Lesson Plan

Course Name:	**Medic Monthly: Capnography for Respiratory Distress (ALS)**	Team Review with QA Checklist by:	
	Medic Monthly: Capnography for Respiratory Distress (BLS)		
Course Owner:	**Ray Kemp – prepared by Mike Phares**	SME Review by:	
Target Audience:	**ALS/BLS**	Final Review & Approval by:	
Total Course Length:	**1 Hour**	Date Loaded to Platform:	

Slide/ Screen #	Lesson	SubLesson/ Page Name	Screen Content	Text Content
1.			**Notes:** 1. Use graphic files supplied; they have been color-corrected. The images in the lesson plan have not. The images have been placed across from the text which they correspond to. They are numbered and titled in the order in which they appear in the Lesson Plan. 2. There is <ALS/BLS> customization for each version of the course on Welcome page and Billboard text on Module page on LMS. 3. There is one set of questions for bothe ALS and BLS.	
2.	Billboard	**Billboard Image and Text in Course Settings on the LMS**	Use this image: 8 Using Capnography to Assess Respiratory Distress_Capnogram.jpg from supplied images	This one-hour Medic Monthly course provides instruction on the use of capnography in the field and its assistance in the treatment of patients in respiratory distress.

3.	**Introduction**	Welcome		Welcome to the elearning for Medic Monthly: Capnography for Respiratory Distress. Medic Monthly is a series that presents the latest in pre-hospital response, procedures, and techniques. This course is designed to enhance your ability to identify the importance of proper training for your role as an <ALS><BLS> provider using capnography for evaluate respiratory stress.
4.	Introduction	Course Instructions	EST. 1992 CAPCE COMMISSION ON ACCREDITATION FOR PRE-HOSPITAL CONTINUING EDUCATION	This course provides one hour of instruction including evaluation and knowledge checks and is presented in a linear format. It is CAPCE-accredited. Please read each page and review the associated materials thoroughly. The course consists of the following components: • Course Summary • Course Instructions • Pre-Test • Course Sections • Knowledge-Check Quizzes • Post-Test/Final Exam Please note that the Pre-Test and the Knowledge-Check Quizzes which appear after each section are not graded. You will only be graded on the post-test in the Final Exam section of the course. If you do not pass the final exam, you are allowed to retake the exam two additional times. There may be

				additional, relevant resource material (if available) that may be viewed online or downloaded. This course is CAPCE-accredited. Also, keep in mind that your progress through the course is tracked and if you log out, you will be able to log in at a later date and continue the course from where you left off. Once you have started a course, courses in progress are listed in My Dashboard of your account.

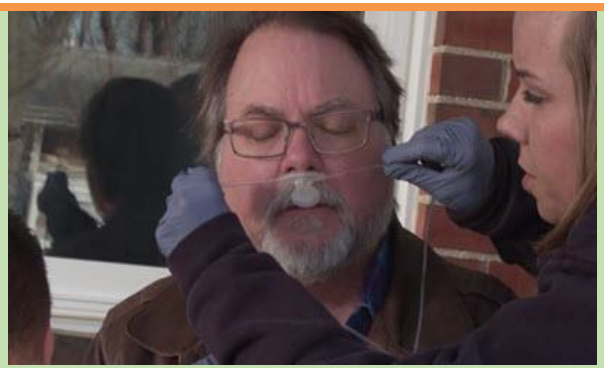
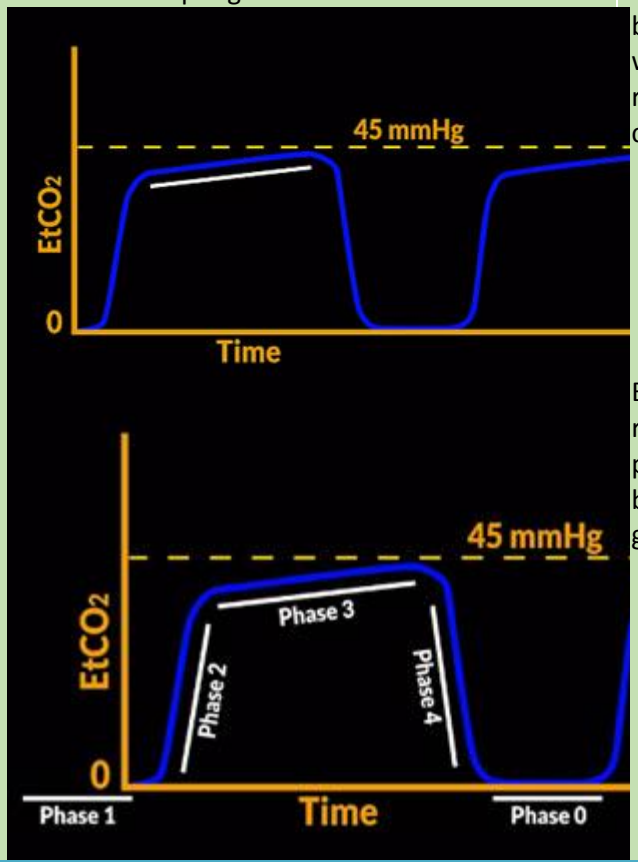
5.	Introduction	Course Overview	Course Overview 	This one-hour Medic Monthly course provides instruction on how to use capnography to deal with respiratory distress. Access to capnography is one of the greatest advances in prehospital medicine over the past ten years. It's also extremely versatile, even though it is often underutilized by providers who don't fully understand all its capabilities. If you're only using capnography for ET tube confirmation and cardiac arrest scenarios, you're missing a lot of useful clinical information from this high-tech but easy- to-use tool. Using three breakout sections, "Back to Basics," "Focus on Pharmacology," and "Documentation Minute," you'll acquire the information you need and be able to use it with confidence in this episode of Medic Monthly.

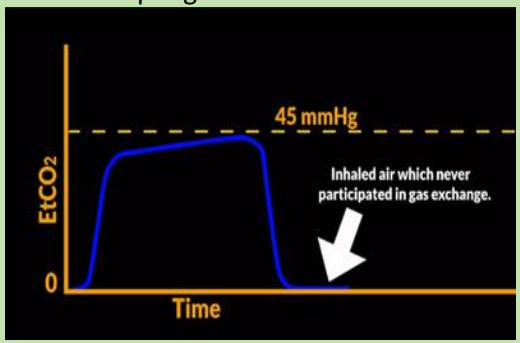
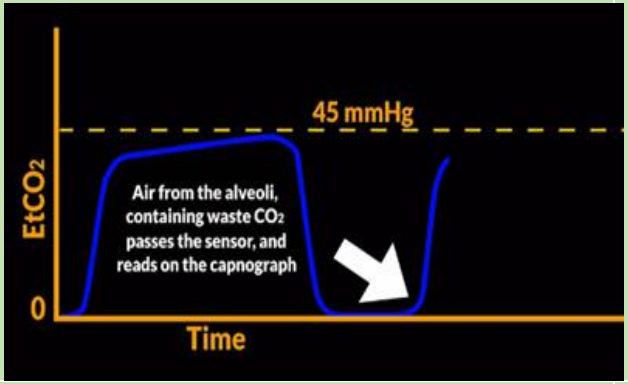
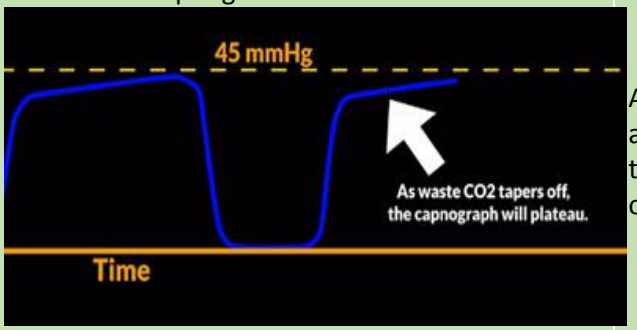
6.	Introduction	Course Objectives	Course Objectives 	At the end of this course, you will be able to: • recognize the proper function, use and interpretation of the capnography waveform (A) • identify and prioritize the proper treatment options for a patient experiencing COPD exacerbation (B) • describe the technique for respiratory evaluation and differential diagnosis using non-invasive capnography. (C) *(Letters in parentheses refer to quiz and exam questions which are likewise marked.)*
1.	**Pre-Test**	Pre-Test	1. C.O.P.D. is a disease process characterized by: a. disruption of circulation to the cerebral vasculature b. disruption of circulation to the pulmonary vasculature c. progressive hardening and thickening of the lung tissue d. progressive hardening of the carotid arteries (B) **Answer: C** 2. C.O.P.D. patients often exhibit: a. bradycardia b. clear but unequal lung sounds c. a prolonged expiratory phase d. hypotension (B) **Answer: C**	Pre-Test

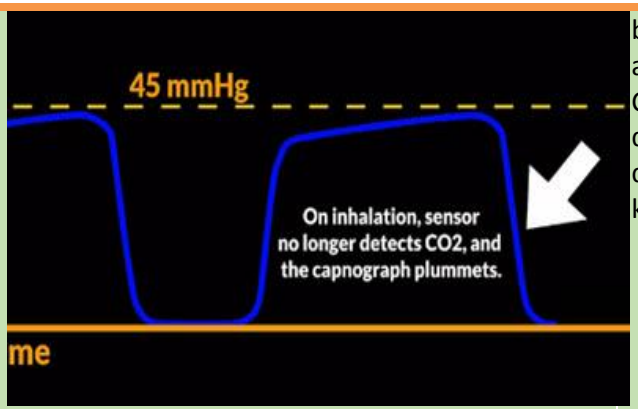
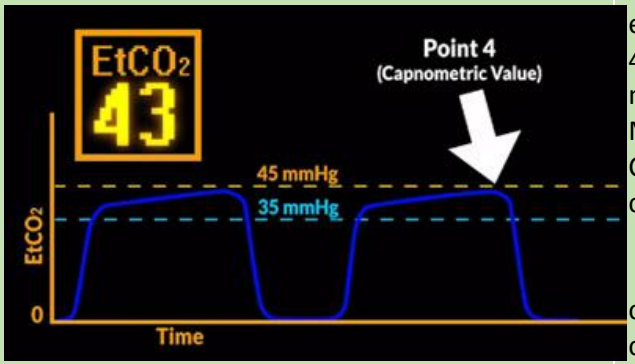
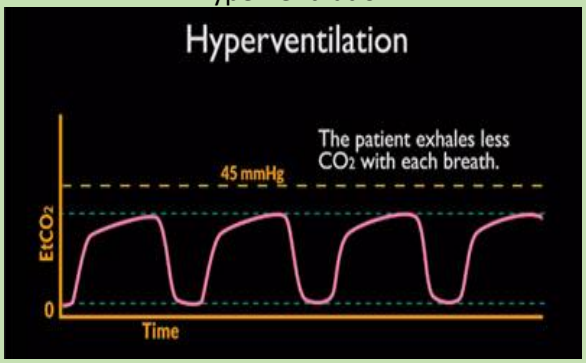
			3. Capnography devices are, in essence: a. heart monitors b. gas meters c. hemoglobin monitors d. pressure meters **(**A) **Answer: B**	
2.	**Course Content starts here.**	Lesson 1 Overview	Lesson 1 Overview: 	In Lesson 1 we learn that the respiratory patient can present many challenging decision points for the prehospital provider. Are we dealing with a heart or lung issue? Blood or neurologic problem? Is there an allergic component to their troubled breathing? How distressed is the patient and do we need to consider an advanced airway? How you answer these questions can have serious consequences for the patient and their course of care. Capnography can play a big role in helping to answer these questions.
3.	Lesson 1:	Video Content	Video: Lesson 1	
4.	Content	Lesson 1	Background of Medical Issue 	EMS paramedics, Jim and Ashley, roll up on a middle-aged adult male who is sitting on his porch, smoking and tripoding slightly forward. He appears concerned and is working to breathe between puffs on a cigarette. He speaks in two- to three-word phrases and labors to breathe always sitting forward. He had been chasing his dog when he became extremely short of breath.

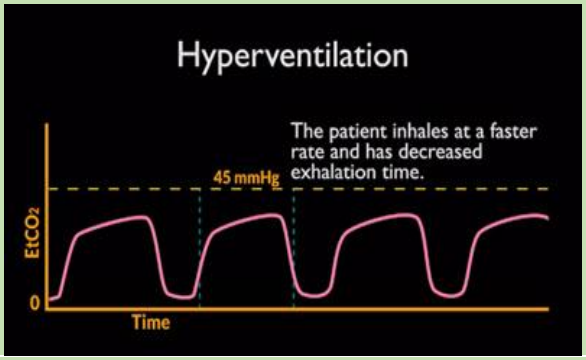
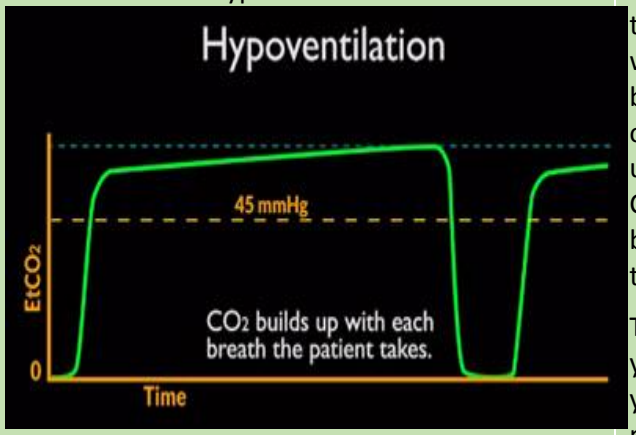
				The patient has asthma, smokes, and sleeps with oxygen. Jim listens to his lungs as his partner, Ashley, puts the patient on a capno-cannula to check his O_2 saturation, and they continue to assess.
5.	Content	Lesson 1	Using Capnography to Assess Respiratory Distress 	As we have just seen in the video, this is where non-invasive capnography devices can have tremendous benefits. However, some feel there is sometimes a certain mystique around waveform capnography analysis. Sampling and reading a waveform can sometimes appear to be imprecise and even impractical. We now know that understanding how to interpret a capnogram may help you recognize the underlying cause of the patient's breathing issue. It can indicate the degree of respiratory distress or failure, and help you monitor for patient improvement or decompensation. But before diagnosing problems from a capnogram, let's understand what a normal waveform looks like and what each phase represents.

6.	Content	Lesson 1	Reading the Capnogram -1  	In essence, a capnography device is a gas meter. This is true for all capnography. A capnography device measures for the gas, carbon dioxide, or CO_2. When we breathe in, we inhale oxygen which is necessary for cellular metabolism, and we exhale the metabolic waste: carbon dioxide. Capnometry is the qualitative or quantitative measurement of end tidal carbon dioxide while a capnogram is the graphical waveform depicting a patient's respiratory cycle. Together, the measurements form capnography.
7.	Content	Lesson 1	Reading the Capnogram -2 	A capnography waveform allows us to see how much carbon dioxide the patient is producing during metabolism and exhalation, a process that we call ventilation. Much like an EKG can show us the pattern of electrical activity in the heart, a capnogram shows us a pattern of the patient's rate and depth of breathing. This is an important indicator of respiratory function or how well the patient is breathing. For a breathing patient, the capnography waveform is typically measured using a non-invasive cannula type device that samples the air as the patient breathes out or exhales.

				
8.	Content	Lesson 1	Capnogram Waveform - 1 	A typical waveform looks a little like a box. The top of the normal capnography waveform slants gently upward, representing a slight increase in exhaled carbon dioxide as the patient exhales. Each segment of the capnogram represents a specific phase of the patient's respiratory cycle. The waveform begins and ends at the baseline of the graph.

9.	Content	Lesson 1	Capnogram Waveform - 2  	A very common mistake is believing exhalation begins at Phase 2 when in actuality, exhalation begins at Phase 1. So then, why is the line flat during Phase 1? Because these first few milliseconds of exhalation is air that had just been inhaled that never participated in gas exchange in the dead space of the airways. Thus, there is no "waste" to measure. But as exhalation continues, air from the alveoli itself that has waste CO_2 is starting to come out of the lungs. Now the CO_2 sensor is detecting this air that participated in gas exchange and rapidly starts the rise represented in Phase 2.
10.	Content	Lesson 1	Capnogram Waveform – 3 	As the alveoli continues to empty, the amount of waste being exhaled starts to taper off as represented by the plateau of Phase 3. But, we never quite fully and completely empty all the waste out of the lungs

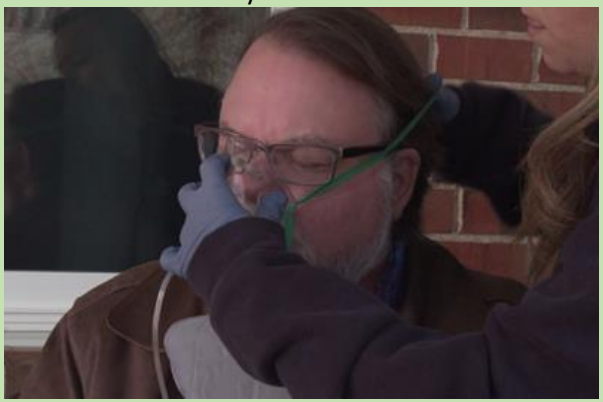
				before needing to take another breath, and as we take that breath, suddenly the CO_2 sensor doesn't see any carbon dioxide and the waveform plummets down to zero as represented by Phase 0, known as the inspiratory downstroke..
				Now, it is at the maximum point at the end of Phase 3, often referred to as Point 4 which is the capnometric value normally between 35 to 45 mm of Mercury (mmHg). That is the End Tidal CO_2 reading that will be shown on the capnometer. Now that you understand what a normal capnographic waveform looks like, changes in the shape, height, and width of the box will give you important clues about what's happening with our patient.
11.	Lesson 1:	Content	Hyperventilation 	For instance, if the patient is working hard to breathe or if they are hyperventilating we will note that the box often becomes shorter and narrower. The box shortens in height because the patient is exhaling less and less CO2 with each shortened breath because they are getting rid of the CO2 faster.

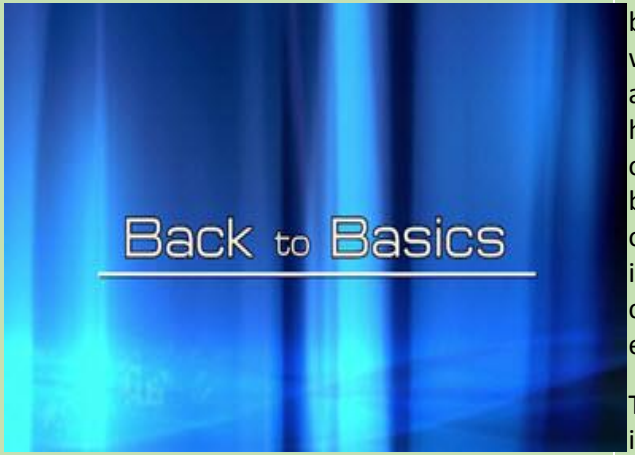
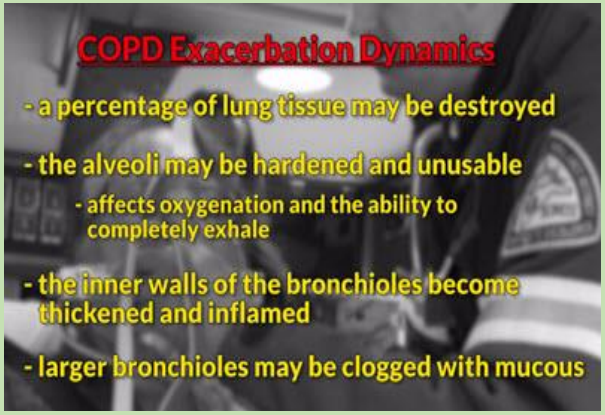
				The box narrows because of the patients increased respiratory rate and decreased time of exhalation. This can be an indication of increased work of breathing or simple hyperventilation by the patient.
12.	Lesson 1:	Content	Hypoventilation 	If, on the other hand, the patient is failing to breathe, or hypoventilating, the boxes will become both longer and taller. Taller because now the patient is not getting rid of the waste CO2 as fast and it's building up as reflected by the increased levels of CO2 exhaled with each breath and longer because of the slower expiratory phase that can be seen in hypoventilation. These are just two great examples of why you should begin capnography early in your patient assessment and track the patients progress or lack thereof. It will also help you record those clinical findings for later.

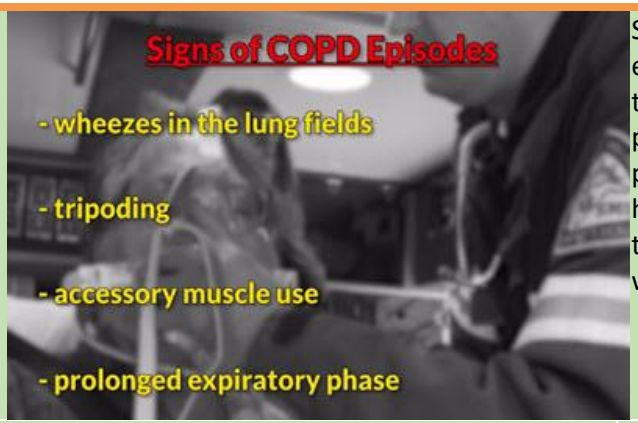
13.	Lesson 1:	Content	Documentation Minute   	Sometimes, one of the most difficult things to document after the call is the reasoning behind a caregiver's clinical impression. While many of our assessment findings can be objectively observed at the time of the call, few can be preserved the way a capnogram can. Utilizing capnography allows you to have objective documentation of the patients initial and ongoing metabolic and respiratory function. Since both improvement and decompensation can be seen over time, it provides additional support when more aggressive therapy is warranted. You should be familiar with how your monitor records and stores capnographic data and how to upload it for inclusion in your Patient Care Record. With that simple waveform you can definitively document correct ET tube placement, return of spontaneous circulation, termination of resuscitation efforts, bronchospasm, failure of respiratory effort, and improvement or decompensation over time.

14.	Lesson 1:	Content	Lesson 1 Summary 	In Lesson 1 paramedics rolled up on a patient with definite breathing and respiratory issues. We learned the value of using capnography with a description of the various capnogram waveforms and how they can be used to help EMS providers with a diagnosis. The "Documentation Minute" break-out explained how capnography can document and upload capnographic data into the Patient Care Record.
15.	Check Point 1:	Check Point	Since placing a patient with bronchitis on capnography you have noticed that his waveform has gotten taller and his end tidal CO_2 has increased from 48 to 62. He appears tired. He is currently on an oxygen mask. The next most appropriate intervention would be: (C) a. Solumedrol b. C.P.A.P. c. 500 ccs of normal saline d. a nasopharyngeal airway **Answer: B** The amount of carbon dioxide that a patient produces during metabolism and exhalation is a process called: (C) a. ventilation b. expiration c. respiration d. CO_2 exhalation **Answer: A** The top of the normal capnography waveform: (A) a. looks like a shark fin b. looks like a box c. slants gently upward	Knowledge Check Quiz 1

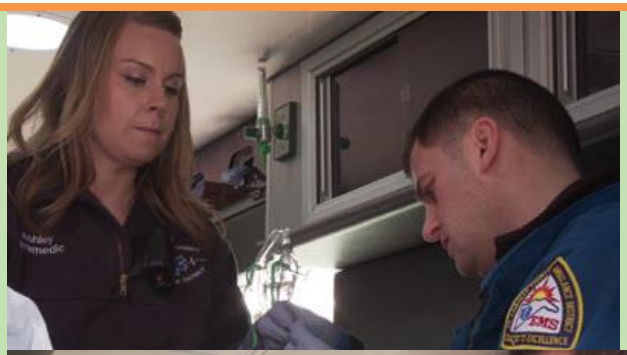
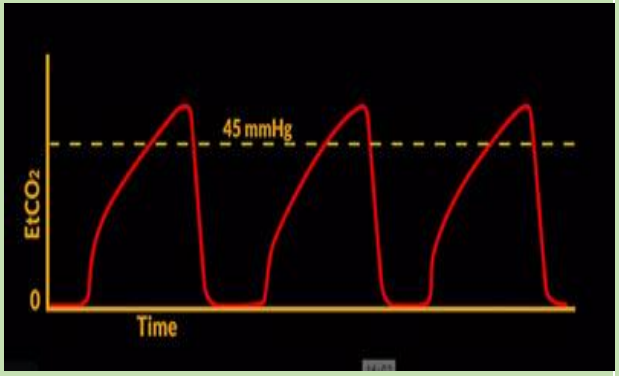
			d. reveals exhaled carbon dioxide **Answer: C**	
16.	Lesson 2:	Content	Lesson 2 Overview 	Lesson 2 demonstrated an early assessment of the patient where our Paramedic Jim recognized the signs of Chronic Obstructive Pulmonary Disease (COPD) and began some inhaled medication to assist with the patient's breathing. The rest of the lesson in our "Back to Basics" break-out reviews COPD, its signs, and mechanism of the disease.
17.	Lesson 2:	Video Content	Video: Lesson 2	

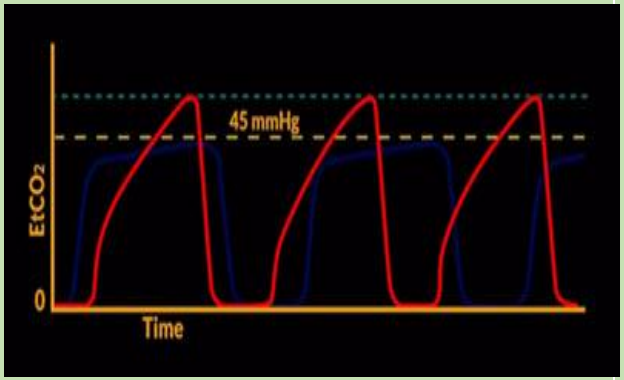
18.	Lesson 2:	Content	Early Assessment  	Paramedic Jim is assessing the patient's lung sounds while his partner, Ashley, is placing him on a capnography cannula and placing a non-rebreather mask over the cannula. Only the mask is hooked up to the oxygen bottle. The cannula will need to be hooked to a monitor. Jim is continuing his lung sound exam. He gets an A+A nebulizer set up in order to move him to the stretcher and then transport. Our paramedics are hitting all the right points for the early assessment of the patient. While walking up Jim already noticed that the patient likely had a prolonged smoking history, had an increased rate of breathing coupled with a forward leaning "tripod"-type position, and increased work of breathing apparent in the patient's accessory muscle use. His next priority were lung sounds and as soon as he heard the patient's decreased air movement with diffuse wheezes, he knew to start setting up for inhaled medications, and he's obviously considering Continuous Positive Airway Pressure (CPAP) with the help of waveform capnography. All these interventions are perfectly appropriate for a patient with a COPD exacerbation.

19.	Lesson 2:	Content	Back to Basics: Chronic Obstructive Pulmonary Disease (COPD) - 1  	COPD, or Chronic Obstructive Pulmonary Disease is a group of diseases that include asthma, emphysema and bronchitis. And, with the patient's wheezing, smoking, and history of asthma, it's apparent that he is likely having a flare-up of one or a combination of these diseases. They are characterized by progressive hardening and thickening of the lung tissue, and symptoms tend to include mucous production, wheezing, chest tightness, and difficulty breathing especially upon exertion. The single most common cause of COPD is smoking. But any long-term exposure to lung irritants as well as some genetic causes can also be contributing factors.
20.	Lesson 2:	Content	Chronic Obstructive Pulmonary Disease (COPD) – 2  	During a COPD exacerbation, there are multiple dynamics that can contribute to the patient's difficulty in breathing. First, some percentage of the patient's lung tissue may be destroyed. The patient's alveoli or air sacs responsible for gas exchange may be hardened and unusable, affecting oxygenation and the ability to allow for complete emptying during exhalation. Also, the inner walls of the bronchioles become thickened and inflamed, inhibiting air movement and gas exchange. Lastly, larger bronchioles may be clogged with mucous. During a COPD flare-up, these factors can combine to make breathing nearly impossible.

				Some of the hallmark signs of a COPD episode are wheezes in the lung fields, tripoding, accessory muscle use, and a prolonged expiratory phase. Of these physical signs, the one that might be hardest to physically appreciate can be that prolonged expiration, and that's where a capnogram can be a big help.
21.	Check Point 2:	Check Point	C.O.P.D. is a disease process characterized by: (B) a. disruption of circulation to the cerebral vasculature b. disruption of circulation to the pulmonary vasculature c. progressive hardening and thickening of the lung tissue d. progressive hardening of the carotid arteries **Answer: C** Which of the following is NOT one of the group of diseases that comprise COPD or Chronic Obstructive Pulmonary Disease? (B) a. asthma b. pneumonia c. emphysema d. bronchitis **Answer: B** As seen in our lesson, when preparing the patient for capnography, which of the following procedures is NOT correct? (C) a. The patient is placed on a capnography cannual. b. A non-rebreather mask is placed over the cannual c. The mask is hooked up to the oxygen bottle.	Knowledge Check Quiz 2

			d. The cannula is hooked up to the oxygen bottle. **Answer: D**	
22.	Lesson 3:	Content	Lesson 3 Overview 	Lesson 3 focuses on the treatment of our patient once he is in the ambulance. This includes a nebulizer, use of a cannula with oxygen, and a stand-by CPAP. The break-out, “Focus on Pharmacology” discusses the specific medication pacakage used in the nebulizer. Most importantly, the use of the capnogram to help diagnose and guide treatment is also covered.
23.	Lesson 3:	Video Content	Video: Lesson 3	
24.	Lesson 3:	Content	Initiating Treatment	Our EMS team now has the patient in the back of the ambulance. A medication nebulizer is set up and hanging off to the side. The oxygen mask is removed but the cannula is hooked into an oxygen source. Paramedic Ashley is stripping out an IV bag with Albuterol, setting up an Atrovent nebulizer, and prepares to run a line. Based on the capnogram, a CPAP is made ready to deploy, in case the patient doesn’t respond to the primary

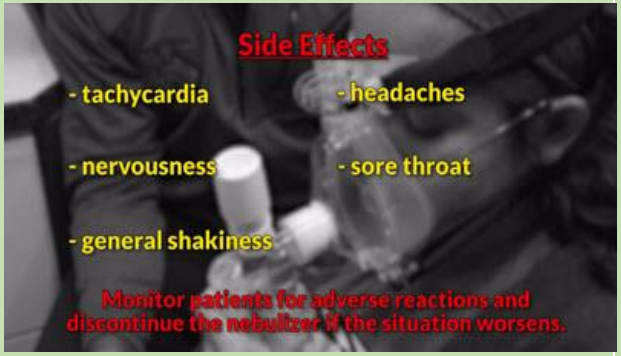
			 	treatments. The pace is moving fast but in a controlled manner. Paramedic Jim asks the patient about his allergies and how many packs of cigarettes he smokes per day.
25.	Lesson 3:	Content	Waveform Analysis in COPD and Respiratory Failure 	Ashley will be driving the ambulance, so before he's alone in the back of the rig, Jim's going to make sure he has his most critical interventions set up and ready to go. But what did Jim mean about that "shark fin"-shaped capnography waveform? Dr. Tan mentioned earlier that a prolonged expiratory phase was one of the hallmark symptoms of obstructive lung disease and sometimes it can be hard to observe. But a capnogram has a specific waveform change in the presence of bronchospasm. Remember that nice, upright box representing normal exhalation? Well, in obstructive lung disease, it takes longer

				to exhale, so we lose that plateau of Phase 3 and instead see that longer gradual rise in CO_2 since it takes longer to empty the alveoli. This can give the waveform the appearance of a shark swimming from right to left. In addition to the tell-tale "shark fin" morphology, the height of the waveform also holds important clues. When the patient is working hard to breathe, it's sometimes difficult to recognize if they are up to the task or failing to breathe. Recognizing that critical difference between working to breathe and failing to breath is important. When the waveform begins to rise above the 45mmHg mark, this hypercapnea is a red flag that the patient may need more aggressive airway interventions like CPAP or mechanical ventilator assistance with an advanced airway.
26.	Lesson 3:	Content	Focus on Pharmacology: COPD 	We also heard Jim request an "A+A" neb set up. A+A is a common industry vernacular in places where the two medications Albuterol Sulfate and Atrovent are given in combination. These two medications work through two different mechanisms to help relieve patients' respiratory distress. Albuterol sulfate, commonly nebulized as a 2.5mg dose in several ccs of normal

saline, stimulates bronchodilation through direct Beta2 Adrenergic stimulation.

On the other hand, ipratropium bromide, better known by its trade name of Atrovent, is an anticholinergic medication. It isn't a bronchodilator, but it helps block cholinergic bronchoconstriction and reduces the mucous production and secretions commonly seen in asthma and COPD exacerbation.

The patient may receive repeated doses of Albuterol, but Atrovent is commonly only given during the first cycle of nebulized medication administration in the prehospital setting.



These medications can produce tachycardia, nervousness, general shakiness, headaches, and sore throat. Patients should be monitored for adverse reactions and if the nebulizer is making the situation worse, it should be discontinued.

If the "shark fin" morphology of a capnogram begins to improve towards a more normal appearing waveform, then you will know with certainty that your therapies are helping reverse the obstructive lung pathology.

27.	Lesson 3	Content	Lesson 3 Summary 	In Lesson 3, Dr. Tan discuss the "A+A" nebulizer medication package that Paramedic Jim provided, and the possible side effects that patients may experience with these medications. In addition, Dr. Tan discuses the capnogram "shark fin" waveform that can tell you a lot about the patient's respiratory situation, and how it can guide your treatment.
28.	Check Point 3:	Check Point	A "Shark fin" type morphology of the capnography waveform is usually indicative of: (A) a. upper airway obstruction b. chronic obstructive pulmonary disease c. congestive heart failure d. diabetic ketoacidosis **Answer: B** A medication combination that is often used with COPD patients is: (B) a. Albuterol Sulfate and Atropine Sulfate drip b. Albuterol Sulfate and Atropine Sulfate nebulizer c. Albuterol Sulfate and Atrovent nebulizer d. Anaphalaxis and Atrovent drip **Answer: C** Whidh of the following may be a side effect of the A+A medication package? (B) a. Diaphoresis b. Tachycardia	Knowledge Check Quiz 3

			c. Loss of consciousness d. Brachycardia **Answer: B**	
1.	Lesson 4:	Lesson 4 Overview	Lesson 4 Overview Dr. Tan_1 	Lesson 4 covers the use of CPAP in conjunction with other medications when treating patients in respiratory distress. Much of the success of CPAP is directly associated with deploying it early on in treatment, and how well you can get the patient to tolerate it in the first few minutes. A capnography cannula should be worn under the CPAP mask. CPAP may help get those nebulized medications deeper into the patient's lungs.
2.	Lesson 4:	Video Content	Video: Lesson 4	

3.	Lesson 4:	Content	CPAP and Continued Monitoring  	In the ambulance Paramedic Jim is coaching a CPAP mask onto the patient's face. Though mentioned earlier, don't forget that there should be a capnography and CO_2 cannula on under the CPAP mask. The patient now has an IV established, a bag hanging, and 200-500 ccs can be absent from the bag. Jim is holding the CPAP mask in front of the patient and applying it to the patient's face during inhalation only, coaching it on to the patient and giving him psychological support. After a few breaths he will hold it in place for several more before attempting to secure it. Once the mask is secured, Jim can also get a blood pressure, re-check lung sounds, hook the nebulizer into the CPAP, and place the patient on a cardiac monitor. Applying the CPAP at this stage is absolutely the right move. And Jim is using good technique. He's being very reassuring and slowly coaching the mask on to his patient. Much of the success of CPAP is directly associated with how well you can get the patient to tolerate it in the first few minutes.

4.	Lesson 4:	Content	The Essentials of Using CPAP - 1  	Jim is also leaving the CO_2 cannula in place under the CPAP mask. These two devices can and should be used in combination. The cannula can also be used for additional oxygen if need be. Some folks delay CPAP administration under the false assumption that it will be disruptive to other interventions. But CPAP not only won't affect the accuracy of capnography, it may help you get that nice clean waveform that can sometimes be elusive when the patient has an oral nebulizer in his/her mouth. CPAP may also help get those nebulized medications deeper into the patient's lungs. CPAP has the greatest benefit to the patient early on in their presentation. So don't wait for critical signs of respiratory failure. And let your capnography waveform be your guide. If you see bronchospasm on your capnogram, hear wheezing on your exam, and see the patient working to breath, that's probably the right time to initiate more aggressive airway management like CPAP in conjunction with your pharmacological interventions.

5.	Lesson 4:	Content	The Essentials of Using CPAP - 2  	It's also important to note that CPAP isn't a panacea. It works in some cases and not in others. You need to continue to assess the patient's vital signs, pulse oximetry, and capnography for signs of continued decompensation. If the signs point to continued respiratory failure, other interventions may be required. Depending on your local protocols, that may include a steroid like Solumedrol, a more powerful bronchodilator like epinephrine, and perhaps Magnesium Sulfate. The patient may also progress to require an advanced airway. In all of these cases, breath by breath, capnography can help you decide if the current treatment is working or failing. If started early in your patient contact, it can help you make some of the tough decisions that may come later down the road and also be invaluable in helping you document why you made the decisions that you did.
6.	Lesson 4:	Lesson 4 Summary	Lesson 4 Summary 	Having taken Lesson 4 you have learned about the benefits of using CPAP as a way of assisting patients in respiratory distress as directed by the information provided by capnography. Some providers delay CPAP administration under the false assumption that it will be disruptive to other interventions, but in fact, CPAP not only won't affect the accuracy of capnography, it may help you get that nice clean waveform that can

				sometimes be elusive when patients has an oral nebulizer in their mouth. Using CPAP is the right decision in many cases as it will help bring about a quicker response to overall treatment.
7.	Check Point 4:	Check Point	When evaluating a patient with a capnography cannula in place, if you wish to use a mask or CPAP, it is best to: (C) a. place the cannula over the mask near the exhaust port b. Switch the cannula to "under device" mode c. remove the cannula and use the higher flow oxygen device d. leave the cannula in place under the mask or device **Answer: D** When starting out a patient on using the CPAP, the term that's often used when working with the patient is: (B) a. monitoring b. advising c. integrating d. coaching **Answer: D** When the decision is made to use the CPAP, once the mask is secured, which of the following is NOT performed? (B) a. Blood pressure reading b. Re-check lung sounds c. Hook the equalizer into the CPAP d. Place the patient on a cardiac monitor **Answer: C**	Knowledge Check Quiz 4

1.	Content	Content	Glossary  	**Capnogram** The waveform produced by a capnography machine that displays expiratory CO_2 and other respiratory factors. **Capnography** The monitoring of the concentration or partial pressure of carbon dioxide (CO_2) in the respiratory gases. Its main development has been as a monitoring tool for use during anesthesia, intensive care, and more increasingly, in pre-hospital care. It is usually presented as a graph or waveform of expiratory CO_2 and other respiratory factors. **Capnometric Value** (See **Point 4**) **Chronic Obstructive Pulmonary Disease (COPD)** A condition where reduced lung function makes it hard to breathe and worsens over time. COPD includes chronic bronchitis, emphysema, or both. The leading cause is cigarette smoking; however, long-term exposure to other lung irritants—such as air pollution or chemical fumes—may also contribute to COPD. **Continuous Positive Airway Pressure (CPAP)** For diseases such as COPD and Sleep Apnea, the patient wears a face mask connected to the CPAP machine which

				keeps the airway open by using small amounts of air pressure. **Point 4** The capnometric value which occurs at the end of Phase 3 of the respiratory cycle and and displays normally between 35 to 45 mm of Mercury (mmHg). That is the End Tidal CO2 reading that will be shown on the capnometer.
2.	Lesson 3:	Content	Course Summary/Wrap-up 	Over a decade after capnography became widely available in the prehospital setting, it remains an underutilized and often underappreciated clinical tool. End tidal capnography can relay important information about the patient's ventilatory status, cardiac output, and perfusion. In the respiratory patient, it can provide important clues to help verify what's happening and what you should do next. But that takes practice. When you approach your next shortness-of-breath call, look to end tidal capnography as one of your very first assessment tools. With practice and the knowledge of what it can do for you and your patient, you'll be an expert with it in no time!

3.	Content	Content	References	Bahvani-Shankar, K., MD. (n.d.). Interpretation of Capnograms. Retrieved March 31, 2017, from http://www.capnography.com/find.htm Brandt, P. A., RN. BSN. (2010, November 29). Current Capnography Field Uses. Retrieved March 31, 2017, from http://www.jems.com/articles/2010/11/current-capnography-field-uses.html Brown, R. H., Brooker, A., Wise, R. A., Reynolds, C., Loccioni, C., Russo, A., & Risby, T. H. (2013). Forced expiratory capnography and chronic obstructive pulmonary disease (COPD). Journal of Breath Research, 7(1), 017108. doi:10.1088/1752-7155/7/1/017108 Grayson, K. (2016, November 12). Use capnography as a primary assessment tool for asthma and COPD exacerbation. Retrieved March 31, 2017, from https://www.ems1.com/ems-products/Capnography/articles/4227304 8-Use-capnography-as-a-primary-assessment-tool-for-asthma-and-COPD-exacerbation/ Page, B., NREMT-P. (2015, December 21). Use capnography as a primary assessment tool for asthma and COPD exacerbation. Retrieved March 31, 2017, from http://www.capnoacademy.com/2015/12/21/use-capnography-as-a-primary-

				assessment-tool-for-asthma-and-copd-exacerbation/ Sullivan, B. (2015, October 13). 5 things to know about capnography and respiratory distress. Retrieved March 31, 2017, from https://www.ems1.com/ems-products/medical-equipment/airway-management/articles/14933048-5-things-to-know-about-capnography-and-respiratory-distress/ Whampler, D., PhD. (2011, August 1). Capnography as a Clinical Tool. Retrieved March 31, 2017, from http://www.emsworld.com/article/10287447/capnography-as-a-clinical-tool
4.	Summary/ Wrap Up:	Segue to Assessment for Course Completion		You've arrived at the end of the course. Complete the following assessment to receive course completion credit.

1.	Assessment	(Multiple Choice / True or False)	**<u>ALS and BLS Questions are the same for this Medic Monthly</u>** 1. A 32 year-old male patient has a new onset of difficulty in breathing while playing in the park with his son. He is unable to relate his medical history but carries an Albuterol inhaler. You hear absent lung sounds in the bases and wheeze in the upper lobes. The capnography waveform shows a "shark fin"-type morphology that is narrow and tall. Based on these findings you suspect: (C) a. a mild exacerbation of emphysema b. a significant exacerbation of Asthma c. a pulmonary embolism d. carbon monoxide poisoning **Answer: B** 2. C.O.P.D. is a disease process characterized by: a. disruption of circulation to the cerebral vasculature b. disruption of circulation to the pulmonary vasculature c. progressive hardening and thickening of the lung tissue d. progressive hardening of the carotid arteries (B) **Answer: C** 3. C.O.P.D. patients often exhibit: a. bradycardia b. clear but unequal lung sounds c. a prolonged expiratory phase d. hypotension (B) **Answer: C**	

4. Capnography devices are, in essence:
a. heart monitors
b. gas meters
c. hemoglobin monitors
d. pressure meters (A)
Answer: B

5. Since placing a patient with bronchitis on capnography you have noticed that his waveform has gotten taller and his end tidal CO_2 has increased from 48 to 62. He appears tired. He is currently on an oxygen mask. The next most appropriate intervention would be: (C)
a. Solumedrol
b. C.P.A.P.
c. 500 ccs of normal saline
d. a nasopharyngeal airway
Answer: B

6. When evaluating a patient with a capnography cannula in place, if you wish to use a mask or CPAP, it is best to:
a. place the cannula over the mask near the exhaust port
b. switch the cannula to "under device" mode
c. remove the cannula and use the higher flow oxygen device
d. leave the cannula in place under the mask or device (C)
Answer: D

7. A "shark fin"-type morphology of the capnography waveform is usually indicative of:
a. upper airway obstruction
b. chronic obstructive pulmonary disease

c. congestive heart failure
d. diabetic ketoacidosis (A)
Answer: B

8. You notice your COPD patient's waveform is becoming progressively longer on the capnogram. This is indicative of:
a. a prolonged inspiratory phase
b. increased CO_2 levels
c. decreased CO_2 levels
d. a prolonged expiratory phase (B)
Answer: D

9. A capnography waveform that is growing taller and longer is often a sign of:
a. respiratory failure
b. cardiac arrest
c. pulmonary embolism
d. kussmaul respirations (A)
Answer: A

10. A capnogram that is both short and narrow is often an indication that the patient is:
a. hypoventilating or failing to breathe
b. obstructed with bronchoconstriction
c. choking with an upper airway obstruction
d. hyperventilating or working hard to breathe (A)
Answer: D