPM
13 cm H ₂ O (maximum)	Flush

Flowmeter setting	Pressure you get
6 LPM	2 – 3 cm H ₂ O
10 LPM	6 – 7 cm H ₂ O
12 LPM	8 – 9 cm H ₂ O
15 LPM	11 – 12 cm H ₂ O

Source: Mercury Medical ML2013-231 Rev. A. The DFU adds: "Slowly increase gas flow to 6 or 8 LPM," then "adjust the flowmeter until desired pressure is obtained," and "do not exceed 30 LPM." CITED

A conflict inside the manufacturer's own paperwork, named rather than hidden: one sheet lists "Flush" as the setting for the 13 cm H₂O maximum, while the DFU says "do not exceed 30 LPM." On many EMS flowmeters flush exceeds 30 LPM. How we resolve it: read the gauge, not the flowmeter, and do not run past 30 LPM chasing the last centimetre. You are within a couple of cm H₂O of the ceiling at 15 LPM anyway.

Where this course starts. Begin at 10 LPM, about 6 to 7 cm H₂O on the table above. If the patient cannot tolerate it, drop to 6 to 8 LPM, the manufacturer's own start, and work up. Once settled, do not leave them below 5. Ceiling 13. The 10 LPM start is this course's choice: no body publishes a starting pressure (Section 15), and the service can set its own in Appendix C.

5.2 What ± 3 cm H₂O actually means for you

CORE — EVERY PROVIDER

The gauge is not precise, and knowing that changes how you use it.

Manufacturer-stated accuracy is ± 3 cm H₂O up to 15. So a gauge reading 10 is telling you the true pressure is somewhere between 7 and 13. DERIVED — 10 minus 3, 10 plus 3.

Three things follow, and they are all good news:

- Stop chasing decimals. Hitting exactly 10.0 on this gauge is false precision. Get into the band and move on.
- The patient is better feedback than the needle. Is the work of breathing coming down? Are they calmer? Is the rate falling? That tells you more than the gauge does.
- A target range beats a target number. Our protocol value in Appendix C is written as a range for this reason.

The one thing the gauge is definitely good for: telling you the device is working at all. If you raise the flow and the needle does not move, you have a leak, a disconnection, or a failed unit. Fix it or swap it.

6. Putting it on

CORE — EVERY PROVIDER

Before the mask touches the face — the 60-second setup

#	Do this	Why it matters
1	Confirm the patient is awake, cooperative, and breathing on their own	This is the manufacturer's indication. No spontaneous effort, no CPAP.
2	Take a full set of vitals	BP, pulse, respirations, SpO2 and mental status. CPAP drops preload, and you need a baseline before you change the physiology.
3	Check cylinder pressure and compute duration (Section 8)	Running out mid-transport is a preventable disaster.
4	Stage suction within arm's reach of the head, switched on and tested	If they vomit you have seconds. Not minutes.
5	Size the mask against the printed template — Mercury ML2013-261 Rev. B, at Actual Size on 8.5 x 11 (Appendix D). Print it before the shift, not at the bedside.	Fit determines seal. Seal determines therapy.
6	Connect O2 tubing to the flowmeter	Standard nipple, standard flowmeter — and push it on HARD. CPAP runs at 10 to 30 LPM, far above anything you use a cannula for, and a hose that is merely started onto the nipple will blow off under that pressure, at a wall outlet or at a bottle. Seat it with a firm twist until it bottoms out, then tug it. If it lets go mid-therapy the patient loses all pressure instantly and the bang startles everyone in the truck, patient included. Re-check it after every move.
7	Brief the patient — see script below	Tolerance is the leading failure mode and briefing fixes most of it.

The patient brief — say it roughly like this

"I'm going to put a mask on your face. It's going to feel like air blowing at you, and it will feel strange at first — like putting your head out a car window. It is going to help you breathe. Stay with me and breathe normally. If you feel sick or need to throw up, grab my arm and I will have this off in a second. Do you understand?"

That last sentence is not a courtesy. It is the safety screen. A patient who cannot understand it or cannot signal is not a CPAP candidate.

Application

#	Do this	Detail
8	Start flow at 10 LPM	About 6–7 cm H2O on Mercury's table. Not tolerated? Drop to 6–8 LPM, the manufacturer's own start ("Slowly increase gas flow to 6 or 8 LPM"), and work up.
9	HOLD the mask to the face first — do not strap it on	Let them feel it while you hold it. Thirty seconds of holding buys you a cooperative patient.
10	Then secure the harness, snug not crushing	Two fingers under the strap. Over-tightening causes leaks by deforming the cushion, and causes pressure sores.

#	Do this	Detail
11	Check the entire mask perimeter — listen and feel all the way around	The bridge of the nose is where it usually starts, not the only place. Adjust the forehead pad before you tighten straps.
12	Keep pulse oximetry on, continuously	It is your titration target. Manufacturer step: "Patient SaO ₂ should be monitored using a pulse oximeter."
13	Titrate up until SpO ₂ reaches goal	In steps, watching the gauge. Goal 94–98%, or 88–92% in COPD (Section 8.1), with the work of breathing easing. Ceiling 13. Fast titration loses patients.
14	Read the manometer	No target number: you are confirming delivery. "Always verify delivered CPAP pressure on manometer" — manufacturer caution. The needle climbs with the flow; if it does not, find the leak. Once settled, not below 5.
15	NIBP every 2–3 minutes until stable	From mask-on until they have shown they are stable (6.1). You have just changed their preload.
16	Reassess at 5 minutes, then every 5–10	Section 7. You are judging trajectory, not a single number.

6.1 Titrate with confidence — and watch the blood pressure while you do

This device stops at 13 cm H₂O, and that ceiling is doing you a favour. There is no setting on this flowmeter that produces a dangerous airway pressure, so barotrauma is not the reason to be timid — and timidity is the more common error. If the patient needs more pressure, turn it up and read the gauge.

What does bite is the blood pressure. You are reducing venous return, and the patient who cannot afford that will show you within minutes. So these two halves go together and are never taught apart: titrate up without hesitation, and have the cuff cycling while you do it.

Put the NIBP on automatic. Cycle it every two to three minutes from the moment the mask goes on, and keep cycling until the patient has been stable at a settled pressure. A manual cuff you keep meaning to get back to is how hypotension gets missed on a patient whose pressure you just turned all the way up. And if the blood pressure drops after you increase the pressure, that is the pressure until something proves otherwise — come back down first, then reassess.

6.2 Hypotension on CPAP — is it the pressure, or the patient?

CORE — EVERY PROVIDER

This one is ours. No body publishes a prehospital algorithm for CPAP-induced hypotension, so nothing below is a guideline quote and we are not going to dress it as one. Every step is inside base EMT scope.

- Confirm the number is real. Recheck it, manually if you can. One automated cuff on a vasoconstricted patient in a moving truck is not a diagnosis.
- Ask when it dropped — before the mask went on, or after? After, and the pressure is your prime suspect and the fix is yours. Before, and CPAP is not the cause; step 4 becomes the priority.
- Come down on the pressure. This is the only intervention that attacks the mechanism and is entirely yours. Titrate to the lowest pressure that still holds the work of breathing down — down, not off. Recheck.
- Call ALS and medical control NOW, not once everything else has failed. Lead time is the point, and Section 7.4 says who to call.
- Flatter, if they tolerate it. The patient who cannot lie down will tell you. Do not fight it.
- Still going the wrong way after you have come down? Come off CPAP and support them with a BVM and a PEEP valve. You are trading continuous pressure for perfusion. NASEMSO v3.0 discontinues NIV on deterioration, but its named examples are worsened mental status, rising EtCO₂ and vomiting — not hypotension. CITED So the principle is theirs and the application here is ours.
- Closest appropriate facility, with early notification.

Where these come from, honestly, because you should know which parts rest on what. Steps 2, 3 and 5 are reasoned from the mechanism rather than from a study. The nearest citation is the ESC's statement that positive pressure reduces preload, and BTS's own view that lowering the pressure “seems theoretically sensible but is without evidence.” CITED We teach them anyway, and we are telling you that is what they are.

And one number people will ask about. A systolic under 100 is not a contraindication and it is not a stop rule. The guideline Montana adopted treats it as a trigger for TREATMENT while CPAP continues — NASEMSO v3.0, in Respiratory Distress: at a systolic under 100, a 250 to 500 mL fluid bolus, and consider a vasopressor. CITED, p. 192. Giving the fluid or the pressor is not base EMT scope. Recognising the number and getting someone who can is. And carry the caution from 6.3 with the number: the classic CPAP patient is already wet, and a reflexive bolus makes that patient worse. Volume is for the preload-dependent patient who is dry. That is exactly why this is a call, not a reflex.

6.3 When the patient needs the pressure and the pressure is the problem

Occasionally you have a patient who genuinely needs positive pressure and whose blood pressure will not tolerate it. The order still starts the same way: come down on the pressure, and think about volume — but think, because the classic CPAP patient is in pulmonary edema, and a reflexive fluid bolus makes that patient worse. Volume is for the preload-dependent patient who is dry, not for the patient whose lungs are already wet.

Before you get there, notice what this situation is telling you. Needing a pressor to tolerate the mask is itself an escalation signal — not a way to settle in and keep driving, but a reason you should already have called. Once you have decided this patient must stay on pressure, a pressor is the bridge. NASEMSO's National Model EMS Clinical Guidelines v3.0 — the guidelines Montana adopted effective 9/1/2025 — publish this preparation: "prepare 10 mcg/mL by adding 1 mL of 0.1 mg/mL epinephrine to 9 mL of normal saline, then administer 10-20 mcg boluses (1-2 mL) q 2 minutes titrated MAP greater than 65 mmHg." CITED Paediatric, same 10 mcg/mL preparation: 0.01 mg/kg (0.1 mL/kg), maximum single dose 10 mcg, every 3 to 5 minutes. CITED

Two honest caveats. NASEMSO publishes that preparation under Bradycardia, not under CPAP-induced hypotension — applying it here is an extrapolation. A reasonable and common one, but not something they wrote for this situation. And they introduce it with the words "for example," so it is a model preparation rather than a mandate; your service protocol governs. Push dose is a bridge, not a destination: it buys the minutes it takes to start an infusion or reach the department, and a handful of boluses is usually all it needs to buy.

The concentration is where people get hurt. 0.1 mg/mL is the cardiac-arrest syringe, not the 1 mg/mL anaphylaxis ampoule — 1 mL of the wrong one into 9 mL of saline is a tenfold error, and that is the single most common way this drug injures somebody. Say the concentration out loud and have the second person confirm the arithmetic before it goes in.

7. When it is not working — failure and removal

STOP — SAFETY CRITICAL

Two rules, and they belong together. Learning one without the other is dangerous.

RULE 1 — DO NOT BREAK THE SEAL EARLY.

NASEMSO v3.0: "Once initiated and patient is tolerating mask, DO NOT discontinue CPAP/BiPAP until patient is on the emergency department stretcher and hospital CPAP/BiPAP is immediately available for patient to be switched over, or physician is at bedside and requesting CPAP/BiPAP be discontinued. Breaking the mask seal causes a significant decrease in airway pressures and may lead to abrupt decompensation due to atelectasis and alveolar collapse." CITED

Read how it opens: "Once initiated and patient is tolerating mask." This rule is about not interrupting a therapy that is working — for a radio report, or to move to the cot. It is not a rule about holding a mask on a patient in trouble.

RULE 2 — TAKE IT OFF IMMEDIATELY, NO ORDER NEEDED, IF:

- Vomiting or active retching
- Declining mental status, or they can no longer protect their airway
- They stop breathing, or breathing becomes agonal
- Panic or intolerance you cannot coach them through
- Hypotension that does not correct when you come down on the pressure — work 6.2 first; coming off

is step 6 there, not step 1

- Equipment or oxygen failure

NASEMSO again: "If patient deteriorates on CPAP/BiPAP (e.g., worsened mental status, increasing EtCO₂, vomiting), remove CPAP/BiPAP and escalate airway management options as above." CITED

This authority belongs to every provider in the truck, at every level, including EMR. Removing a mask from a vomiting patient is airway protection, not a scope-restricted intervention. Nobody needs permission and nobody should hesitate.

7.1 Recognizing failure

CORE — EVERY PROVIDER

Reassess at 5 minutes, then every 5–10 minutes. You are judging trajectory — is this going the right way — not one number.

Failure signals:

- Work of breathing not coming down — still tripodding, still using accessory muscles, still speaking in short phrases
- Respiratory rate not coming down
- SpO₂ not coming up
- EtCO₂ rising in a patient whose work of breathing is not improving, where you are measuring it
- Mental status declining, or new agitation
- New hypotension after initiation
- Losing tolerance of the mask

7.2 The escalation ladder

STOP — SAFETY CRITICAL

Titrate up to 13. Past 13, escalate — there is nothing left in the device.

Below the ceiling, turning it up is treatment. Past the ceiling it never becomes treatment: more flow just buys you a failing patient with a leaking mask and a cylinder emptying faster.

The ladder, in order:

Step	Do
1	Recheck the reversible things: seal, kinked tubing, cylinder contents, is the flow actually where you set it, is the gauge moving
2	Contact medical control and/or request ALS intercept — EARLY, while you still have road left, not at the point of collapse
3	Stage the BVM within reach BEFORE you need it. Do not go looking for it during an arrest.
4	Remove CPAP and ventilate if the patient becomes apneic, unresponsive, or cannot protect the airway

And “escalate” is an empty verb until you say which kind. There are two, and they run on different clocks.

THERAPY — what you can escalate right now, with what is already in the truck:

- A BVM with a PEEP valve, assisting the breaths they are already taking. That is 7.3, and it is the step people forget.
- BiPAP, where the sending or receiving facility has it and you are transferring.
- Intubation.

RESOURCES — what only exists if you asked for it ten minutes ago:

- Medical control.
- An ALS intercept.
- A second ambulance, if you are BLS and ALS covers the area.
- A critical care team launched toward you instead of waiting for you to arrive.
- Respiratory therapy standing up before you get there.
- A divert decision, while diverting is still cheap.

That is why step 2 sits where it does. The therapy half you can start whenever you decide to. The resources half has a lead time, and the lead time is the entire point.

The rural version: decide early, because your options thin out with distance. The decision you can make at minute ten with an intercept available is not available to you at minute forty.

7.3 The step people forget — a BVM can support a breathing patient

CORE — EVERY PROVIDER

When CPAP has run out of room, the next thing is already in the truck. A bag-valve mask with a PEEP valve, used to assist the breaths the patient is already taking rather than to override them, does something CPAP cannot: it adds inspiratory support on top of the expiratory pressure. That is the gap between what our device delivers and what a hypercapnic patient actually needs.

Assisting is a skill, not a squeeze. You watch the chest, you begin the squeeze as the patient begins to inhale, and you let them set the rate. You are adding to their effort, not fighting it. Done badly it is worse than nothing — you stack breaths, drive the pressure up and drop the blood pressure out. Done well it is the bridge between a device that stopped at 13 and an airway nobody wanted to take on a gravel road.

This matters most for the CO₂ patient. CPAP adds no breath. It lowers CO₂ only by making the patient's own breathing easier, and a patient who is tiring has little left to give — that is a limitation of the therapy, not a failure of your technique. A patient failing on CPAP because of CO₂ needs their ventilation supported, and until definitive care that is a bag, a PEEP valve, and somebody patient enough to do it properly.

7.4 Who you call, and when

CORE — EVERY PROVIDER

This is our routing. It is the same on every call, and it is taught rather than left to Appendix C, because guessing at it under pressure is how people end up calling nobody.

On a 911 call: contact the RECEIVING emergency department and ask for the provider. Our medical director is deliberately not in this path.

On an interfacility transfer you have MORE options, not fewer — and they come in an order:

- The sending provider first. That includes when a BLS crew needs to START CPAP en route. They own

the workup and the transfer plan, and they have actually seen this patient.

- If you cannot reach them, go sideways: the accepting facility, or online medical control. This is an availability problem and the fix is finding somebody.
- If you have a safety concern about what you were told to do — OR ABOUT WHAT YOU WERE TOLD NOT TO DO — call our medical director for online medical control. This is not a fallback from the step above. It is a different trigger on a different axis: you reached someone, you got direction, and you believe the direction is unsafe.

Say that second half out loud, because it is the half that gets skipped. Crews will escalate an instruction to DO something long before they escalate an instruction to WITHHOLD something. Both are worth the phone call.

And one thing that needs saying in a room rather than left to be inferred: making the call is the protocol working. It is not an admission that you could not handle it. Where it reads as failure, people stop calling and start guessing — and guessing is the thing this whole course is trying to prevent.

Transferring a patient on CPAP is fine. What the crew needs is a plan for the patient who may exceed 13 or turn out to need BiPAP, and that usually means a ventilator on board rather than a second disposable CPAP.

One call worth making before you are forced into it: when the trade is protect the blood pressure or protect against hypoxia, that is a medical control decision, and it should be made while coming down on the pressure is still buying you something. Give them four things — the pressure setting and how long they have been on it, the blood pressure before and now, what happened when you came down on the pressure, and what the work of breathing is doing.

DEEPER — BACKGROUND, OPTIONAL

ERS/ATS names failure to improve as an early predictor of NIV failure, alongside higher severity score, older age, and pneumonia or ARDS as the cause. It also states that "NIV failure is an independent risk factor for mortality" in de novo hypoxemic respiratory failure — the pneumonia and ARDS group. CITED The mechanism they describe is that NIV is much less effective at reducing work of breathing in hypoxemic failure than in hypercapnic failure, and that the main risk is "to delay a needed intubation."

Translated: in the pneumonia patient, a CPAP mask can make the numbers look acceptable while the patient tires out underneath it. That is the patient this ladder exists for.

8. Oxygen — the constraint that ends transports

CORE — EVERY PROVIDER

Compute this before the mask goes on. Not after.

CPAP at 10 LPM and up, plus a nebulizer on a second cylinder, empties oxygen fast. On a long rural transport, oxygen — not the device — is usually what limits you.

Two numbers, and you can carry both of them in your head. At 15 LPM, from a full cylinder, holding back 200 PSI:

- A full D — about 19 minutes. DERIVED: $(2000 - 200) \times 0.16 \div 15 = 19.2$
- A full Jumbo D — about 34 minutes. DERIVED: $(2000 - 200) \times 0.28 \div 15 = 33.6$

And one rule that covers everything in between: half a bottle, a bit less than half the time. (The 200 PSI you hold back comes off a smaller number, so a D at 1000 PSI is about 8 and a half minutes, not 9 and a half.

DERIVED: $(1000 - 200) \times 0.16 \div 15 = 8.5$)

Both figures are floors, on purpose. Catalina ships a D holding 425 litres and the factor behind that 19 assumes 350, so the real bottle lasts longer than the number says. Mercury's own published table puts a full D at 15 LPM at 23 minutes, measured full to empty with nothing held back. We teach the low number because of the two ways to be wrong, sending for a cylinder you turn out not to need is the one you can afford.

READ THE FLOW RATE BEFORE YOU TRUST EITHER NUMBER. Both are 15 LPM figures. Titrating toward the 13 cm H₂O ceiling means running at flush, and the manufacturer allows up to 30 LPM — at which a full D is about 10 minutes and a full Jumbo D about 17. DERIVED: $1800 \times 0.16 \div 30 = 9.6$, and $1800 \times 0.28 \div 30 = 16.8$. Double the flow, half the time. The plan you made at 15 goes wrong exactly when the patient is sickest, because that is when you turned the flow up.

So: if your transport is 40 minutes and your portable is a full D, that cylinder does not finish this call. That is a decision to make before the mask goes on — not at the halfway point, with the patient on therapy and the truck moving.

STOP — SAFETY CRITICAL

Three oxygen rules specific to us.

1. "M" is ambiguous and the two meanings differ by more than double.

An M60 holds 1,699 L. An M / M122 holds 3,455 L, both at a service pressure of 2,216 PSI. FACT — Catalina Cylinders medical specifications. At 15 LPM from full, holding back 200 PSI, that is roughly 103 minutes versus 210. DERIVED Somebody must read the stamp on our onboard cylinder and write it in Appendix C before anyone plans a transport from a duration figure.

2. If you start CPAP in a house, start the oxygen plan in the same breath.

The wrong answer is to leave the mask off until the patient reaches the ambulance. A living-room extraction can easily run ten minutes, and that is ten minutes of therapy a patient who needs it is not getting. Put the mask on where the patient is, and send someone for more oxygen at the same moment — a portable will not carry a long scene plus a transport at 15 to 30 LPM, so the second bottle is part of the plan, not a contingency. Say the oxygen plan out loud the way you say the pressure.

3. This device only runs on a regulator that supports high flow.

CPAP needs 10 to 30 LPM, and the top of that range when you titrate toward 13. A regulator that tops out below that cannot drive this device no matter how full the cylinder is, and the failure looks like a device problem rather than a regulator problem — low pressure on the manometer that will not come up when you turn the flow up. Check the regulator, not just the gauge. This applies to portables and to hospital wall outlets alike, so it is worth knowing which outlets in the department will and will not run it before you need one.

The same planning applies inside the hospital. A patient on CPAP who leaves the department for twenty minutes of imaging needs a bottle staged before they leave, not found while the transport team waits at the door. Anyone who is going to be off wall oxygen needs a plan for the gap.

DEEPER — BACKGROUND, OPTIONAL

Why the numbers we teach are deliberately low — and where that is not true.

The classic cylinder factors (D 0.16, E 0.28) assume a D holds 350 litres and an E holds 625. Catalina, a manufacturer whose cylinders a service like ours actually carries, ships an MD at 425 litres and an ME at 680. **FACT** So the factors understate the oxygen you have — by about 20 percent for a D and about 9 percent for an E. **DERIVED:** D, $(425 - 350) \div 350 = 21.4\%$; E, $(680 - 625) \div 625 = 8.8\%$ That error runs in the safe direction: it predicts you run out early. We keep the low numbers for exactly that reason, and we are telling you rather than letting you find the gap yourself and quietly stop trusting the method.

One asymmetry worth knowing, because it changes how much slack you have. The Jumbo D figure is NOT low in the same way. A Jumbo D is an M22: 623 litres at 2,216 PSI, which works out to 0.281 — essentially the 0.28 we use. **FACT** So the D number has room in it and the Jumbo D number does not. On a long transport with a Jumbo D, treat 34 minutes as close to the truth rather than as a floor.

Source for both: Catalina Cylinders, MEDICAL SPECIFICATIONS, Rev 12/13. Appendix D.

8.1 Oxygen and COPD: aim for 88–92%

CORE — EVERY PROVIDER

The target. 88–92% for known COPD, or for anyone at risk of holding CO₂. Montana's adopted guideline says about 90% may be adequate in COPD; its 94–98% target is for everyone else. CITED NASEMSO v3.0 Airway Management pp. 183, 185; BTS emergency oxygen guideline 2017. Ask what their usual saturation is, and whether they are on home oxygen.

Why too much hurts. It is not mainly the “hypoxic drive.” Breathing slows only a little, and briefly, and CO₂ keeps climbing anyway. The bigger cause: extra oxygen opens blood flow to the worst-ventilated lung, so more blood passes air that is not moving. Oxygenated hemoglobin also holds less CO₂. CITED Abdo and Heunks, Crit Care 2012.

In a paramedic trial, a non-rebreather at 8–10 L/min more than doubled deaths compared with titrating to 88–92%: 9% against 4%, relative risk 0.42 (95% CI 0.20–0.89). CITED Austin et al., BMJ 2010.

On our device the oxygen rides with the pressure. The Flow-Safe II runs on oxygen, about 70–75% FiO₂ in a typical adult (Section 5). You cannot turn the oxygen down without turning the pressure down. So a COPD patient on CPAP may sit above 92%, and the neb adds more oxygen. While CPAP is working that is usually a trade worth making, but watch harder for CO₂: drowsiness, confusion, a rising EtCO₂.

Never withhold oxygen from a hypoxic COPD patient. Give it, then titrate down to the target. Off CPAP, that means a nasal cannula, not a non-rebreather.

9. The three add-ons

We stock three things that attach to this device. Each has a different purpose and a different catch.

9.1 T-piece nebulizer

CORE — EVERY PROVIDER

It works, and it needs a SECOND oxygen source.

Manufacturer: "Yes, the nebulizer can be placed in-line between the mask and CPAP valve and requires a second gas source." CITED That means two flowmeters running — one driving the CPAP valve, one driving the neb. Plan the oxygen accordingly (Section 8).

NASEMSO adds a hardware requirement worth knowing: "A specialized T-connector with a spring valve assembly is required to allow maintenance of positive airway pressure." CITED If a T-piece does not have that valve, it will dump your pressure.

Where it goes: between the mask and the CPAP valve.

What you must do after starting it: look at the manometer and retitrate.

One more thing about the tee, and it is the kind of thing that costs a crew a minute at a bad time. A nebulizer sitting inline with NO gas connected to it is an open port in a pressurized circuit. It leaks. Your pressure will not come up and the mask is not the reason.

So the rule is a decision, made once: expecting another dose? Leave the neb inline, gas connected, and let it run dry. Single treatment and done? Take it out. What you never do is leave it inline with the gas turned off.

This is service and operator knowledge, not manufacturer guidance — Mercury's Directions For Use contain no nebulizer content at all. UNKNOWN as far as the labeling goes; it is in this packet because it has bitten people.

Reloading, and the order the pieces go in

CORE — EVERY PROVIDER

These kits cannot be recharged with the mask running. When the nebulizer runs dry you come off pressure to reload it, and with our equipment there is no way around that. What you control is how long the interruption lasts. Measured on our own kit, moving with intent, it is about thirty seconds. UNKNOWN as far as any published source goes — this is our own bench measurement, and the equipment officer owns it — and about half that when every piece is already opened and laid out before you start. The variable is not your hands, it is your staging. Open the second nebulizer before you need it.

That is also the closest this device gets to a continuous nebulizer: a series of short, deliberate reloads on a patient you are confident is bronchospastic. Pre-stage, come off, reload, go back on, and read the manometer again.

One assembly detail that has stopped people cold: our T-piece nebulizer kits run mask → nebulizer → EtCO₂ tee → CPAP valve, so the nebulizer sits on the mask side of the EtCO₂ tee. That is not necessarily true of every kit. If the pieces do not seem to go together, the answer is almost always an order problem rather than an incompatibility — take the extra few seconds to find your kit's order, and find it on a training night rather than at a bedside. Somebody who concludes the equipment does not fit will quietly stop carrying it.

STOP — SAFETY CRITICAL

Nobody publishes what the neb does to your pressure on this device. So you measure it.

Mercury publishes a pressure table for the EZ model — a different device, where one oxygen source is split between the CPAP valve and the nebulizer, so running the neb starves the valve and pressure drops hard (15 LPM gives 11–12 cm H₂O with the neb off, and only 4–5 with it on). That table does not apply to us. On our plain Flow-Safe II the CPAP driving flow is untouched and the neb adds gas from a separate source. UNKNOWN — Mercury publishes no pressure table for this configuration, and the direction of change is not established by any manufacturer document.

So the rule is behavioural, not predictive: activate the nebulizer, then look at the gauge, then retitrate. Every time. And again when the neb runs dry.

9.2 What goes in the neb

CORE — EVERY PROVIDER

Albuterol — beta-2 agonist. Relaxes the smooth muscle that is squeezing the bronchi. It prefers beta-2 receptors, the main receptor in bronchial muscle. For wheezing from bronchospasm: asthma, COPD. NASEMSO: 5 mg nebulized in distress, repeated as often as needed. CITED Most patients improve within 5 minutes, with a peak near 1 hour. Tremor and a faster pulse are expected, because some heart receptors are beta-2 too.

DuoNeb — albuterol plus ipratropium. Two routes to the same muscle: albuterol relaxes it, and ipratropium blocks acetylcholine, the vagus nerve's signal to tighten. Labeled for COPD. NASEMSO: ipratropium 0.5 mg with the albuterol for asthma or COPD, up to 3 doses; not in bronchiolitis. CITED It starts as fast as albuterol and lasts longer, about 4 hours. One vial is 2.5 mg albuterol plus 0.5 mg ipratropium. Not with an atropine allergy.

Nebulized epinephrine — alpha and beta agonist. Alpha tightens vessels and makes them less leaky, so a swollen airway lining shrinks; beta relaxes bronchial muscle. For stridor: croup at rest, anaphylaxis with stridor, and bronchiolitis when suction and oxygen fail. NASEMSO: 5 mg (5 mL of 1 mg/mL). CITED Expect a faster pulse. In anaphylaxis it is an add-on, never a substitute for IM epinephrine, and NASEMSO sends everyone who gets it to definitive care.

NASEMSO: "bronchodilators should be administered in line with NIV." CITED Then the same rule as above: neb on, look at the gauge, retitrate.

Sources: FDA drug labels on DailyMed (Appendix D); NASEMSO v3.0 pp. 152, 156, 191, 378, 382, 385.

9.3 T-piece (inline) EtCO₂

CORE — EVERY PROVIDER

Use it as an apnea and rate monitor. Treat the number as less reliable than one sampled by nasal cannula — and do not use it as a diagnostic tool.

Mercury's own labeling on the inline tee is unusually blunt: "For apnea alarm triggering only. If used for capnometry or capnography, numeric value or wave form may be attenuated. Do not use as a diagnostic tool. For accurate capnometry or capnography, a nasal sampling cannula is recommended." CITED

Note the hedge, because it is the manufacturer's own: the number or the waveform MAY be attenuated. Not

will be. What is unhedged is the sentence after it — do not use as a diagnostic tool. So no morphology calls off a tee-sampled trace, no shark-fin, no plateau shape, and the number does not get handed across as equivalent to a hospital value. Trending it is a different question. Peak inspiratory flow through this device reaches 115 LPM, and that stream dilutes a few hundred millilitres of exhaled gas fairly consistently, pushing the number DOWN by roughly the same amount breath to breath. Direction survives that dilution; absolute value does not. That is why it reads useful in the field and why Mercury still will not call it diagnostic.

What it is genuinely good for, and this is not a small thing: this device has no alarms of any kind. An inline tee turns a silent device into one that tells you the patient stopped breathing. Mercury makes the same point — capnography changes breath to breath, where pulse oximetry lags by minutes.

Charting: record rate and the presence of a waveform. If your service charts a tee-derived number, it should be flagged in the narrative as sampled through an inline tee on CPAP and not comparable to a hospital value. See Appendix C — the medical director sets whether that number gets charted at all.

9.4 Nasal EtCO₂ sampling cannula under the mask

CORE — EVERY PROVIDER

Better number. Costs you seal. That is the whole trade.

Manufacturer: "for the most accurate reading use an EtCO₂ cannula under the mask." CITED It samples closer to the source, before the exhaled gas is diluted.

But it runs a tube under a seal that is generating your therapy. On a device where pressure comes from flow against resistance, a leak is lost therapy.

When to accept that trade: when the number is going to change what you do — a suspected hypercapnic COPD patient, or a decision about escalating. When not to: routine monitoring on a patient who is doing well.

STOP — SAFETY CRITICAL

The rule that settles every conflict between these two.

Seal is therapy. Monitoring is not. When they compete, the therapy wins by default. A perfect EtCO₂ number on a patient whose mask is leaking is worse than no number on a patient getting full pressure.

DEEPER — BACKGROUND, OPTIONAL

Why the number is diluted, mechanically.

Peak inspiratory flow through this device is 71.5 LPM at 5 cm H₂O and 115 LPM at 13. FACT A patient's exhaled breath — a few hundred millilitres carrying the CO₂ — is dumped into a stream moving at up to 115 litres a minute. The sample the analyser draws is overwhelmingly fresh gas.

This is not a device defect and it is not unique to Mercury. Preclinical work on CPAP with capnography found that CPAP "consistently reduced ET-CO₂, likely due to CO₂ dilution from high flow rates," with a widened β -angle and blunting of the inspiratory downstroke, while respiratory rate measurement stayed accurate. That last part is exactly why rate survives and the number does not. CITED

9.5 A note on the equipment itself

Everything in this section is a consequence of assembling a CPAP setup out of separate parts. A second gas source, a tee that has to go in the right order, a nebulizer that cannot be reloaded without coming off pressure — none of that is a device defect. It is what a modular kit costs. An integrated disposable CPAP, with the nebulizer and capnography ports built into the unit, removes most of it, and it is worth this service knowing that the difference exists.

One caution if we do go looking. The obvious candidate is Mercury's own Flow-Safe II EZ, which integrates the nebulizer — but it solves the assembly problem by splitting a single gas source between the CPAP valve and the nebulizer, and Mercury's published figures show what that costs. At 15 LPM the EZ delivers 11 to 12 cm H₂O with the nebulizer off and 4 to 5 with it on. At 10 LPM, 6 to 7 falls to 2 to 3. FACT On our plain Flow-Safe II running a second source, the CPAP driving flow is untouched and the nebulizer adds gas on top of it.

So the thing to ask for is not simply "the integrated one." It is an integrated unit that keeps a second gas source — one that removes the assembly burden without asking us to give up most of our pressure at the exact moment we are treating a bronchospastic patient. That is a real distinction, and it is the difference between a purchase that helps and one that trades a nuisance for a worse problem.

10. Short-handed: what comes first

CORE — EVERY PROVIDER

Nobody runs CPAP, a nebulizer, EtCO₂, coaching and titration at once with two people on a moving ambulance. So decide in advance what you drop.

Never dropped — this IS the therapy:

- Mask seal
- Pressure confirmed on the manometer
- The patient coached and tolerating it
- The mask removable one-handed without hunting for a clip
- Suction staged within reach
- Pulse oximetry
- Eyes on work of breathing and mental status

EtCO₂ is not the thing you drop.

The inline tee sits in the circuit and costs you nothing — no seal, no pressure, no hands. It is never dropped. The only capnography that ever competes with therapy is the nasal sampling cannula worn under the mask, and it is set aside only when it is actually breaking the seal, not as a matter of routine. If you are short-handed and cannot do everything at once, the order is: seal and pressure first, then suction staged within reach, then pulse oximetry, then everything else. Suction sits above the number deliberately — on the patient who vomits, a working suction within arm's reach matters more than a saturation you are watching.

The nebulizer is a timing decision, not a diagnosis. Ask one question out loud:

"Am I confident this patient is bronchospastic?"

	YES — CONFIDENT BRONCHOSPASM	NOT SURE / MIXED PICTURE
What is the therapy?	Both, and the bronchodilator goes on EARLY. Do not wait to see whether pressure alone fixes it. Asthma and COPD with wheeze are the patients who need the drug soonest.	Pressure first. If hypoxia is not resolving and respiratory rate is not the primary problem, add the bronchodilator. Nobody should be talked out of a neb on a hypoxic patient.
EtCO ₂	Keep it. The inline tee costs you nothing.	Keep it. The inline tee costs you nothing.
If you can only do one thing	Get the pressure on, keep the seal, and get the drug in early.	Get the pressure on and keep the seal.

This replaces the older wet-versus-tight question, which asked you to commit to a diagnosis a field lung exam cannot reliably support. A lung exam in a noisy room captures the loudest sound, not the whole pathology, and wet-sounding patients respond to bronchodilators often enough that withholding one on the strength of crackles is its own error. What we are actually treating is hypoxia. The only thing worth committing to up front is the patient you are confident is tight, because that patient needs the drug early.

11. Pediatric patients

CORE — EVERY PROVIDER

There is no age limit. There is a mask limit. Those are different problems and people confuse them constantly.

The scope answer:

Montana attaches no age, weight or size qualifier to CPAP at any level. An EMT has exactly the same CPAP authority as a paramedic, for adults and for children. EMR is out of scope for CPAP entirely — that is the only level restriction, and it is not about age. NHTSA's 2019 National EMS Scope of Practice Model agrees and attaches no age qualifier to CPAP. CITED

Worth knowing how solid that is: the Montana drafters clearly knew how to write an age limit when they wanted one — they wrote "adult only" next to epinephrine 1:1,000 and "pediatric or adult" next to IO access. They wrote neither next to CPAP.

The "aged 2 and older" trap:

NASEMSO's Respiratory Distress guideline is scoped to "Patients aged 2 and older," and people read that as "no CPAP under 2." That is backwards. Age decides which page you are on, and CPAP survives on all of them:

Patient	Guideline	What it says about CPAP
2 years and older	Respiratory Distress	NIV "should be administered" for severe distress
Under 2, bronchiolitis	Pediatric Respiratory Distress (Bronchiolitis)	CPAP "can be administered, when available, for severe respiratory distress"
Croup, any age	Pediatric Respiratory Distress (Croup)	CPAP "should be administered for severe respiratory distress"
Newborns	—	Excluded from the Airway Management guideline

The real limit — mask fit:

No manufacturer or guideline anywhere publishes an age, a weight, or a patient face size for any of these masks. We looked: the sizing chart, the DFU, the FAQ, the product listing and the FDA 510(k) — whose "Patient Population" field is blank. UNKNOWN Mercury's own answer is the only one that exists: "Are there any age limits? No, if the mask seals & the patient cooperates."

The table below gives the masks' own dimensions, which Mercury does publish. That is not a published patient size — mask geometry tells you what to hold against a face, not which face it will fit.

So the practical rule for us: our smallest patient is whoever the Small Adult/Medium mask actually seals on. That is decided per patient with the printed template against the face, never by looking up an age. Any age or weight number you hear quoted for this is made up.

Mask	Full length	Opening	Stocked here?
Adult (Large)	131.88 mm	81.5 mm	YES
Small Adult (Medium)	122 mm	75.2 mm	YES

Mask	Full length	Opening	Stocked here?
Child (Small)	104.75 mm	63.4 mm	NO

The sizing template must be printed on 8.5 × 11 at "Actual Size" or the geometry is wrong and it will lie to you.

Two contraindications that bite harder in kids:

The DFU excludes unconscious and facial anomalies. Cooperation is the binding constraint in children, and craniofacial proportions differ — so a child is more likely than an adult to fail the manufacturer's own eligibility test. Children also decompensate faster and tolerate a mask worse. Apply the failure ladder in Section 7 earlier, and set a lower threshold to call for help.

STOP — SAFETY CRITICAL

An equipment gap this training cannot close.

We do not stock the Child/Small mask. The 2020 joint position statement of NAEMSP, the American Academy of Pediatrics, ACS-COT, Elic, ENA and NASEMSO — which Montana's own DPHHS EMS for Children program hosts and distributes — lists an NIPPV-capable device under BLS for "All ages," and states: "Availability and use of appropriate pediatric-sized equipment is necessary, not discretionary. Adult-sized items should not be substituted or adapted for use on pediatric patients except where available pediatric-focused equipment has malfunctioned and where failure to provide further intervention by adapting an adult device for pediatric use would result in serious harm to the pediatric patient." CITED

Not having bought the mask is not that exception. To be precise about its weight: this is a national multi-society consensus position statement, not a Montana rule, and it carries no regulatory force — but it is the standard this service would be measured against.

This training is not going to teach you to improvise an adult mask onto a small child. The gap is stated, and stocking the Child/Small mask (Mercury 1057211, or 1057223 with neb and tee) is routed to the service in Appendix C as a purchasing decision.

12. At the hospital

ED PANEL

For ED nursing and providers receiving these patients.

Keep our mask on until yours is ready.

Breaking the seal drops airway pressure immediately and can cause abrupt decompensation from alveolar collapse. So switch to hospital CPAP once it is set up and ready at the stretcher, and not before. Until then the crew's mask stays on. This is NASEMSO's rule (Section 7, Rule 1), and the crew works to the same one. CITED

Do not compare our EtCO₂ number to yours.

If the number came through an inline tee it is diluted by the flow through the device — peak inspiratory flow reaches 115 LPM — and the manufacturer labels that configuration for apnea detection only. A prehospital tee-derived number and your hospital value are not the same measurement, so the absolute comparison is invalid. The crew's own trend is not — if their number moved in one direction over twenty minutes on a stable setup, that direction is worth having. Ask the crew which sampling method was used — tee or nasal cannula under the mask — because the answer changes how much the number is worth.

What the crew could not do.

This is a CPAP-only device with a hard ceiling of 13 cm H₂O. If the patient is hypercapnic and failing, the crew had no BiLevel option and no ability to add inspiratory support — they were not under-treating, they were at the end of the equipment. The escalation decisions that were unavailable to them are BiLevel, higher pressures, and intubation.

Useful handoff questions.

- What pressure, and how long have they been on it?
- What did they look like before it went on — is this an improvement or a plateau?
- Any hypotension after initiation?
- EtCO₂ — tee or nasal cannula?
- Did they get a bronchodilator, and by what route?

13. Troubleshooting

Problem	Likely cause	Do this
Gauge reads low / will not come up	An inline nebulizer with no gas connected — an open port in a pressurized circuit. Or a leak at the mask seal, most often the bridge of the nose.	Check the nebulizer FIRST — it is binary and instant, where a seal hunt costs you a minute. Inline with the gas off? Connect it or take it out. Then reseal the mask, adjusting the forehead pad BEFORE tightening straps. Over-tight straps deform the cushion and cause leaks.
Gauge does not move at all when you raise flow	Disconnection, kinked tubing, empty cylinder, or a failed unit	Trace the circuit from cylinder to mask. If everything is connected and the needle is dead, swap the device.
Pressure dropped suddenly	Nebulizer just activated (direction NOT predictable — re-read the gauge and retitrate), cylinder running out, or the seal broke	Check the gauge, check cylinder pressure, check the seal. Retitrate.
Patient panicking, pulling at the mask	Normal and expected in the first minute	Go back to holding the mask rather than strapping. Coach. Lower the pressure and re-climb. Do not sedate.
Patient vomiting	—	MASK OFF NOW. Suction. Do not wait for an order. Reassess whether CPAP is still appropriate.
Blood pressure dropped after starting	Reduced preload from positive intrathoracic pressure	Reassess. Consider lowering pressure. Contact medical control. Consider whether this patient was preload-dependent.
SpO2 not improving	Failing therapy, wrong diagnosis, or a leak	Below 13, titrate up and reassess. At 13, work the escalation ladder in Section 7 — there is nothing left in the device.
Not enough hands	—	Section 10. Seal and pressure first, then suction within reach, then pulse oximetry, then everything else.
Cylinder will not last the transport	Planning failure	Should have been computed before application. Request intercept, plan a cylinder change, or reconsider the therapy.

STOP — SAFETY CRITICAL

Do not sedate a patient to tolerate CPAP.

NASEMSO: "Routine use of sedation is not recommended for treatment of anxiety in patients on NIV. Anxiety should be presumed due to hypoxia or inadequate minute ventilation." CITED GINA is blunter and broader — in an acute asthma exacerbation, "Do not use sedatives." CITED That is general asthma care, not a statement about NIV; GINA makes no NIV recommendation at all (Section 14). The agitation is a symptom of the problem, not an obstacle to the treatment. None of this means never. If a patient has a coexisting anxiety that genuinely needs treating, ask — that is a conversation with the sending provider or online medical control, not a bedside decision made alone.

14. What the evidence actually shows

CORE — EVERY PROVIDER

Say this to a patient or a partner and you will be accurate:

"This keeps people off ventilators."

Do NOT say "this saves lives." The intubation benefit is consistent and strong across the literature. The mortality benefit is not — it appears in some analyses and disappears in others, including the largest and most recent. Overstating it is not harmless: it is how a therapy gets applied to patients it will not help.

DEEPER — BACKGROUND, OPTIONAL

The numbers, so you can see why we say it that way.

Intubation — consistent across every analysis:

- Scquizzato 2023, prehospital NIV meta-analysis, 12 studies / 1,485 patients: intubation RR 0.44 (95% CI 0.31–0.63), NNT 17. CITED
- Goodacre 2014 network meta-analysis: prehospital CPAP OR 0.32 (95% CrI 0.17–0.62). CITED
- ERS/ATS 2017, prehospital cardiogenic pulmonary edema: RR 0.31 (95% CI 0.17–0.55). CITED
- Cochrane 2019, in-hospital ACPE: RR 0.49 (95% CI 0.38–0.62), NNT 13, moderate quality. CITED

Mortality — inconsistent:

- Scquizzato 2023 — the largest and most recent prehospital pooled analysis: no significant reduction. RR 0.89 (95% CI 0.70–1.13), $p = 0.34$.
- 3CPO (Gray, NEJM 2008), 1,069 patients, the largest single trial: 7-day mortality 9.5% NIV vs 9.8% standard oxygen, $p = 0.87$. No difference. Authors' own conclusion: NIV "induces a more rapid improvement in respiratory distress and metabolic disturbance than does standard oxygen therapy but has no effect on short-term mortality."
- Cochrane 2019 did find one: RR 0.65 (95% CI 0.51–0.82), NNT 17, but graded it low quality.
- Goodacre 2014 found one for CPAP: OR 0.41 (95% CrI 0.20–0.77).

What 3CPO did show, and it matters:

At one hour versus standard oxygen: dyspnea score better by 0.7 ($p = 0.008$), heart rate lower by 4 ($p = 0.004$), pH better by 0.03 ($p < 0.001$), PaCO₂ lower by 5.2 mm Hg ($p < 0.001$). CITED Patients felt better and their physiology improved, faster. That is a real benefit and it is what you will see with your own eyes.

An older and smaller trial shows the same thing for CO₂ on CPAP alone. In severe cardiogenic pulmonary edema, PaCO₂ fell from 58 to 46 mm Hg in 30 minutes on CPAP, against 64 to 62 on oxygen alone (Bersten, NEJM 1991, 39 patients). CITED CPAP adds no breath, so that is the patient's own breathing getting more effective.

3CPO also found something worth remembering when your patient fights the mask: non-completion for discomfort was 0.3% on standard oxygen, 5.2% on CPAP, 8.4% on BiLevel. Intolerance is common, expected, and largely coachable.

Guideline positions, for completeness:

- ERS/ATS 2017 on cardiogenic pulmonary edema: "We recommend either bilevel NIV or CPAP... (Strong recommendation, moderate certainty of evidence.)"

- ERS/ATS 2017 on the prehospital setting specifically: "We suggest that CPAP or bilevel NIV be used for patients with ARF due to cardiogenic pulmonary oedema in the pre-hospital setting. (Conditional recommendation, low certainty of evidence.)" — with the caveat that they "emphasise the need for appropriate training and adequate infrastructure, including coordination with emergency departments before initiating a programme." That sentence is part of why this course exists.
- Asthma: ERS/ATS make no recommendation ("Given the uncertainty of evidence we are unable to offer a recommendation"). GINA 2026 likewise offers none. NAEMSP includes asthma. That divergence is real; we follow NAEMSP because we are prehospital, and we watch these patients closely.
- Pneumonia / de novo hypoxemic failure: ERS/ATS make no recommendation, and warn NIV failure here is an independent mortality risk. Highest-vigilance group.
- Notable absence: the 2022 AHA/ACC/HFSA Heart Failure guideline contains no recommendation on NIV or CPAP at all. If someone asks what the AHA says about CPAP for flash pulmonary edema, the honest answer is that the cardiology guideline is silent. The recommendation lives in the pulmonary and EMS literature.

15. No guideline gives a starting pressure

CORE — EVERY PROVIDER

Nobody publishes a starting CPAP pressure. Not one body. We checked all of them.

Source	Publishes a starting CPAP pressure?
GOLD 2026 Report	No — zero pressure values in the entire document
ERS/ATS 2017 NIV guideline	No
ESC 2021 Heart Failure guideline	No
AHA/ACC/HFSA 2022 Heart Failure guideline	No — no NIV content at all
NASEMSO National Model EMS Clinical Guidelines v3.0	No
Montana (current)	No — the state no longer publishes treatment protocols

That is a verified absence, not a gap in our research. FACT

The one empirical reference point that exists is the 3CPO trial protocol: CPAP "was commenced at 5 cm of water and increased to a maximum of 15 cm of water," and the mean pressure actually delivered across 346 patients was 10 ± 4 cm H₂O. CITED Treat that as what a large trial did, not as a guideline recommendation — because it is not one. Note also that our device cannot reach 15.

This course starts at 10 LPM (about 6–7 cm H₂O) and titrates to SpO₂ and work of breathing, up to 13. That start is this course's own choice, not a published value. The service can set its own in Appendix C.

Appendix A — Psychomotor skills checkoff

Evaluator initials each step as performed. Steps marked ALS/ED are optional and are NOT counted against an EMT candidate. A candidate who completes every unmarked step is competent to apply and monitor this device. EMR candidates: CPAP application is outside EMR scope in Montana, so EMRs are checked off on the EMR PANEL steps only — recognition, positioning, oxygen, staging suction, mask removal and assisting the applying provider. An EMR who completes those steps has completed this course. Do not mark an EMR incomplete for steps their license does not permit.

Candidate		Level	
Name:		Cert level:	
Evaluator:		Date:	
Device serial / lot:		Attempt #:	

Preparation

- ☐ States the indication out loud, and says whether they are confident this patient is bronchospastic
- ☐ Confirms patient is awake, cooperative and spontaneously breathing
- ☐ Screens against the seven manufacturer contraindications
- ☐ Obtains a full set of baseline vitals: BP, pulse, respirations, SpO2, mental status
- ☐ Checks cylinder pressure and states the expected duration and the oxygen plan out loud
- ☐ States whether the oxygen supply will outlast the anticipated transport
- ☐ Stages working suction within arm's reach of the patient's head
- ☐ Selects mask size using the printed 1:1 template against the face (Mercury ML2013-261 Rev. B, printed at Actual Size — Appendix D)

Application

- ☐ Seats the O2 hose fully onto the nipple and tugs it to confirm; begins flow at 10 LPM, lower if not tolerated
- ☐ Delivers a patient brief that includes how to signal the need to vomit
- ☐ HOLDS mask to face before securing the harness
- ☐ Secures harness snugly — two fingers fit under the strap, cushion not deformed
- ☐ Checks the full perimeter for leaks; addresses the nasal bridge first
- ☐ Keeps pulse oximetry on continuously, and titrates in steps until SpO2 reaches goal (94–98%, 88–92% in COPD)
- ☐ Verbalizes that a gauge reading of 10 means a true pressure of 7 to 13
- ☐ Reads the manometer to confirm delivery, and states there is no target pressure
- ☐ Sets NIBP to cycle every 2–3 minutes until the patient is stable

Monitoring and failure

- ☐ Reassesses at 5 minutes and states a trajectory judgement, not a single number
- ☐ Lists at least four triggers for immediate mask removal
- ☐ States that pressure is titrated up to 13, and that past 13 the answer is escalation, not more flow

- ☐ States the 13 cm H₂O device ceiling
- ☐ Verbalizes the escalation ladder in order
- ☐ Demonstrates assisted ventilation with a BVM and PEEP valve, timed to the patient's own inspiratory effort, without stacking breaths (7.3)

Removal — timed, performed under simulated vomiting

- ☐ Removes mask one-handed from a fully applied, pressurized setup without hunting for a clip
- ☐ Suction applied without leaving the patient's head

Time recorded: _____ seconds (Service baseline — see note below)

Note on removal time: this course deliberately publishes no target removal time, because no manufacturer or guideline source states one and inventing a safety margin would be dishonest. Record each candidate's time. Once the service has a baseline across its own staff on its own masks, the medical director sets the threshold in Appendix C.

Accessories

- ☐ Attaches T-piece nebulizer; states that a SECOND gas source is required
- ☐ After activating the nebulizer, checks the manometer and retitrates
- ☐ States that inline T-piece EtCO₂ is for apnea and rate — the number may be attenuated and is not a diagnostic value
- ☐ States the trade-off of a nasal cannula under the mask (better number, worse seal)
- ☐ States the short-handed priority order, and gives the bronchodilator early when confident of bronchospasm

ALS / ED — optional, not scored for EMT

- ☐ ALS/ED — Explains why CPAP lowers CO₂ only by easing the patient's own breathing, and why a tiring COPD patient gets less of that
- ☐ ALS/ED — Describes preload/afterload effects and identifies a preload-dependent patient
- ☐ ALS/ED — Describes the ED transition without an unpressurized gap

Result		Signature	
☐ Competent (full scope) ☐ Competent, EMR panel ☐ Needs remediation		Evaluator signature:	
Remediation plan / comments:			

Appendix B — Attendance roster

One row per attendee. Retain per your CE record-keeping policy.

Course	Prehospital & ED CPAP: the Flow-Safe II
Date	
Location	
Instructor (name, cert #)	
CE hours awarded	
Approval / course #	

#	Print name	Cert level	License #	Signature	Skills
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

Instructor attestation: I certify that the individuals listed above attended this course in its entirety and that skills competency was evaluated as recorded on the individual checkoff sheets.

Instructor signature: _____ Date: _____

Appendix C — Medical director sign-off

SERVICE CONFIGURATION

Teach this course as written. Every value below ships with a working default, so nothing on this page delays delivery. The service sets its own values when convenient and they supersede the defaults from that moment forward. Collect the signature alongside delivery, not ahead of it.

Each default below is a starting position, not a value with an authority behind it. Where no national body and no Montana state document publishes a figure, the default is flagged as this course's own choice — Section 15 documents that verified absence. Strike any default and write the service's value beside it.

C.1 Clinical values

Starting CPAP pressure (a range, not a point — see §5.2). DEFAULT: begin flow at 10 LPM, about 6 to 7 cm H₂O on Mercury's table; if the patient cannot tolerate it, drop to 6 to 8 LPM and work up. Titrate to SpO₂ (goal 94–98%, 88–92% in COPD) and work of breathing. Once the patient is settled and tolerating the mask, do not leave them below 5 cm H₂O, which is 8 to 9 LPM on Mercury's own table. Ceiling 13. §15 documents the verified absence of a published starting pressure, so the 10 LPM start is this course's own choice, not a published value. 3CPO is the only empirical anchor (start 5, max 15, mean delivered 10 plus or minus 4) — what one large trial did, not a recommendation. Service value:

Maximum pressure authorized for this service. DEFAULT: 13 cm H₂O, the device ceiling. This is a hardware fact, not a policy choice — the Flow-Safe II cannot exceed it. Service value:

Any level-specific limit this service imposes. DEFAULT: none, matching state scope. An EMT holds the same CPAP authority as a paramedic, for adults and for children. Service value:

Indications approved for this service. DEFAULT: respiratory distress from suspected cardiogenic pulmonary edema, COPD, asthma or pneumonia, per the NASEMSO National Model EMS Clinical Guidelines v3.0 that Montana adopted 9/1/2025. Service value:

Contraindications adopted. DEFAULT: the manufacturer's seven, taught verbatim in §2.2. Service value:

Is a physician consult required before applying outside the manufacturer list? DEFAULT: yes — contact online medical control first. Service value:

Reassessment interval. DEFAULT: 5 minutes, as taught in §7 and as scored on the Appendix A checkoff. Service value:

C.2 Operational values

Safe residual cylinder pressure. DEFAULT: 200 PSI — the convention, and the value used in the duration formula and the worked example. Choosing 500 instead shortens every duration in Section 8 by about a sixth — a full D at 15 LPM falls from about 19 minutes to about 16. DERIVED Service value:

Onboard cylinder actual designation. NO DEFAULT IS POSSIBLE — this one must be read off the cylinder. An M60 gives roughly 103 minutes at 15 LPM from full; an M/M122 gives roughly 210 (Section 8). Do not quote a duration until the stamp is read. Stamp reads:

Minimum oxygen duration required before applying CPAP on a transport. DEFAULT: estimated transport time plus 50 percent. UNKNOWN — no body publishes a margin; this one is this course's own proposal and the medical director owns the answer. Service value:

Owner of periodic device verification against a test lung, and interval. DEFAULT: the service's equipment officer, monthly. Service value:

May a tee-derived EtCO₂ number be charted, and with what qualifier? DEFAULT: no. Document only the presence or absence of waveform, for apnea detection. Mercury labels the inline tee "for apnea alarm triggering only" and "Do not use as a diagnostic tool." Service value:

Mask removal time threshold. NO DEFAULT BY DESIGN — no source publishes one, and inventing a safety margin would be dishonest. Record every candidate's time on the Appendix A checkoff and set the threshold once a baseline exists. This is not a prerequisite for teaching the course. Service value:

C.3 Course administration

Accrediting body. DEFAULT: deliver as service training with no CE claimed. Accreditation gates CE issuance only — it does not gate the training. Service value:

Course / approval number. DEFAULT: none, pending accreditation. Service value:

CE hours awarded, and category. DEFAULT: none claimed pending accreditation; log contact hours locally in the meantime. Service value:

Recertification / refresher interval for this competency. DEFAULT: annual. Service value:

C.4 Open items escalated to the service

#	Item	Decision
1	Child/Small mask is NOT stocked. National multi-society consensus (NAEMSP/AAP/ACS-COT/EIIC/ENA/NASEMSO 2020, hosted by MT DPHHS EMSC) says adult items should not be substituted for pediatric patients. Purchase Mercury 1057211, or 1057223 with neb and tee?	
2	Confirm receiving facilities have CPAP immediately available at the stretcher on arrival. The NASEMSO continuity rule (Section 7, Rule 1; Section 12) depends on it. Until it is, the crew's mask stays on. (Reinstated 2026-10-19; it was retired 2026-09-04 when Section 12 planned no device swap.)	
3	Confirm regulators support the required continuous flows AND are back-pressure compensated. The manufacturer cautions that non-compensated devices affect delivered flow.	
4	Confirm two flowmeters/outlets are available wherever the T-piece nebulizer will be run.	
5	RESOLVED 2026-09-03 — no longer blocking. The scope claim rests on the Scope of Practice Document, not on the ARM, and the rule is now cited in dual form (24.112.502, formerly 24.156.2771), which is correct whether or not the SB 518 transfer took effect. Whether MAR Notice 2025-149.1 was adopted remains unconfirmed because rules.mt.gov sits behind a bot challenge; the Department's own Rule Notices page publishes an adoption link that points at the proposed PDF. Optional to close: open rules.mt.gov/gateway/ruleno.asp?RN=24.112.502, or phone the ECP Program at (406) 444-6880.	

Medical Director signature: _____ Date: _____

Print name: _____

Appendix D — Sources

Every clinical claim in this document traces to one of these. Manufacturer documents govern device operation; guideline documents govern clinical practice; where they conflict, the conflict is named in the text rather than resolved silently.

Manufacturer — Mercury Medical

- Flow-Safe II Directions For Use, #83-900-0390 Rev. 9, 09/2024. mercurymed.com/wp-content/uploads/Flow-Safe-II-DFU.pdf
- Flow-Safe II FAQs. mercurymed.com/wp-content/uploads/Flow-SafeII_faqs.pdf
- Flow-Safe II+ FAQs. mercurymed.com/wp-content/uploads/Flow-SafeII_plus_faqs.pdf
- FiO2 / flow-vs-pressure / cylinder duration chart, ML2013-231 Rev. A, 04/2013. mercurymed.com/wp-content/uploads/fiO2_chart_a.pdf
- Apnea Alarm Accessory DFU, #83-900-0482 Rev. 2, 01/2023. mercurymed.com/wp-content/uploads/83-900-0482-Flow-Safe-II-EZ-Apnea-Alarm-DFU-Rev-2-SR-added-14-x-7-sm.pdf
- Deluxe Contoured Mask Sizing Chart, ML2013-261 Rev. B. mercurymed.com/wp-content/uploads/ML2013-261-Deluxe-Contoured-Mask-Sizing-Chart-Rev-B-sm.pdf
- Drug labels (mechanisms), FDA via DailyMed: albuterol sulfate inhalation solution, setid eafa5b05-d692-48e7-a413-30f847547eb2; ipratropium bromide and albuterol sulfate inhalation solution, 38f9a201-3954-4370-8e71-7ec2df88a1ff; Adrenalin (epinephrine injection), 3b7a4364-668d-4eb2-a20c-04adc35aabe4.
- FDA 510(k) K090710, "Mercury CPAP," cleared 20 August 2009.

Scope of practice

- Montana ECP Scope of Practice Document. Montana Dept. of Labor & Industry, Emergency Care Provider Program. Effective 9/1/2025.
- Montana DLI, "Montana Emergency Care Provider (ECP) Endorsements" (endorsement project explanation), 2025 — documents the removal of CPAP from the EMT Airway Endorsement.
- ARM 24.112.502, ECP Scope of Practice (transferred from 24.156.2771 under SB 518). See Appendix C item 5.
- National EMS Scope of Practice Model 2019. NHTSA, DOT HS 812 666, February 2019.
- SUPERSEDED — Montana Prehospital Treatment Protocols v11, rev. 11/2020. Source of the retired 10 cm H2O EMT cap. Cited here only to mark it as no longer in force.

Clinical guidelines

- National Model EMS Clinical Guidelines, Version 3.0. NASEMSO Medical Directors Council, March 2022. Adopted by Montana effective 9/1/2025.
- Rochwerg B, Brochard L, Elliott MW, et al. Official ERS/ATS clinical practice guidelines: noninvasive ventilation for acute respiratory failure. *Eur Respir J* 2017;50:1602426.
- Global Initiative for Chronic Obstructive Lung Disease. GOLD Report 2026.
- Global Initiative for Asthma. GINA Global Strategy for Asthma Management and Prevention, 2026; and GINA Summary Guide for Asthma Management and Prevention, 2026, p. 35 — "Do not use sedatives," in managing exacerbations. Read directly from the published PDF.
- Davidson AC, Banham S, Elliott M, et al. BTS/ICS guideline for the ventilatory management of acute hypercapnic respiratory failure in adults. *Thorax* 2016;71(Suppl 2):ii1–ii35.
- O'Driscoll BR, Howard LS, Earis J, Mak V. BTS guideline for oxygen use in adults in healthcare and emergency settings. *Thorax* 2017;72(Suppl 1):ii1–ii90.

- 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur Heart J* 2021;42:3599–3726. (Superseded by the 2026 edition, which is paywalled and was not read; the hemodynamic caution quoted here is from 2021.)
- 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure. *Circulation* 2022;145:e895–e1032. Cited for a verified ABSENCE of NIV content.
- McCoy AM, Morris D, Tanaka K, et al. Prehospital Noninvasive Ventilation: An NAEMSP Position Statement and Resource Document. *Prehosp Emerg Care* 2022;26(sup1):80–87. (Abstract read; full text is subscription-only.)
- Recommended Essential Equipment for Basic Life Support and Advanced Life Support Ground Ambulances 2020. Joint statement, NAEMSP / AAP / ACS-COT / EIIC / ENA / NASEMSO. Hosted by Montana DPHHS EMSC.

Trials and systematic reviews

- Gray A, Goodacre S, Newby DE, et al. Noninvasive Ventilation in Acute Cardiogenic Pulmonary Edema (3CPO). *N Engl J Med* 2008;359:142–151.
- Berbenetz N, Wang Y, Brown J, et al. Non-invasive positive pressure ventilation (CPAP or bilevel NPPV) for cardiogenic pulmonary oedema. *Cochrane Database Syst Rev* 2019;4:CD005351.
- Scquizzato T, Imbriaco G, Moro F, et al. Non-Invasive Ventilation in the Prehospital Emergency Setting: A Systematic Review and Meta-Analysis. *Prehosp Emerg Care* 2023;27(5):566–574.
- Goodacre S, Stevens JW, Pandor A, et al. Prehospital noninvasive ventilation for acute respiratory failure: systematic review, network meta-analysis, and individual patient data meta-analysis. *Acad Emerg Med* 2014;21(9):960–970.
- Lim WJ, Mohammed Akram R, Carson KV, et al. Non-invasive positive pressure ventilation for treatment of respiratory failure due to severe acute exacerbations of asthma. *Cochrane Database Syst Rev* 2012;12:CD004360.
- Austin MA, Wills KE, Blizzard L, Walters EH, Wood-Baker R. Effect of high flow oxygen on mortality in chronic obstructive pulmonary disease patients in prehospital setting: randomised controlled trial. *BMJ* 2010;341:c5462.
- Abdo WF, Heunks LM. Oxygen-induced hypercapnia in COPD: myths and facts. *Crit Care* 2012;16(5):323.
- Bersten AD, Holt AW, Vedig AE, et al. Treatment of severe cardiogenic pulmonary edema with continuous positive airway pressure delivered by face mask. *N Engl J Med* 1991;325:1825–1830.

Oxygen cylinder data

- Virginia Department of Health, Oxygen Cylinder Guidance, EMS-6020 (duration formula, 200 PSI residual, factor table).
- Catalina Cylinders, MEDICAL SPECIFICATIONS, Rev 12/13 — service pressure and oxygen contents for MD, M22 (Jumbo D), ME, M60 and M122. catalinacylinders.com. Airgas Healthcare 2025 Gas, Equipment and Services Guide (shipped capacities used to check the legacy factors).

Prepared 4 September 2026; revised 19 October 2026. Clinical content and plan were subjected to independent adversarial review by two non-authoring AI models before drafting; the review gate returned PROCEED on the fourth iteration after three rounds of blocking findings were resolved by primary source or by operator decision. Findings that changed this document: the seal-continuity rule was paired with an explicit removal override; the document was restructured into tiers; a failure-escalation ladder and a short-handed task priority were added; an invented mask-removal time was withdrawn; the nebulizer drop order was made phenotype-dependent; and Mercury's M-cylinder duration table was excluded after an arithmetic check found it internally impossible.

This document is a training aid and it does not replace medical direction. The defaults in Appendix C govern until the service replaces them; setting them is not a prerequisite for teaching this course.