Hi. My name is Stephanie Tate. I am a registered nurse at University Medical Center in Lubbock, Texas. I presently work in the Emergency Center and today we are going to be talking about chest tube drainage systems.

In the emergency center that I work at it is a Level I Trauma Center and we deal a lot with chest tubes during traumas. This will be a one hour presentation and I hope that you learn a lot from this presentation today.

We are going to start with the anatomy of the chest then talk about physiology and the pathophysiology and clinical conditions that would require someone to have a chest tube. There are different types of chest tube drainage systems and we are going to be covering those today. We are also going to talk about thoracostomy which is the incision of a chest tube and talk about how a nurse would set up for one when assisting a physician. And finally how to remove a chest tube system.

Our objectives are understanding the physiology and pathophysiology related to conditions requiring a chest tube drainage system, to be a safe and effective nurse when caring for a patient with a high quality of care, recognizing signs and symptoms when a chest tube can be removed.

We are also going to talk about chest anatomy, the thorax, the mediastinum, and the lungs. We are first going to talk about the thorax. The thorax is located between the neck and the abdomen and the chest wall cavity. The thorax cavity protects the heart, the lungs, the great vessels, and other parts of the trachea, esophagus, and thymus gland. It also creates a vacuum system that expands the lungs during inspiration. The mediastinum is located from the front to the back and top to the bottom of the thoracic cavity. It is located in the center. It is flexible and contains the heart, the pericardium, the thymus gland, part of the trachea and esophagus, and a network of blood vessels and network of nerves.

We are also going to talk about lungs and lung cavities. The lungs are located in the thoracic cavity and the lungs suspend from the trachea into a substantial portion of the thoracic cavity. The left lung is longer than the right lung. It is smaller and more narrow. It is divided into two lobes, the upper and lower left lobes. As a nurse, the nurse or physician will document left upper lobe LUL, and left lower lobe LLL. The right lung is divided into three lobes; upper, middle, and lower lobe. It is the right upper lobe RUL, right middle lobe, RML, and right lower lobe, RLL. More about the lung. The lungs have a natural tendency to collapse and recoil. The lungs pull away from the chest wall and this results in a sub-atmospheric negative pressure. The negative pressure keeps the lungs expanded and allows the lungs to move in sync with the rib cage and diaphragm during inspiration.
Pathophysiology. If fluid, blood, or air enters the small space between the visceral pleura and parietal, the negative pressure is disrupted. The natural tendency of the lungs to recoil will take over and cause the lung to collapse. When the lungs collapse, fluids, blood, or air must be removed from the lung so that it can be fully expanded again. Fluid, blood, or air in the lung is never a good thing. It can cause shortness of breath, also known as SOB, and also it can cause pain. Your patient might present saying that they have a stabbing sharp pain during inspiration. Right now I have a visual for you to look at. This visual is of the lungs in a CAT scan. This patient has had a CAT scan and as you can see the white or the gray area is where the fluid is in the lung. This person might have blood or other kind of fluid in their lungs causing them to have the sharp pain during the inspiration.

This next slide talks about clinical conditions requiring chest drainage systems. Any type of external penetration of the chest wall resulting in surgical intervention or trauma, like a stab wound or gunshot wound, or anything that would cause penetration to the lungs would require a chest drainage system. Rupture of the surface of the lung would require a chest drainage system. It could be a rib fracture or anything else that is penetrating into the lung itself. Rib fractures, flail chest, pneumothorax, tension pneumothorax, and hemothorax are all going to be explained in the next couple of slides.

A rib fracture. There is also a visual here of your ribs that you can take a look at for just a second. These rib fractures usually result from blunt force or crush injuries. Many times in the ER that I work at you will see rib fractures associated with motor vehicle accidents or motor cycle crashes. Rib fractures are not typically considered life threatening but they can be associated with injuries to the lung, aortic arch, or vertebral column. These injuries may be considered life threatening. Rib fractures are less common in children than adults because children are very flexible rib cage. When someone presents to the ER with a rib fracture the nurse, physician, or person taking care of the patient should watch for tenderness on palpation of the area that is affected, possible crepitus as ribs rub against each other, hypoventilation, flinching secondary to pain. So if the patient walks in and they are holding that side, you know that side of their chest wall, that might be indication of a rib fracture or possible subcutaneous emphysema.

Flail chest. Flail chest is any kind of injury to the thorax that usually results from a serious crush injury or high-speed motor vehicle crash. In our ER that I work at we are a Level I Trauma Center and have all kinds of major crush injuries and high-speed accidents. We see this quite often. A flail chest occurs when two or more adjacent ribs are fractured in two or more places of the thorax itself, or the sternum. The sternum can also be detached when someone has a flail chest. It is a free floating chest wall that is drawn inward with inspiration and outward with expiration. So instead of just staying still when the patient breathes in and when the patient exhales, the thorax is going to move with the patient, which is not a good thing. It is very painful. This will result in impaired ventilation and pain. The patient will have an increased respiratory effort and rate and decreased tidal volumes, hypoxia, and an impaired cough. The nurse or patient looking for a person with flail chest needs to watch out for a paradoxical chest wall motion, cyanosis, diaphoresis, confusion, hypotension, hyperresonance on the injured site, and decreased or absent breath sounds on the affected side of the flail chest.
This is the pneumothorax. I have a visual here and you can see the area that is gray or white is where there is air in the lung cavity. A pneumothorax results when air enters the pleural space. This causes a loss of negative pressure which we talked about earlier as what you want in your lungs. So this means you can have one or both sides of your lungs collapse. This is caused from blunt or penetrating chest wall trauma. An open pneumothorax is called a sucking chest wound. Because trauma has caused the pleural face to be open to the atmosphere. Blunt trauma means it is caused from the motor vehicle crash. This usually has lead to lung or rib fracture. Air moves freely in and out of the pleural space and then through the hole in the chest wall. This is what causes the open pneumothorax and it causes a sucking sound. So if you hear a sucking sound when you are listening to the patient or just standing in the room, you will know that the patient has an open pneumothorax. An open pneumothorax can be caused from a gunshot wound or a stab wound or similar trauma to that area.

A tension pneumothorax occurs when perforating injury to the chest allows air into the pleural space on inspiration but does not allow air to escape on expiration. So it is trapped in the lung itself. This can be very fatal to the patient and needs immediate attention. As a nurse you need to watch for mediastinal shift, hypotension, and shock.

This slide is about a hemothorax. A hemothorax is accumulation of blood in the pleural space. As you will see on this chest x-ray you can see that you cannot even see one side of the lung because there is so much blood in that area that is causing damage to the patient. This will require a chest tube immediately. This most likely results from injury to the lung from penetrating or blunt trauma or injury to the chest wall and great vessels. Watch for signs of shock, decreased breath sounds on the injured side, dullness to the injured site on percussion, respiratory distress and possible mediastinal shift. Hemothorax is the blood that is in the lung and the blood can come from the lung itself or the chest wall area causing the patient to have decreased breath sounds on that injured side.

These are two other causes of a chest tube. This first one is cardiac tamponade. Blood pools into the mediastinal cavity and collects in the pericardium which externally compresses the heart. This is a lot like a tension pneumothorax. Cardiac tamponade sometimes will require one or two tubes in need to prevent blood accumulation in the mediastinal cavity. This allows blood to be drawn out of the chest wall once a chest tube drainage system is in place.

A pulmonary contusion is like a bruise. It is a bruise to the lung from blunt chest trauma. These symptoms usually do not develop until 12-48 hours after an injury occurs. So when the patient presents to the ER with pain in their lung area, in the chest wall area, you might consider pulmonary contusion. But since the symptoms do not develop until 12-48 hours after the injury a lot of times a pulmonary contusion is a suspicion of the physician and can be later diagnosed with a chest x-ray.

This is what you might need to know when assisting with a chest tube insertion. The physician will be the one to do the thoracostomy which is actually what it is called when you do a chest tube insertion. The physician will place the tube around the fifth intercostal space anterior to the mid axillary line on the affected side of the patient. This is most likely around the nipple line or under the arm of the patient. You need to make sure that you have suction ready to go,
that it is prepared and that it works so that once the chest tube is in place the physician will be able to hand you the tubing so that you can hook the patient up to suction and if there is any blood or fluid you can go ahead and remove that from the patient. You also need to make sure that you have the atrium or drainage system ready. You will see later in this presentation how to set up all of these systems. You also need to make sure that the skin is cleaned with some kind of antiseptic solution. You also might consider a local anesthetic if there is time for that. Also you need to make sure that you have dressing materials available so that when the physician inserts the chest tube you can secure it with a dressing.

The first type of chest tube drainage system is an old type of system. It is a reusable chest tube drainage system and was made up of one to three interconnected reusable glass bottles. These were used in the old days. And as you can see I have a picture available for you to see what they used to look like. But know since technology has gotten much better we now use one piece molded plastic units that are reusable, but most of the time we do use disposable chest tube drainage systems.

This is a disposable chest drainage system. This system right here that you can see in the picture is the one that we use here at University Medical Center. These type of disposable chest drainage systems were introduced in 1967 as a one piece three chamber system. Today’s systems are disposable, compact, and sterile. They are much safer than the traditional three bottle systems. As you can only imagine if we had a three bottle system how the glass could break and cause major trauma to other nurses as well.

There is a collection chamber that allows fluid to drain and volume can be measured accurately. So as you can see there are numbers that measure the fluid and the nurse can write on different times of how much is actually out and what time they were out. There is also a water filled chamber. This allows air to leave the patient and prevents air from entering the patient’s chest. There is also a suction chamber. This uses either a mechanical device or uses water to limit the level of suction.

This is about the water seal chamber. The water seal chamber is connected to the collection chamber. There is a fluid reservoir and it is filled with 2 cm of water. Notice that you will see a float-ball design at the top of the chamber with a pouch that allows fluid to pass through it. And a compartment above the ball that holds the water that fills the water filled chamber. Both wet and dry suction systems have this water seal chamber. This is the most important part of the chamber itself. And if the presence of continuous bubbling at the beginning continues throughout while the patient is hooked up to it, this confirms an air leak. The presence of a continuous bubbling system confirms an air leak.

This next part is about the suction control chamber for wet seal systems. This is a model of an old system that we used here at University Medical Center. We currently use a dry chamber, or dry atrium, but this is what our old one used to look like. The wet suction control chambers regulate suction pressure by water height in the suction control chamber. Amounts of negative pressure in a patient’s chest is determined by the height of the water in the chamber. Not the level of the vacuum set by the wall regulator. So that is a key point. You need to make sure that you remember that in a wet suction control chamber the amount of negative pressure in
the patient’s chest is determined by the height of water in the chamber and not by the level of the vacuum set by the wall regulator. The sound of bubbling in the wet unit provides feedback that the system is working properly. If you have air bubbling in the suction control chamber you have an air leak and you must assess the tubing and the system itself to make sure that you find the air leak. Sometimes there is a default in the tubing or sometimes there is a default in the atrium itself.

This slide is going to talk about suction control chambers for dry. At the hospital that I work at we currently use a dry suction control chamber. You can adjust the level of negative pressure with a screw-type valve. But now manufacturers use a calibrated, self-regulating mechanism to get the desired suction level. This allows the nurse or physician to adjust the dial so that it has more or less negative pressure. Typically you want to have about 20 cm of water suction. Which you will see later when I show you the atrium that we use, you will see how you can regulate the system. Also, you can set the wall suction to 80 mmHg or higher to remove accurate blood or fluid out of the lung.

The suction control dry chamber is a quieter system and is a little bit harder than the wet system to recognize if the system is working properly. But it is much easier to use, and like I said, you can adjust to less or more negative pressure which allows the physician and the patient to have a better outcome. You can also set the wall suction and this allows for you to have higher or lower amounts of suction.

This next slide, as you can see, is setting up. You need to make sure that you have a chest drainage system available, your chest tubes, and the thoracostomy tray all at the bedside for the physician to use. At our Level I Trauma Center these are two pictures of what our big trauma room looks like. If you want to take a few minutes to look around you can see that we have a chest tube tray on a silver pan and then we also have chest tubes up against the wall for different sizes. We have everything available at the bedside so that the physician, or if an emergency were to come up, or if we need another chest tube than just one, everything is there and ready to go. Make sure to always be prepared when setting up. Also, before you are doing the chest tube, if the patient is awake or not sedated, you need to make sure the patient understands the procedure. A consent does not need to be signed for a chest tube; well you might want to check with your hospital’s policy, but I know at our hospital we don’t necessarily need a consent. But you do need to let the patient know about what is going to happen, what they are going to feel like, and why we are doing the chest tube itself. If its going to be a while or you have time you might want to think about pre-medicating the patient or using a local anesthetic. Like I said earlier, during a trauma everything is very fast paced and you are trying to do something to make the patient better in an emergent situation that pre-medicating or a local anesthetic is normally not considered. But if they come in and you do have the time to do so, definitely think about it for being a patient advocate.

And this right now is what I am going to show you. I am going to go ahead and take the time to show you how to set up a chest tube drainage system, show you the supplies that we use, show you how to set up the suction, and what it will look like. You are now going to see how we would set up a chest tube drainage system. Like I said earlier, the hospital that I work at right now, we use the dry chest tube drainage system so that is what I have right here. These are the
things that you would need to have at the bedside. And like I showed you in the picture,
everything at the hospital that you are most likely going to work at in the trauma setting is going
to be at the bedside for you. If its not these are the things you would want to grab.

Most of the time you are going to have a Mayo stand, it’s a silver stand that your tray will
stay on. This right here is our cut-down tray and this right here has hemostats in it, sterile
scissors, any kind of sterile equipment that might be needed when physicians put in a chest tube
drainage system, or a thoracostomy. This is actually a thoracostomy tray and it has everything
that would be needed for the physician to use when doing that. Its got some sutures like Prolene
for the suture site and this is all sterile. When you are putting in a chest tube or thoracostomy you
will need to use sterile technique. As a nurse when setting up your chest tube drainage system
and setting it up to suction, you do not need to be sterile but any time that you are at the incision
site you should probably be sterile to decrease any kind of infection that can be caught by the
patient by not being sterile.

This right here, I will just kind of talk about the different things, and then I am actually
going to get the atrium out of its package and set it up to suction and show you what tidaling
looks like in the suction chamber. So we will go ahead and begin. This right here is going to be
your Betadine solution. This right here is going to be what you would use to clean the patient. A
lot of times in a trauma situation you will squirt the Betadine in your sponge, you would have
gloves on of course, and you are just going to pour it here like that and get it real wet, or you will
squirt it on the patient. Betadine does stain so be careful not to get it on your clothes. And then
you will hand this steriley to the physician so that they can clean the site that they are going to
do the thoracostomy. You also need to have a chest tube itself. These come in all different sizes.
They are in French sizes. This one right here is a 28 French catheter. Of course depending on the
patient’s size, their chest wall size, the patient’s age, is going to be on what size the physician
will use. The physician will be able to tell you what size they are going to need. In our ER room
we have tape on these and we tape them to the Mayo stand so that all the sizes are available for
the physician in the emergent situation.

Also, you make sure that you have the sterile gloves at the bedside for the physician to
put on. The physician, of course, will tell you what size gloves that you need to wear. This right
here is a size 7.5 and you would assist the physician in maybe putting their gloves on before
doing the Betadine solution on the patient. The next thing right here after showing them this, of
course, you would have your thoracostomy tray available. The thoracostomy tray comes with the
sutures so that when after the chest tube is in place they can suture it in place so that it does not
pull out easily and everything that is in here from hemostats to sterile scissors and everything
that any kind of instrument that the physician would need to use is in here and sterile for them.

After they make the incision site with their sterile procedure they will insert the chest
tube and this is when you as a nurse play a very, very important role. A scalpel is also used to
make the incision site, this is all something that needs to be placed at the bedside for the
physician to be able to make their incision site along with the sterile thoracostomy tray.

This right here again is a dry atrium. And I will just kind of walk you through how we
would open it, how we would set it up. Again you don’t have to be sterile for this. You can just
kind of open it up however which way you would want to. And a lot of time I know in our ER we get a lot of people that come in and that need chest tubes right away and EMS or your flight crew team, someone like that, will be able to tell you if they think the patient is going to need a chest tube and in that case you or someone else that is going to be helping you in your trauma can go ahead and get this set up and set up the suction before the patient even gets there so that takes a couple of seconds off after the chest tube is in place for the suction.

I want to go over a few things of the atrium real quick that I will probably talk about later in the presentation. This little blue clip right here is a clamp. You will see later in the presentation that you never want to ever use a clamp on a chest tube, it can cause danger to the patient, but, if you do need to use it you will see later in the presentation why you might need to use this clamp. We typically take it off and just set it at the bedside so that it doesn’t get confused with anything.

This comes with a lot of packaging that you will just take off to be able to get ready for the patient. A few things that I want to show you real quick. This is a little stand. You will see later in the presentation I will talk about how there is a little white stand. You can flip this out, it clips into place and it will stand up on its own on the floor. I prefer to use the little hooks that can hook onto the bed so that it doesn’t get knocked over or anything like that on the floor and these are great for when you are transferring the patient and you take them off of suction you can just hook this onto your bed and no one knocks it over or anything like that. So like I said you a lot of times they are going to come pre-filled with your water to go in your water chamber and just real quick. So this is your chamber itself. This is your atrium and this is of course a dry suction chest drain. This right here is your little dial and I said earlier its like negative 15 to negative 20 and you can just kind of move it just like this to whatever you desire. And whenever you move it you will see earlier that whenever I put the water in it will come up and down whenever I put the water in.

So I will go ahead and break the ball and whenever we put the water in the system if you know its good the water will turn blue. And it should go up to about 2 cm. Okay. So once it does that and you will see it turns blue, this is the little ball that I talked about, that I talked about earlier in the presentation so you will see that and it will fluctuate as the suction pressure fluctuates. Okay? And right here is where your measure and I talk about later about dating, timing, and initialing where your drainage is and your consistency and all that will be right here. You will be able to see per hour how much suction you have out. So what I will do is this right here is actually going to be what hooks up to the chest tube itself. These little holes, I don’t know if you can see these little holes right here. Okay, these are the eyelets that I talked about and that is what allows for your blood or fluid or air to leave the lung. Okay? And those are the little eyelets.

So your chest tube will actually hook up your tubing that is connected to your atrium will hook up to the tube itself and once that is done you will take your suction, and this is a portable suction that we have in our ER, but we are going to hook it up to right here and this is something you definitely want to check before hooking it up to your patient to make sure that your suction is working properly. We are going to turn on the suction and you will see right here that it is bubbling. Okay. That is not good right now. So if its hooked up to a patient its going to want to
do this and whenever the patient breathes and whenever they inhale and exhale it will kind of go up and down. It’s hard to do with me holding it but you will be able to see it will tidal up and down with the patient. And you will see as I move the dial how the ball goes up and down for your pressure. Up and down.

As you will see I am regulating my suction right here. Like I said it needs to be between negative 15 and negative 20 but it could be more depending on the physician. So you will just have to clarify it with the physician but if you don’t have an order it is safe to start off with negative 15 to negative 20. And this is your little dial right here. So this about it for when you have the chest tube hooked up to the patient. And of course this right here will be hooked up to your actual chest tube. A lot of times they have to cut this to fit the patient and it will be hooked up. And I am going to go ahead and turn my suction off as I continue to talk. Okay. So now that I just told you about how the physician would make sure that the sutures were in place and you would most likely be hooking the patient up to suction, your next job as a nurse will be to make sure that you have appropriately put the dressing on the site because you can’t just leave it open to air.

So what we use right now in our emergency room and I think emergency rooms all over the United States, is a petroleum based jelly dressing. And right now we typically use this petroleum gauze right here. It is very sticky and this really helps fill the patient’s chest. It really helps fill the incision and make sure that no air leaks in or nothing gets in there that is going to cause any type of infection to the patient. So what we typically do, the stuff comes in little pieces and we wrap it really, really tightly around the chest tube insertion site after the sutures. We try not to leave any kind of room for air to get in or anything that could cause a problem or infection for the patient. So this is what this one looks like and we also have this Duraform, it’s a nice yellow color, and it does the same thing, it is a petroleum dressing, petroleum based dressing, and you can also wrap this around the patient very tightly. After you get done wrapping your petroleum dressing you are going to need to make sure that you have some kind of tape. Right now in our ER we are using a Hypofix type dressing. This is great stuff. Its perforated so you can just kind of rip it and tear it when you need it and we typically just tear it into different sections and we get it ready because what we do is we put a little sponge after you have the petroleum dressing you are going to get out some sponges and you can use 4x4’s. Right now in our ER we make a little incision just right here and we can put it around the patient around the circle. You can also use any kind of there is also some sponge out there that comes like in more of like a circular form like this that you can just kind of wrap around the petroleum dressing itself. So just kind of whatever is what you use at your hospital. I don’t know if there is a policy or procedure out there but I am sure you will learn. But you definitely want to make sure that your petroleum dressing is on there padded by some gauze so that if it is bleeding or leaking or anything like that this will help soak that up. And then you want to make sure that it is taped securely with this Hypofix and when you do that you want to make sure that all four sides of the incision site are taped. And this you know to tape onto the patient you know four different ways and make sure it is good and on there and what we typically do is we grab a black sharpie or a pen and we date, time, and initial it so that if you are giving report to an ICU nurse or etc. they know exactly what time the dressing was changed at and anything like that. You also need to chart in your nurses notes if there is any problems with the site itself, if its bleeding or if its oozing or anything like that. And also if you are having to change a dressing out quite often you might want to make sure
that your chest tube is still in and that it is in the proper place and confirm it with a chest x-ray and that kind of thing and make sure that the physician taking care of the patient is aware of any kind of problems that could arise from the dressing site or the incision site itself.

I believe that this is the end of this part of the presentation. And we are going to continue on with the rest of the Power Point and start learning about how to care for the patient now that you know how to set up for the patient with the chest tube. Now we are going to learn how to care for a patient that requires a chest tube.

Okay. Now that we have gone through the steps of setting up for a chest tube drainage system, we are now going to move in to caring for the patient with a chest tube. Caring for a patient with a chest tube is not an easy task. There is a lot of assessment involved in making sure that the patient is comfortable and anytime that the patient is moved or assessed you need to make sure that everything is still intact. Because if the chest tube is pulled out of the patient or there is something wrong the nurse needs to know right away what is going on with that patient because it can be detrimental to the patient itself if it is not taken care of.

Immediately after the insertion the nurse needs to assess the insertion site location and tube size. And the nurse needs to assess every four hours while the chest tube is in place for drainage collection. You need to assess the drainage collection system for fluctuations in the air leak indicator, which we talked about earlier. You need to assess for air bubbles in the air leak indicator, and also make sure that suction is set at appropriate levels. Like I said earlier, most of the time suction is set at about 80 mmHg, but, for the doctor or physician they might recommend something different depending on the criteria that the patient meets. Also immediately after insertion the nurse every four hours should assess that the chest tube is in place. Also there needs to be assessed immediately after the removal of the chest tube. We will talk later about when a patient might be ready for the removal of a chest tube.

A nurse also needs to assess for the comfort level. The nurse needs to assess breath sounds, heart rate, blood pressure, and temperature. Because any vital sign that is out of normal limits can mean that there might be something wrong in the chest tube system itself. Also you need to be assessing for respiratory rate and rhythm and oxygen saturation. You need to assess the drainage for announced color, consistency, and you also need to address the dressing itself for any kind of occlusivness from drainage from the insertion site itself or that the chest wall at insertion site for subcutaneous emphysema. Any of these things could mean that there is something that is lodging the dressing. If there is something that is lodging the dressing you need to remove the dressing and reapply it. If this does not work you need to call the physician immediately.

Also when you are assessing the drainage system for the drainage itself for the amount and color and consistency, you need to mark the volume of the drainage. You need to date, time and initial on the atrium itself or however you are collecting the drainage.

You also need to when you are caring for a patient with a chest tube make sure that there is a chest x-ray obtained immediately after insertion and removal. Physicians know that they need to order a chest x-ray but I know at our hospital sometimes we are responsible for when
there is a trauma for making sure that orders are in place. So you need to make sure with any kind of procedure that the patient has that involves them like having a chest tube the chest x-ray is obtained so that they know that it is in proper placement.

You also need to verify that the patient knows potential complication. If they are dyspneic which means that they are having difficulty breathing or anything like that you need to make sure that the patient understands signs and symptoms that can cause them to not have the proper chest tube in place.

Also you need to assess for the position of the drain system. You need to make sure that the drain system is in an upright position and needs to be below the level of the heart. Again let me repeat that. It needs to be below the level of the heart at all times so that the blood does not back up into the lung itself and cause more problems. You can either sit it on the floor. Like our system which I showed you earlier has that little white piece that you can set up on the floor or it also has a hook that you can hook to the bedside itself.

You also need to make sure that you have emergency equipment at the patient’s bedside. This emergency equipment would include Vaseline gauze, more normal sterile 4x4’s, and anything like that for in case when moving the patient or if the patient is not sedated and they are being crazy and wanting to pull out all their tubes you need to make sure that that patient is either properly restrained or sedated so that they do not pull out their own chest tube but accidents do happen. So if these things occur you need to make sure that you are prepared as a nurse because it will fall back on you and you need to make sure that you are at the patient’s bedside when this happens and doing the right thing. Also if this stuff happens you need to make sure that the physician is called and immediately so that they can come in and assess the patient and either re-insert the tube or decide what they are going to do from there.

When you are caring for a patient with a chest tube you also need to make sure that you are repositioning the patient every two hours. Again, when you are repositioning the patient make sure that you are assessing for the placement and you are watching out for the drainage collection system itself so that it does not get knocked over or pulled out or anything like that.

Depending on your hospital policy you might want to think about changing your dressing daily or even more frequently. Of course if you can imagine the saturation that it will come and it will also become soiled around that area. Your dressing can become loose or anything like that so you just need to make sure that you are assessing the dressing. If I were you every time that you reposition the patient I would assess the drainage and make sure that there is not anything wrong with that area. And if there is and you are not able to fix it you definitely need to call the physician.

Also, you never ever, ever need to clamp a chest tube. Like I showed you earlier there is a clamp that comes with a chest tube. A lot of times we throw that away. There are a few times that you might need to clamp a chest tube and this would be when you are changing the chest tube system out if you are you know like we said we have the disposable drainage systems and if you are changing that out and if the patient has had a chest tube in for an excessive amount of time you might need to change the drain system out itself so you would need to clamp it. You
also if you are assessing for the location of an air leak you would maybe need to clamp it then and if you are assessing the patient’s tolerance of the chest tube removal. If the patient is doing better respiratory wise and the physician is wanting you to assess the patient might be able to have their chest tube removed you would maybe want to think about clamping. But remember, other than that, that clamp is no good and you really should just throw it away at the beginning.

This is caring for the site of the chest tube itself. The nurse needs to assess the chest tube insertion site. Check to make sure the dressing is dry and intact; it’s not soiled, it’s not saturated or anything like that. You also need to palpate around the dressing for subcutaneous emphysema. And subcutaneous emphysema is when air is actually escaping from the pleural space and its allowing air to enter into the tissue and it kind of feels like a crackling. If you palpate it, it kind of feels like a little crackling. Like you are crackling you are popping those little white bubbles that come in packaging. That’s what it kind of sounds like and the patient itself really doesn’t really know its there but you can feel it and if that is happening that means that there is a leak and that is not very good.

Like I said earlier you need to check your hospital policies for the dressing change. You also can check with the physician if he wants it every day or every four hours, what they want. You need to make sure that the patient is sedated or in restraints if risk for pulling the patient pulling out the tube. Like I said, accidents do happen but if your patient is not in the right state of mind you might want to talk to the physician about proper sedation or restraint or a family member at the bedside, someone like that to make sure that the chest tube is does not get pulled out and causes harm to the patient.

If there is an air leak noticed you need to like I said earlier cover the site with a sterile dressing and call a physician immediately and like I said earlier you probably also want to consider ordering a chest x-ray either whenever you call the physician to say hey do you think we should go ahead and order a chest x-ray or do you want to come and assess the patient and then order one. These are just things that you know could speed up the patient’s care.

This next slide is about the tubing. You need to as a nurse inspect tubing for any kind of kinks or leaks, compression or occlusion. A lot of times the patient can be laying on the tubing itself causing a kink. Sometimes it will get looped around the bed or I have seen it before where it gets under the wheel of the bed. You just need to be assessing for stuff like that. I mean things happen. You don’t know when they happen. You just need to make sure that the tubing is not in a loop or anything like that because if its blood it can actually clot up in there and then it will back up into the patient which would not be very good at all.

If the patient has to come off the chest tube drainage unit or chamber you need to assess the patient when they are returned when they return back. You need to make sure that there is no leaking, air leak or breathing or anything like that. You need to assess the patient when they go off the unit and when they come back. You also need to be careful when you are manipulating the chest tube they call it stripping or milking the chest tube because this can cause too much pressure and suck lung tissue into the tube itself. If you do have to manipulate the chest tube system by stripping or milking it to get clots out or to make sure that its not clogged up, you need to start with the patient at the site of the incision and work down into the chest tube drain. You
don’t want to start at the bottom and move back up because if you do that you will push what ever is at the bottom up into the patient. So you always want to work away from the patient itself.

This next slide talks about drainage fluid. You need to monitor the volume, the rate, the characteristics and color. Is it dark, is it light, is it thick, is it thin, you know, how much is it, and you know, if there you know going any more than lets say they started off having 50 and now they are having 100 obviously there is something wrong there. You need to address that issue. You also need to mark the level on the chamber itself and date, initial, and time it. Over 100 ml/hr of fluid post-op is considered excessive. If you have more than 100 an hour you are recommended to call your physician and talk to him about it and address any other kind of issues. If a trauma patient comes in and we usually expect a lot when we first if we expect like a hemothorax where there is blood in the lung, we expect a lot of blood to normally come out. But if you are having 200-300 ml/hr after a trauma this is considered excessive and surgical intervention is most likely going to happen for this patient.

This talks about the water seal. You need to make sure that your water seal is filled to the appropriate level. Like the system I showed you earlier. It comes with a pre-filled little syringe that you just pop in there and fills up the water. The level of water will actually move as the patient breathes and when this happens this is called tidaling. Tidaling will not occur if the tube is kinked or clamped, if the patient is lying on the tube or there is fluid filled in the loop that I was talking about earlier, if you have a loop and there is fluid in it the tidaling will not occur or it will not occur if there is any adhesions or lung tissue that is blocking the catheter eyelets. And the catheter eyelets are those little bitty holes that I showed you earlier in a part of the chest tube itself.

Also if there is no air is leaking into the pleural space and the lung has re-expanded you might want to consider removal of the chest tube. This water seal chamber is very important and you really need to remember about the tidaling and when it will not occur and stuff like that. And tidaling will occur during inspiration and expiration.

This is about suction. This picture right here is from our trauma room. And I will give you a few seconds to kind of look at that. This suction we usually have two wall units in the front and then two wall units on the back of these canisters. You will hook like I said to you earlier you will hook it up to the chest tube drainage system itself and this is disposable so you can dispose of this as you need to. The suction connection should be rechecked routinely. You need to make sure that they are suctioning properly and you can on ours at our hospital you can regulate on the wall like I said earlier about 80 mmHg. The suction level is normally about negative 15 to negative 20 centimeters of water for adults in the actual chamber itself and I showed you have to regulate that earlier in the presentation.

Disconnecting the chest drainage unit. Disconnecting is not discontinuing. Disconnecting is whenever the patient is being transported to another unit or you know they are going from the ER to the ICU or the ICU to the floor or they are going for a CAT scan or radiology or any kind of procedure that is off of your unit or out of their room. You need to make sure that the chamber is disconnected. You also would maybe disconnect the chest drainage system it its full like if its
disposable and you are going to dispose of it and get a new one. If the unit is cracked or broken or if the patient’s condition has healed. When you would disconnect the chest drainage unit you are going to clamp the suction tubing and discontinue the chest drain and make sure it is discontinued from suction.

This next slide talks about removing the chest tube. Of course you are going to have to have a physician’s order to remove a chest tube of a patient. Like I said earlier if their respiratory rate has gotten better, if their breathing efforts have gotten better and you notice this as a nurse and you might want to mention that drainage has gone to little or nothing you might want to go ahead and initiate to the physician that you think that the patient might be ready for the chest tube to be removed. If the patient is breathing normally with no signs of respiratory distress you could mention this. If breath sounds are equal and bilateral on both sides of the chest and if the respiratory rate is at baseline for the patient. Things to consider sometimes are you know COPD or ARDS or something like that. You need to make sure that their breath sounds are right for the patient. You would need to obtain a chest x-ray that would show the lungs that the lungs are re-expanded, there is no residual air or fluid in the pleural space anymore, that the lungs have re-expanded and gone back to normal for that patient. If there was an air leak, there is no air leak any longer so the air leak is gone and the lungs have re-expanded. And also when the water filled chamber water fluctuations have stopped, when the tidalizing has not been as great as it was, this would be a time to initiate the physician to maybe remove the chest tube.

This is just a little slide of our auto-transfusion. We don’t do this that much in our ER because our blood bank gets to us so quickly. We are able to cross match blood and stuff like that very, very quickly in our Level I Trauma Center but in the case that you are unable, lets say there is a shortage of blood or something like that, you can reinfuse the patient’s own blood to themselves and this can be done through the chest tube drainage system. Who might need it? Someone who is bleeding very heavily either post-operatively or pre-operatively, or it’s a trauma related injury and you are unable to get blood or the blood bank is taking too long. You can give the patient back their own blood that is in their drainage system and put it back into their venous system through an IV. This is used as an alternate to the blood bank because blood is readily available and does not need to be cross matched because it is the patient’s and it is easy to collect. One of the things you might want to consider when doing auto-transfusion is to make sure you understand and the physician understands the hospital policies that concern auto-transfusion. You also need to make sure you know the procedures and protocol when handling blood. And you need to make sure you follow the manufacturers instructions for use on the equipment because every hospital is going to have different equipment, different atriums, different equipment and stuff like that so you just need to make sure that you understand your hospital’s equipment for auto-transfusion.

We are coming up to the end of my presentation. These are just a few key points that I just want to go over and make sure that you understand them. I really hope that you have learned a lot from this presentation and that you can now feel comfortable going out on your unit or wherever you work and assisting a physician with a chest tube and also caring for a patient with a chest tube.
So, key points. You need to make sure that you know that negative pressure keeps the lungs expanded and allows the lungs to move in sync with the rib cage and diaphragm during inspiration. You need to make sure that you remember that rib fractures are not considered life threatening but they can be associated with injuries to the lung, aortic arch, or vertebral column that can lead to life threatening events. An open pneumothorax is called a sucking chest wound and like I said before you will hear actually a sucking sound when you are in the room with a patient. A chest tube inserted in the fifth intercostal space anterior to the mid axillary line on the affected side, so around about the nipple line. Also the collection chamber allows fluid to drain and volume to measured accurately. Very important chamber. And the water filled chamber allows air to leave the patient and prevents air from entering the patient’s chest. The suction chamber is used either with a mechanical device or water to control the line and the level of the suction. Both wet and dry suction systems have a water seal chamber and the water seal chamber is the most important chamber out of the three chambers. Also suction level is normally between negative 15 to negative 20 centimeters of water for an adult. And the last thing is that auto-transfusion is the reinfusion of the patient’s own blood.

Now that we have come to the end of my presentation, I hope that you have learned a lot and feel comfortable with chest tube drainage systems, caring for a patient with a chest tube drainage system, and when to ask a physician permission for removal of a chest tube drainage system. I appreciate your time. I know it has been a long hour but again my name is Stephanie Tate and I am an emergency room nurse at University Medical Center in Lubbock, Texas. Good-bye.

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