[introduction music]

Dr. Schwartzstein: This again is one of our simulation sessions, it's similar to the other ones that we've done. Again this is going to be in large part focusing on review of materials that you've already seen and applying the knowledge and working through an unknown case and again we'll use the people not actively involved in the simulation as consultants, so if you guys need some help call on your colleagues to do that. Do you have anything else you want to introduce about the scenario?

Jeff: Yes, so I just want Matt to introduce himself, simulation fellow, so just give him a second.

Matt: Hey guys, my name is Matt Defrancesco I am a hospitalist over at the Bringham doing some work over at the STRATUS center, the same center here so I might come and talk to you guys, and I'll be helping out with some of the technical aspects. When the case is over, we'll start discussing together.

Student 2: Awesome.

Jeff: Does anybody have anything they'd like to air out before the simulation, so that we're going to do it right the fourth time around? No, you feel good?

Student 2: We'd like to take a second to assign roles.

Jeff: Okay, we'll flip it.

[laughter]

Student 2: So, Matt you're good with the board? Okay, and do you think that you could get all the information or do you think we should have two people at the board, like one with history and one's with-- one's enough okay.

Student 4: [inaudible 00:01:37]

Student 2: Okay, great.

Student 3: I can keep my on the vitals so thats [unintelligible] .

Student 2: Okay.

Student 3: Someone's family members in case they come?

Student 2: I think communication with family members and the patient, and you both are really good at that. You did a really good job last time, so one of you wants to take lead on it, you both can.

Student 4: We can take history together, or everyone can too.

Student 3: We should have one person just do the-- Make the decisions -run through with the-

Student 2: History

Student 3: -history

Student 2: Maybe one of you be more--Do you want me to do it?

Student 3: Doesn't matter.

Student 5: Okay, so I can do family members if there is one and just simply **[unintelligible 00:02:12]** .

Student 2: Yes, and telling the patient what's happening, I can try to lead the taking the history like right when they get in.

Dr. Schwartzstein: Must be a really complicated play **[unintelligible 00:02:22]**

[laughter]

Student 5: Wait, what am I working on? What's my role?

Student 3: Explaining to the patient when we're making decisons.

[crosstalk]

Student 3: Should one of us do that?

Student 2: Yes, we're also all meant to be like. [crosstalk]

Student 5: Let's do it team [laughs]

Student 4: What about who should make the decisions, we're all going to talk about it but one person should [crosstalk]

Student 3: I'll call it okay?

Jeff: [unintelligible 00:02:49] here **[unintelligible 00:02:52]** my friend I just met?

[laughter]

All: Yes.

Jeff: This is Mr. Jones, he just came in. He's 17 years old, he has a history of mild, persistent asthma and the ambulance brought him in from school after he got really short of breath at Phys Ed. class. He said he was playing basketball and he noted that he got progressively worse. Shortness of breath was getting more uncomfortable, and he got dizzy and he told his teacher and they sent him to the nurse, and she didn't feel comfortable, so they put him in the ambulance and sent him here. He said that he had a recent upper respiratory infection. He had cough, runny nose, sore throat the last two days. He did bring his inhaler with him to school today so anyway he's doing okay he's just a little uncomfortable. Feel free to ask him anything.

Student 2: Hi sir how are you doing?

Mr. Jones: Not that well.

Student 2: Okay, could you tell us a little bit of what you're feeling right now?

Mr. Jones: It's so hard to breathe.

Student 2: Hard to breathe, okay.

Mr. Jones: Yes, yes, yes.

Student 3: We should give albuterol maybe?

Student 4: Can we get oxygen first of all?

Jeff: Sure oxygen, yep.

Student 2: Okay, have you ever had this feeling before?

Mr. Jones: Yes, but [muffles] not quite like this.

Student 2: What have you felt prior to this?

Mr. Jones: I don't even know, I was fine a couple of days ago.

Student 2: You were fine a couple of days ago, so we have in your history that you have a history of asthma. Does your asthma usually feel like this or does it usually feel different?

Mr. Jones: Kind of like this, kind of like this, but not this bad. [cough]

Jeff: I'm going to put some oxygen on you okay?

Mr. Jones: Okay, groans .

Student 3: Kendall they mentioned that he forgot his albuterol--his inhaler, maybe ask him if that's what he needs right now.

Student 2: So when you normally have your asthma exacerbations do you take anything for it?

Mr. Jones: Yes, inhalers.

Student 2: You do take your inhalers and you haven't had your inhalers today?

Mr. Jones: No, not today but the past couple of days I have.

Student 2: Does it usually help you when you take it?

Mr. Jones: Yes, yes. Why am I so short of breath?

Student 2: We're going to try to figure it out, as much as you can just try to stay calm. We've got a good team working on this for you and we'll update you as soon as we have any other information. Okay?

Mr. Jones: Okay, okay.

Student 3: [whisper] What does he usualy take for inhalers?

Student 2: What do you usually take for inhalers?

Mr. Jones: I don't even know.

Student 2: Well do you know what it looks like?

Mr. Jones: It's red.

Student 2: Red. Okay, and do you have any other past medical history, so you have asthma are there any other chronic illnesses that you have or surgeries you've had in recent years?

Mr. Jones: I had my tonsils taken out years ago.

Student 2: Years ago, okay. Any allergies?

Mr. Jones: No, no.

Student 2: Okay, and are you experiencing any other symptoms in addition to the shortness of breath?

Mr. Jones: I can't even really think about anything else, what do you mean?

Student 2: Are you feeling any chest tightness, any muscle weakness?

Mr. Jones: I don't know about weakness I have a, I'm in bed .

Student 2: Okay.

Student 3: Can you ask if he wants us to call anybody. Family might be helpful-

Student 2: Yes-

Student 3: -because he's--

Student 2: - is there anyone you'd like us to call. Any family or friends that you'd like to have here with you?

Mr. Jones: Having my parents would be great.

Student 2: Okay great, we can give your parents a call.

Student 3: Someone call the parents.

Jeff: Sure I'll get the contact info for you and maybe one of you can reach out.

Student 2: Okay thank you. You mentioned that you had an upper respiratory tract illness to our nurse earlier, could you expand on that a little bit?

Mr. Jones: My throat was so scratchy [crosstalk], uh my nose was a bit runny, but that was about it.

Student 4: You think we should give him a bronchodilator?

Student 2: Yes, I'm okay with that.

Student 4: Nurse, can we give him a bronchodilator?

Jeff: A bronchodilator? Did you have one in mind?

Student 4: Red was maybe the albuterol.

Student 2: What's his heart rate at?

Student 4: His heart rate is 117

Jeff: Sorry how do you want me to give the albuterol?

Student 4: Inhale right--

Jeff: Okay, I'll grab an inhaler. Not sure if he's going to be able to do the inhaler.

Mr. Jones: Absolutely.

Student 2: albuterol that sounds right?

Mr. Jones: Familiar.

Student 2: Do you know if you heard wheezes on the physical?

Student 1: I didn't do a physical exam.

Student 4: Should we do a physical and see if we hear wheezes?

Student 2: Yes, sure.

Jeff: Mr. Jones-

Student 2: I wanted to ask a little bit.

Jeff: -If i give you an inhaler are you going to be able to do that?

Mr. Jones: I don't-I don't think so. I can barely talk.

Student 4: Can we order a chest X-ray as well?

Jeff: Yes, we can get a chest X-ray ordered. Do you want to give the albuterol some other way, I don't think he can do the inhaler?

Student 2: Aerosol can you--

Jeff: Like a nebuli?

Everyone: Yes.

[laughter]

Jeff: Okay, I'll go get the nebuli.

Student 3: We're just going to hold you very quickly sir.

Student 2: Right now we're just listening to your lungs, definitely wheezes.

Student 5: How are you feeling?

Mr. Jones: I mean, look at me .

[laughter]

Student 1: [unintelligible 00:07:57] the lower your lung.

Student 2: So wheezes on the--

Student 1: It's all throughout

Student 2: Throughout, okay.

Student 4: Any crackles?

Student 1: No crackles.

Student 2: We're going to put you on albuterol nebulizer which will open up your airways hopefully and that will hopefully help to start getting you breathing, okay?

Mr. Jones: Okay.

Jeff: I'll put the nebulizer up right into your mask okay?

Student 2: Okay. Can he speak while he's on the nebulizer no?

Jeff: That's a little bit hard, I may have to take the mask out.

Student 5: [unintelligible 00:09:00]

[laughter]

Student 2: No it's okay, you can finish the treatment. While he's doing this do you guys just want to just quickly debrief? We're just going to go talk about what's going on for a second we'll be right back okay?

Jeff: Okay.

Student 2: We have an EKG.

Dr. Schwartzstein: [unintelligible 00:09:15]

Student 2: Is there anything else we want to order?

Student 5: We ordered a chest X-ray EKG.

Student 3: He can get a chest X-ray. He had an upper respiratory infection so we can get a blood count with differential just to see what's happening there.

Student 5: It's already out there.

[laughter]

Student 2: Do you think we need an EBG?

Student 3: Yes we should give a blood test.

Student 4: Did we get like a list of the physical exam of kind of any abdomen pain, anything like that. Sometimes they'll give that to us, the nurse will if we need it **[unintelligible 00:09:53]** [crosstalk]

Student 2: With his vitals what are we thinking? [crosstalk]

Jeff: We order an X-ray and we have it back.

All: Thank you.

Student 4: Respiratory **[unintelligible 00:10:06]** .

Student 3: [unintelligible 00:10:06] sets up.

Student 5: Chest X-ray we see.

Student 2: I'm just going to check back in with the patient to see **[unintelligible 00:10:16]**

Student 5: Just to summarize we want.

Student 3: Hi, I just wanted to check back in and see how you're doing, I know you're still on the nebulizer, if you could just give me a thumbs up or thumbs down for better or worse?

Mr. Jones: A little better.

Student 2: Okay. I'm glad to hear that, we're still going to keep working to try to make you even more comfortable. Okay?

Mr. Jones: I hope so.

Student 3: Pre-ordered tests?

Jeff: We're going to get the labs down on you and we're going to have to do an arterial blood gas. I'm going to have one of the doctors explain that to you.

[laughter]

[background conversation]

Mr. Jones: Where did that medication go?

Student 5: Hi, sir. We're just going to take a little bit of blood and just check some lab values. We're going to check and make sure that you still don't have an infection, like you were talking about you've been coughing the last few days so we want to make sure that there's no infection in your blood and we're also just going to check and make sure that you have enough oxygen. Right now, to us, it looks like things are getting a little bit better, but we want to make sure we figure everything out. Is that okay with you?

Mr. Jones: You were getting better, but I don't know about now.

Student 2: Okay. Well, we're going to try to figure this out together.

Student 3: We won't get those results.

Jeff: I'm going to pull off the labs so everyone can see but I don't know if you want to read the X-ray first?

Student 3: We thought that there was some lymphadenopathy which might be due to the previous ERI, and wanted to see the CBC, to see if we should do a culture.

Student 4: It was white **[unintelligible 00:12:23]** I think it may have to do with the infections still partially

Student 2: It's not very ellevated though.

Student 4: A little bit. When was the infection did, he say?

Student 2: Let me clarify. Hi, sir. I just wanted to clarify a little bit about the infection that you were speaking about earlier, how long ago was that?

Mr. Jones: Couple of days.

Student 2: A couple of days ago?

Mr. Jones: Yes.

Student 2: Okay. Are you still experiencing any of the symptoms?

Mr. Jones: Yes.

Student 2: From the illness the same sore throat, all of that?

Mr. Jones: Yes.

Student 2: Okay, so you mentioned a sore throat. Is there anything else?

Mr. Jones: Just my breathing now is terrible.

Student 2: What about before with the initial infection?

Mr. Jones: I don't even know, there was like a cold I guess.

Student 5: Do you have a cough at all?

Mr. Jones: Yes.

Student 4: Did you have a fever?

Mr. Jones: I don't know.

Student 2: Were you producing any mucus , like when you coughed, was anything coming up?

Mr. Jones: Not really.

Student 2: No. It was more of dry cough?

Mr. Jones: Yes.

Jeff: I have the patient's mom on the line, do you want to talk with her?

Student 2: That'd be great.

"Mother": Hi. I'm Kevin' s mom. What's going on?

Mr. Jones: Mom.

Student 4: Hi, Kevin 's mom. We have your son here, we're doing everything that we can to-

"Mother": What's going on? Is he okay? What happened, why is he in hospital?

Student 4: We aren't exactly sure, and we think it has something to do with his asthma. We've ordered a lot of labs. Did you want to try to talk to your mom?

Mr. Jones: I don't know if I can. Hi?

"Mother": How is he doing?

Student 3: He's very short of breath right now, I think it would help if you were able to come.

"Mother": Did you use the inhaler?

Student 4: We gave him a similar medication to it and it seemed to be helping a little bit but he's still very short of breath. If you could come that will be really helpful.

"Mother": If his inhaler is not helping, then what is it?

Student 5: We're still not sure if he's having some infection or if he's having a flare-up of his asthma. Do you happen to know what medication he usually takes?

"Mother": He usually has albuterol.

Student 5: He usually takes the albuterol, okay, great. We gave him a little bit albuterol and it helped a little bit but he's still not feeling great so if you could come down here, we think that would be great for him to have a little bit support right now?

"Mother": Okay, I'm on my way.

Student 5: Great. Thank you so much.

Student 4: [whisper] I was going to ask about the infection issue, if she knows something.

Student 4: Hey, Mom. One more question, do you know anything about his recent infection?

"Mother": Infection? He had some, like a cold.

Student 4: Okay. We'll see you soon. Thank you.

[background conversation]

Mr. Jones: [groans] It just got so much worse.

Student 4: It got a lot worse? You're breathing?

Mr. Jones: It's so much worse.

Student 4: Okay.

Student 5: What does it feel like now? Is it feeling the same or?

Mr. Jones: Oh, my right-side hurts.

Student 5: Your right-side hurts? Do you mind showing us where exactly it hurts?

Mr. Jones: I would love to but...

[laughter]

Student 4: Is it the right side of your chest or the right side of your body?

Mr. Jones: Yes.

Student 4: Upper chest, where in your chest?

Mr. Jones: Up there.

Student 4: Right here?

Mr. Jones: Yes.

Student 4: Okay and is it a tightness or is it more of a pain?

Mr. Jones: I don't even know.

Student 4: Okay.

Mr. Jones: Which wasn't there before.

Student 2: Do we want to give him another nebulizer treatment?

Student 4: Guys, maybe we didn't see-

[crosstalk]

Student 2: [unintelligible 00:15:59] controler medications for asthma.

Student 5: Should we read you the chest x-rays?

Student 3: We could also call a respiratory consult.

Jeff: You guys, his oxygen saturation is dropping a little bit, I don't know if there's anything new that you want me to do?

Student 5: Can we listen again to the chest right here and if that's changed?

Student 4: Can we also give him a new X-ray?

Jeff: A new chest X-ray? Okay I'll work on that later.

Student 4: It's a like sudden right pain.

[crosstalk]

Student 1: Kevin, I'm just going to lift you up again for the listening to your **[unintelligible 00:16:27]** .

[crosstalk]

Mr. Jones: Where I'm I?

[crosstalk]

Student 2: Hi Kevin , are you aware of-- do you know where you are?

Mr. Jones: I don't know, the doctor’s office?

Student 2: Okay. You're at the hospital and we're taking care of you, just try to stay with us. You still feel that pain?

Mr. Jones: Yes.

Student 2: We are going to listen to your lungs again. We're just going to lift you up so that we can do so.

Student 3: Blood pressure drops significantly.

Student 4: I can hear the wheezes.

Student 3: Similar at the front.

Jeff: Do you hear anything on that right side?

[background noise]

Student 3: It doesn't sound as loud on the right side as it does on the left side [crosstalk]

Student 1: His blood pressure is dropping a lot, we should start on the left side

Student 3: Other than that I can't [unintelligible] .

If I can take a listen to the heartbeat.

[background conversation]

Jeff: The first chest x ray?

Student 4: Second. Is there a second one?

Jeff: We haven't rolled them down yet, but we can, we're about to. We're rolling down right now. Okay. We can get it up here as soon as they do it so should take a second.

Did you hear something on the exam?

Student 3: All I heard--you want to try to take a look here just incase on the right side. It wasn't as loud as the left side, the left side you can hear it.

[crosstalk]

Student 2: Okay. You're pretty sure though, that's all.

Student 3: Yes, but we should take another listen just the **[unintelligible 00:18:10]** .

Student 4: Do you want to lift him?

Student 3: Yes **[unintelligible 00:18:13]** One, two, three.

Student 5: Flaps.

Jeff: I'm a little worried about his blood pressure is seems a bit lower down.

[crosstalk]

Student 3: Could we start him on IV fluids?

Jeff: IV fluids? Yes, sure. I'll hang that now.

[background noise]

Okay the fluids are running in.

[background conversation]

Student 4: Yes, because you don't see the **[unintelligible 00:18:42]** .

Student 5: No, you don't see any markings on the right side, you can see the edge of where the-

[crosstalk]

Student 2: Do we want to call a pulm counsel?

Student 3: Yes.

Student 2: Could we call pulmonary counsel?

Jeff: Yes, sure.

Student 2: Do we want to give him like morphine or even a pain ?

Student 3: I think so.

Student 2: Can we?

Student 4: Hello, sir. How are you doing? Are you with us?

Mr. Jones: You tell me.

Student 4: Do you know where you are?

Mr. Jones: Not really, who are you, where's my mom?

Student 4: I'm one of your doctors and your mom will be here, she is on her way.

Student 2: Is that blood pressure right?

Student 3: We gave fluids.

Student 4: We gave fluids.

Student 2: That makes sense.

Student 4: I think because he's getting delirious, I think we should give him something for the pain?

Student 6: Pulmonary consult, you guys called us?

Student 2: Hi. We have a 17-year-old male patient currently who came in with what looks like an asthma exacerbation following an upper respiratory illness and sports practice at school. It looks like he's now developed a pneumothorax and we wanted to check with you to see what you would advise in moving forward?

Student 6: [inaudible 00:20:01]

Student 2: Yes

Student 6: Have you given him oxygen?

Student 2: He has been on oxygen since he got here.

Student 6: Okay what do you think we should do for the pnuemothorax ?

Student 2: His blood pressure was dropping, we put him on IV fluids and gave him an albuterol nebulizer. He now has this sudden chest pain. I don't know if we need to drain.

Student 4: If it's a tension pnuemothorax, don't we want to try get some of that air out?

Student 2: Is that what you would recommend?

Student 6: Yeah?.

Student 2: pulmonary consult?

[laughter]

[crosstalk]

Student 2: In the meantime, is there anything else that you would recommend? Pulmonary team?

Student 6: Let me talk a little bit more with my team.

Student 4: Ask about pain medication.

[background conversations]

Student 3: It's going down again. It's the tension I think **[unintelligible 00:21:09]**

Student 3: Kendall, did you ask about pain meds?

Student 2: Okay, so I'm comfortable with that if we want to drain it.

Student 1: Yes , me too.

Jeff: I think we need to do something right now, his oxygen is 82.

Student 2: We are going to drain the air out.

Jeff: The test tube is going to take a little bit to go get the kit and everything. Is there anything you want to do like now? I feel like the oxygen is going down, I'm getting a little worried about him.

Student 2: Is he still on oxygen?

Jeff: Yes.

Student 2: As well as IV fluids?

Jeff: Yes.

Student 5: Is there with the increase the oxygen ?

Student 1: You want to increase the oxygen? Do you want him on a different mask or something [crosstalk] do you want?

Student 5: What is he on right now?

Jeff: Well, it's hard to know he's on a mask [crosstalk] . We can turn all the way up to high flow.

Student 5: Could we do that? can try another way out, probably high flow. [crosstalk]

Student 2: We need to like decrease his system **[unintelligible 00:22:18]** . That's probably already happening. I mean increase the system **[unintelligible 00:22:21]** .

Student 3: At what point you have to-

Student 2: His blood pressure is 100 over 49

Dr. Schwartzstein: There is another way to get the air out besides a chest tube

Student 3: Can we do thoracentesis.

Student 2: That's when you pull **[unintelligible 00:22:37]** . You have to go-

Dr. Schwartzstein: Right above the rib.

Student 4: Right above the rib.

Dr. Schwartzstein: Yes.

Dr. Schwartzstein: Where is the **[unintelligible 00:22:46]** . [crosstalk]

Student 2: It's the front.

Student 3: Could we do thoracentesis on the front or off the hook, a needle thoracentesis?

Jeff: Just a needle? Okay let me sit him up a little bit so the air can go up. You want to put a needle in?

Student 3: Can we just talk to him for just for a second?

Student 4: Okay, hello, sir. Your mom isn't here yet, but we think we know what is going on. We think that you have some air in your lung, which is making it really painful when you breathe so we're going to try to take out some of that air.

Student 2: We're going to place a small needle just above one of your ribs, and we're going to take some of the air out and we really think that, that's going to help you a lot. Does that sound okay to you?

Mr. Jones: I mean no but-

Student 2: We really think it's going to help you on, and we got to do it sooner rather than later, but we want to make sure that you're okay with the procedure. Do we have the green light?

Mr. Jones: Yes

Jeff: All right, good job guys.

[applause] .

Student 2: That was shorter

Student 5: Yes, I thought there was so much to come.

Student 4: Good job team. This is after **[unintelligible 00:24:20]**

Matt: Okay, so first off that was great. You guys did a great job back there . He was a little challenging with his history, but kind of went along with his shortness of breath. The first thing to kick things off is to ask those of you that were managing the case how that felt and what are your reflections and some of your questions just in the first couple of minutes .

[background conversations]

Jeff: Kay leave your mic on, but I'll take your stethoscope.

Student 5: One things I was thinking about through the whole thing was that even treated the pneumothorax, it didn't seem we had very well managed his asthma that caused it. and what else we should have done for that? I still wasn't very clear about. Does anyone else have thoughts? **[inaudible 00:05:26]** .

Matt: Even just emotional reflections of how a doctor would take care of a patient like that.

Student 2: I think it's particularly with a younger patient that didn't have a parent with him, I think that one of the big things is that I get really caught up in the case, so I'll t hink oh, we haven't checked back in or we haven't reached out to his mom so I think that was good when we did that and then also just realizing how hard it is to talk to a parent, because you want to be open and honest with them but also don't want to absolutely terrify them, striking a balance of saying he's fine but this is what's going on was more difficult than I expected.

Student 4: I think it was actually just a little bit kind of scary for me, especially not knowing a full kind of direct history and this patient not really being able to convey what medications has he taken prior and read as the medication getting that, and so wanting to help but being so nervous that you could give something wrong with

either your immediate reactions of like, oh, I think you need albuterol but then not knowing is that actually what you normally take and so want this push and pull, and then trying to be patient and calm so that you'd make the right moves with your team.

Student 5: I think for me, maybe for most of us, this time I felt we moved faster than the last simulation I was a part of at least. we were making decisions a lot faster. Making those decisions was a lot harder internally for me because I kept wondering what the complications would be, even though they might be secondary to fixing the problem. I kept worrying about the complications.

Tina said from the get do let's give them oxygen and I thought what else could happen if we give them oxygen, right, and then we talked about corticosteroids, and we realized he might be sick and maybe let's not do that and it'll be long term anyways so it might not be as beneficial so it was kind of hard to battle, the pros and the cons between the medications and everything we did.

Student 6: On the other hand we had some issues with informed consent too and we we're trying to explain the procedure but the patient still seems a little bit confused, and was obviously not fully healthy, mentally aware state of mind, so getting that consent for that procedure, seemed really difficult.

Student 3: I agree and it's always sort of difficult when you get new information on the fly and keep up with what you know, and try to make a decision even though you know that some things are going to go wrong based on what your decision is, but to still try to manage whatever you see is happening. It's pretty difficult to do.

Matt: Awesome, great reflections, so a lot of stuff about **[unintelligible 00:28:33]** younger patients, interacting with family members and kind of emergency scenarios, informed consent, and some questions about the therapies that you are giving and whether they lined up with home medications, and then whether or not that even matters in that line so we can probably touch on all that stuff. Before we do that, would anybody in the room be willing to summarize their case, the medical facts of the case and maybe a sentence or two? If you had to describe to someone who wasn't in this room today what the case was about, what would you say, or if you were calling a consultant?

Student 7: [unintelligible 00:29:08] 17 year old boy arrives, he was sick at PE . He arrived with shortness of breath at the ER and it's getting worse so they put him on 02 and then started on albuterol and continuous x rays found **[unintelligible 00:29:33]** thorax at which point they relieved the pressure.

Matt: Great, so some severe asthma exaserbation in a young male leding to tension in the thorax, excellent.

Dr. Schwartzstein: That's a great job you guys.

[applause]

The other tricky part of--for this typically for you guys right now is what I would call cognitive overload so you're focusing on some very particular things. Not allways able to integrate what's happening on the monitor at the same time, which is your

physical exam or your history and data coming in. There is a lot of stuff to be juggling relatively simultaneously, and that will come with more experience but there is the sense, and of course if you have a team, you might say to one person, "Keep an eye on the monitor for me."

One person will be making sure we're getting the history as described and recording things. We're using your team effectively in periods where there is cognitive overload, is really a big deal. During cardiac arrest sometimes, as the attending I come in and my job is I actually feel for a pulse the entire time so I know whether CPR is effective, I know when the pulse has come back, while there's all this other stuff going on. Allocating job responsibilities to members of the team can be a way to deal with that information overload and to have people focusing on different aspects of it.

Let's start with the history because I think you were troubled a little bit by the history. Why did the history matter here? What were we really after? I'm opening this up to the whole group now. What are you worried about with the asthmatics or otherwise healthy, what about the history of his asthma, or this particular episode? How might that inform you about what's going on?

Student 7: I think it was helpful to know that he had a prior history with asthma and that's what was causing his narrowing airways and his wheezing, and then the fact that it didn't improve with albuterol could have been a sign of the fact that he had a previous viral infection, so there's increased inflammation that's not going to clear right away when you give him a round of dialator.

Dr. Schwartzstein: Right, so that timing, there was like I went to my friend's house, they had a cat, ten minutes later I started wheezing because I have an allergy to cats, and now I'm here, that's probably not a lot of inflammation most people [unintelligible] , but it's gone on maybe as you were **[unintelligible 00:32:06]** for a couple of days so maybe there's some, whether it's infectious inflammation or it's asthmatic inflammation, that may be important. What else about his history even before his episode?

Jeff: We have **[unintelligible 00:32:20]** .

Dr. Schwartzstein: How might other elements in history be important here? Way in the back.

Student 8: I guess one thing you were talking about was whether that upper respiratory infection was really just a viral infection or perhaps a more serious infection that could have exacerbated and proven with these symptoms, or other things we didn't talk about was it could it be **[unintelligible 00:32:55]** or other things that could have moved on. This case could end up being one of them **[unintelligible 00:33:04]** .

Dr. Schwartzstein: More history about what his real baseline health is, has he in fact, perhaps been losing weight, or has he been not his usual self before this, maybe more **[unintelligible 00:33:15]** infection. Good, right here.

Student 9: Right, I was going to add on that and maybe try to probe him more for associated symptoms because when we asked him was he feeling anything else, he was really just focusing on his chest pain and really trying to tease out if there was anything else going on too.

Dr. Schwartzstein: Alright, good. Learn more about the history of that asthma.

Student 10: [unintelligible 00:33:40] when the numbers came up, how when we first have very specific on set, and you can ask them like you know **[unintelligible 00:33:48]** how did this sort of incident, like talk to your partner **[inaudible 00:33:51]** started? I'm wondering was there any evidence in the first x-ray that there was already **[unintelligible 00:33:58]** notice **[unintelligible 00:34:00]** did we ask simply about how the pain started or the exact moment or no. Do you remember?

Student 2: He told us, I'm pretty sure, so he said, "I have a really sudden chest pain that just started."

Student 10: Right. What I'm wondering is if there's evidence from first before the whole like now like Mike said so did he come in or when he went **[unintelligible 00:34:27]** .

Dr. Schwartzstein: It sounds like the stories of pain came while he was here, right?

Student 2: Yes, that was my interpretation.

Dr. Schwartzstein: Who ordered the blood tests? Who asked for that? I forgot. [crosstalk] Why did you order the blood tests?

Student 3: His O2 stock was low, and so he wanted to see whether there was AD O2 maybe there was vq miss match happening.

Dr. Schwartzstein: Okay, so to a guy who had hypoxia.

Student 3: Right.

Dr. Schwartzstein: Any other reason why you might want information from their **[unintelligible 00:35:03]** with an asthma attack?

Student 11: He probably wanted to look to see if he was hypoventilating or hyperventilating.

Dr. Schwartzstein: Hypoventilating, yes **[unintelligible 00:35:19]** why do I care about that?

Student 11: Because in a mild asthma attack, you would see someone hyperventilate to compensate, but in a severe asthma case, they would start hypoventilating.

Dr. Schwartzstein: What if I told you I've been intubated twice for my asthma attacks. Would you care? Did we ask about that? Did we ask whether he's ever been in the emergency department for that? Did we ask how many times he's had asthma attacks?

Student 2: We should ask his triggers too.

Dr. Schwartzstein: There's a focus on the acute episode, which is natural, but there's a lot of information about his asthma itself, which could help you think about, is this something that happens a lot to him, is this a rare event, is this a kind of asthma patient who gets really severe episodes, do I need to do something about that?

Student 5: Obviously it makes sense that we'd ask all those questions to get a better picture of what to do going forward. I was actually, when I was in the case, felt like we'd gone too long without giving albuterol, like we were asking too many questions before giving albuterol, and heard "Oh, asthma, forgot his inhaler. We should just give him albuterol right away". Is that too trigger happy?

Dr. Schwartzstein: No, no, I think it's totally appropriate even in this way of dealing with the information over there, you have to multitask here a little bit so I've got enough of the history to feel, like an exam, you heard the wheezing and so forth, and you **[unintelligible 00:36:46]** , have a heart problem, you might want to ask about the things that might have caused somebody to be in respiratory distress. Once you're pretty sure this is going to be asthma, oh okay I will go ahead and give him an albuterol, but now I've got to find out more information. While you're learning and practicing medicine, there's a sequence, again, my whole history, then I do my physical exam, then I get laboratory.

You're doing multiple things here at the same time because that's the nature of the acutely ill patient, that you have to do that. It's easy to lose track of where you are when you do that, like maybe I haven't asked all the questions I needed to past the medical history, or I haven't gotten social history, where do they smoke cigarettes or do they use recreational drugs, do they do other things that might have played a role in some of his **[unintelligible 00:37:32]** that you would get if you were doing your systematic history.

Again, you're first year you're still figuring out how to do a lot of this stuff, so I'm not being critical on this in any way but those are the kind of things that you would want to know ideally to help gauge, is this guy going to be really at risk, because part of what we talk about in a lot of cases we do is, "What do you predict might happen?" You've got a blood test and you're worried that his PCO2 was high. That would be something we would have to act on. You're predicting, what if he's getting into that range of hyper cap, hypoventilation. When he got worse, have you seen the first gasp with his PCO2 being low, he might have wanted second gasp as he's getting worse because maybe now the PCO2 is rising, aside from his pneumothorax.

Maybe his asthma was suddenly getting worse from the mucus or something in it, anything else obstructing, so that notion of getting a little bit more complete sense of where this person has been before with his asthma, how this is going to go **[inaudible 00:38:34]** . Alright, so he was tachychardic. Are we worried about giving him albuterol if he's tachycartic?

Student 2: I think that was one of those. I was happy I had some more decisive people on the team, because I think that I tend to sort of pause like, "What's everything that could happen?", which doesn't work in emergency situations. I think

we considered it, but it was one of those things that yes, that was a possibility, but the more important thing in this moment was to open up his airways and make sure that he was ventilating well. It was a con but a con that we're willing to take.

Dr. Schwartzstein: Carlos, why do you think he was tachycartic?

Student 12: Probably because of his hypoglycemia, he wasn't **[unintelligible 00:39:25]** .

Dr. Schwartzstein: It's simulating **[unintelligible 00:39:39]** he's anxious, he's short of breath, he's worried. All these things are going to aggravate the symptom diagnosis. How would albuterol **[unintelligible 00:39:48]** sympathetic nervous system.

Student 13: Just could drive it up.

Dr. Schwartzstein: That could drive it up but if it fixes some of those things, it could calm him down, it may actually release something added

Dr. Schwartzstein: I don't know if you guys noticed it, but his heart rate actually came down after the first albuterol treatment rather than going up.

Student 14: Does it make sense to layer on **[unintelligible 00:40:11]**

Dr. Schwartzstein: So, you could add in an anticholinergic drug as well. **[unintelligible 00:40:18]** increasing data that the anticholinergics, in asthma-- We tend to use them more for emphysema type patients, but with asthma, they probably do have a good added benefit even in that scenario. So **[unintelligible 00:40:32]**

Student 15: Since he had so much airway resistance, would something like a CPAP have helped him?

Dr. Schwartzstein: A what? I'm sorry?

Student 15: CPAP.

Dr. Schwartzstein: CPAP? What do you guys think?

Student 15: Give him positive pressure to get the air in.

Dr. Schwartzstein: So, if his pCO2 were high, you definitely might think about that. Although, we'd be really worried about doing an actual endotracheal intubation. In a young person, probably the work of breathing wasn't the major issue for him. So, probably would have been a little less pressed to do that in him than in an older patient.

Student 6: Yes, just a question on that. After the development of a tension pneumothorax, would the CPAP actually worsen it if it were set to push in a constant pressure?

[crosstalk]

Dr. Schwartzstein: Yes. So, people have been using the word tension pneumothorax. So, what is a tension pneumothorax, can you remind us?

Student 4: Air going in, but can't go out.

Student 16: Pneumothorax, in which the break-- It acts as a one way valve. So, with each inspiration you're getting more air in, but then when you exhale, the air doesn't actually go out. So, that pressure builds and starts putting pressure on the rest of the mediastinum and the heart, and can lead to cardiac collapse.

Dr. Schwartzstein: We talked briefly about that one mini case with the pneumothorax, and you say pop a bleb in the lung which is not uncommon in the asthmatic to have these little blebs in the top of the lung. So, it pops, and ordinarily if the lung is smaller, it begins to collapse, that hole is sealed off. So, you just have a regular old pneumothorax. In some people, you get this ball valve effect, as I was saying, and every time you breathe in, the lung gets bigger, the more air escapes, then you exhale and it closes off again. Air keeps building up, and tension develops in that thorax or hemithorax. As Rachel had noted while this was going on, that the mediastinum has shifted over into the left chest now. So, you can't see the right heart border. That's how I know that the mediastinum has shifted over.

Often you'll see the hemidiaphragm really depressed on the side of the tension pneumothorax. It's not as impressive on this film as it is on some others, but you can see the mediastinal shift as well. So, he's got a tension pneumothorax at this point. Now, if I were to put in positive pressure, absolutely, I might force even more air into that tension pneumothorax and worsen it. So, you probably would not want to do that once you've seen the tension pneumo. So, why did he now drop his blood pressure? Thoughts on that? **[unintelligible 00:43:36]**

Student 17: So, the pressure on the right side, could you push enough to **[unintelligible 00:43:45]** on the SVC or something like that? The superior vena cava or basically the heart. That's like the cardiac system.

Dr. Schwartzstein: Yeah, so the pressure in the thorax is high now, so pressure outside the thorax where the IVC is, or the veins and the **[unintelligible 00:44:07]** they have less of a pressure gradient to move blood in. So, my preload has gone down. You did the exact right thing, gave him fluids, and realised the initial step here to try to increase preload. That's getting back to thinking about our Ohm's law, mean arterial pressure is equal to cardiac output times SVR, and cardiac output has just gone down. Is it stroke volume, is it heart rate, the stroke volume, preload, after load, contractility.

So, you are going through that process, hopefully, in your head as you are trying to figure out what is going on here. This looks like a preload problem. So, you will hear probably, as you go into the PCE, there are these tables of hypotension and shock, and that sort of thing. People will talk about this being kind of an obstructive shock. I don't like that term because it doesn't really tell you, in my mind, linking back to the basic mechanisms, this is a preload problem with the heart. The way you need to deal with that is to give fluids, but you need to relieve the tension **[unintelligible 00:45:15]**

Jeff: What does this remind you of, this situation where you have increased pressure surrounding this area and you had decreased preload? Tamponade. Yes, pericardial tamponade. This is actually a very similar type of shock. It's the same idea, it's a preload issue and it's also characterized within this, you'll see, obstructive shock. It's not really an obstruction, it's really just the idea of transmural pressure, just from a different source of pressure. From this, it's a intrathoracic pressure of air pushing on the heart structures, but for pericardial tamponade it's from the fluid inside of the pericardium actually pushing on the heart structures, but same mechanism.

Dr. Schwartzstein: All right. Good. The issue then is trying to relieve that tension. So, you want to go where the air is, and the air is anti-gravity, if you will. Air is going to rise relative to the fluid-tissue compartment. He's on his back relatively. He's going to come anterior. When we tap pleural effusions, we do it in the back here, on the posterior axillary line, or a little bit even more medial than that. Usually, for tension pneumo we tend to just do it in anterior. So, you will go into the midclavicular line, second rib, you find that, so you are looking for the manubrium, and that tells you where the second rib is, going back to your anatomy. Then, I know, several of you are saying you want to go over the top of the rib. Just remind everybody why that is.

Student 18: Because at that point you are less likely to hit the vein, artery and nerve that run below the ribs

Dr. Schwartzstein: Right, all of that runs below the ribs. So, that is where you would go. We have a slide up there with chest tubes. Chest tubes are put in laterally. In this case, that is not a big deal at all because we have the tension. This is another X-ray of the tension pneumothorax that shows you the depressed diaphragm on the right side as well as a major shift in the mediastinum to the other side so that it probably would be associated with bad hypertension.

Jeff: So, if you were to put a needle decompression in this exact spot, what would be the properties of that needle that you might choose. You want it to be like a big needle, skinny, long, short?

Student 19: [unintelligible 00:47:54] short and **[unintelligible 00:48:01]**

Jeff: Yes, exactly. All the same principles. You want that air to rush out as fast as possible. So, you want there to be a large bore, short needle. Actually, sometimes if you are just looking for a needle, and you find one, all you really need is the needle. If you happen to find the end of a syringe that still has the plunger on it, the plunger is going to pop right off the end. It is just going to pop right out, you have to be careful, because there is a lot of pressure in there, and it is coming through that little needle. It is going to come straight through. So, really, all you need is the needle itself. You don't need it to be attached to anything, just needs a conduit to out the atmospheric pressure.

Dr. Schwartzstein: What was the tip off? When you were examining him, what was the tip off that there was something going on there?

Student 1: So, when I listened to the lungs, we had diminished lung sounds on the right side as when compared to the left. So, that meant he probably had pneumothorax.

Dr. Schwartzstein: All right. Great. So, again, this is where a physical exam becomes really important. So, I had heard wheezing, David had heard wheezing before, and suddenly it's unilateral that the breath sounds had really diminished. That could be from the unilateral obstruction, perhaps, but that's uncommon in asthma, and we didn't have any history of an aspiration or foreign body. The other thing that you'll hear about is the subtle physical exam finding, and I'm not sure if there was enough of a shift on that prior film to actually see this **[unintelligible 00:49:25]** modelling here. You can sometimes feel for tracheal deviation.

So, if the whole mediastinum is pushed over, but where you have to feel for that is really where the trachea is coming up out of the thorax, not up here where the larynx is. You want to feel really down and get a sense where the trachea is and is it being pulled over from one side to another. So, that's another physical exam finding if you're worried about tension pneumothorax. So, physical exam's important in making these diagnoses. Anybody who has this kind of respiratory distress and it suddenly worse, you want to be thinking about the possibility of a pneumothorax, even if they don't have chest pain you want to demonstrate that.

Jeff: Is it worth thinking about how an asthmatic might develop a pneumothorax if their asthma gets worse? Is that something that you would commonly see from a severe asthma?

Dr. Schwartzstein: There are two issues. This commonly comes up with the emphysema patients as well. You know we had talked about this notion of time constants and compliance and resistance of that particular area of lung. When the time constant is high, you don't get a lot of air moving in and out so much. It often happens here, although people think about it as "barotrauma", it isn't so much the pressure as the volume that's the issue. If I have an area of lung that has a high resistance, I might, during inhalation, when things open up, as the lung gets bigger, air will get in there.

Then as you start to exhale and lung volume gets smaller, that area may close off, right? In an asthmatic airway between the inflammation of bronchoconstriction, the room is going to be much narrower and the lung is going get smaller. You may actually close off during exhalation and truly trap air behind that.

Now the next breath comes in, I get more air but it all doesn't come out and the next breath comes in, I get more air and it doesn't. That local lining, it may be getting bigger and bigger until it finally pops. That's the mechanism that we will sometimes see in emphysema as well as in an asthmatic. It isn't so much the central airway pressures are so high, but there's local area of lung trapping the gas and getting larger and longer on successive inhalations.

Student 21: What is it that causes a tension pneumothorax to develop, instead of a regular pneumothorax? Why is it that that part of the lung isn't closed off?

Dr. Schwartzstein: It's probably the size of the hole that makes a difference.

Student 2: In terms of management, we sort of stopped right when we would have been draining. What would have happened subsequently we were just taking out

with like a needle? Would we have needed to replace a chest tube eventually once we could get in there?

Dr. Schwartzstein: Not 100% sure. You don't have the X-ray. I had a scenario when I was chief resident where I was making Saturday morning rounds and I came upon a cardiac arrest that was going on. It was an emphysema patient. Patient was intubated and had no blood pressure and you know, it's funny, the respiratory therapist is bagging the patient because they're **[unintelligible 00:52:43]** put him on a ventilator and she had sort of a frown on her face. I said, "What's wrong?" And she said, "It's really hard to pump the air in." I quickly listened on both sides and there was no breath sounds on one side. So without even an X-ray, we did a needle decompression.

Now if I had been wrong, I would have created a pneumothorax. You're going to have to do a chest tube either way. In fact, it was a tension pneumo, and suddenly the blood pressure came back. You sometimes have to act. We talked about certain, not certain. You know, you've got a patient in extremis, you need to start doing something based on your best understanding of the physiology and physical exam and go from there. You put that needle in. Often we put a catheter in if you can, because as the lung comes up, you don't want the needle gapping at the lung. But you've got to replace, put a chest tube in as soon as possible after that. It's just a time sensitive thing in term of--

Student 2: Will the tension pneumothorax hole close on its own?

Dr. Schwartzstein: Eventually. When you put a chest tube in, you put that to suction. It would take all the air out that pulls the lung out to the chest wall. Then that hole would heal. Okay. You keep them on the suction until the hole heals.

Student 22: You said in extremis you have to act quickly. One thing is when you were asking for consent to put the needle in and I found myself kind of like "just get it done". So I'm wondering at what point you quit asking and just put the needle in? At what point if someone is in extremis? Because I know consent is really an important thing. But also, you need to also **[unintelligible 00:54:27]**

Dr. Schwartzstein: Yes. What do you guys think? Was he competent?

Student 4: Yes.

Dr. Schwartzstein: What have you learned about competence and assessing competence?

Student 4: Thank you. Well, I think one thing-- It was tricky because, and I think you did a great job like green-lighting it. It was simple. Like in my mind I was just like similar like let's get the needle in. But also, you know, I feel like there's risks, there's pros and cons that we like didn't explain and like maybe should have, even if we know like where we should be putting a needle, I feel like still things can go wrong. In addition, I was wondering like he's 17.

Should we have called the mom really quick to make sure, you know, is that something we should do? I just feel like he-- But at the same time this patient was in

so much pain that it seemed like he was, for a while, I don't even know if he was fully conscious, fully, fully aware and so trying to explain it when he maybe he wouldn't have understood. So a lot. I feel like there was a lot on both sides.

Student 2: I was just going to say, my worry was the consent piece. It was also like I'm coming at him with a needle. I didn't want to, he was conscious enough to know what was going on. He could see if a needle was coming at him. I was like, we need to give this kid a heads up that we're about to put something in his side. I think that was where I was coming at it from. But I think yes, that's a really-- Because he did seem competent to me and I think assessing competence would have taken a longer period of time. There were periods that he was like in and out, but I don't know how quickly you assess competency in these situations.

Student 23: At one point he said, "Where am I?" which made me think that he wasn't oriented to person, place and time. I don't know how many times you-- what their level of consciousness is. That might have given a sense of his oxygenation.

Student 5: My understanding is if he was a 17-year-old in this situation and fully competent and said "no", you would probably still do it. It almost didn't matter whether he was competent and what he said, but I think the informing him of what was going to happen was really important.

Dr. Schwartzstein: The real issue is that if you have someone who otherwise may die, and he was in a place where he could have died from this. You do what you need to do to save their life, particularly if there's any question about competence. I think that's the way you would worked in a scenario. I think your point's well taken. I'm sure he wasn't 100% intact at that point. You can argue you didn't have the time to go and get a full mental status evaluation and this procedure was not particularly risky. I know it seems like that **[unintelligible 00:57:25]** risky procedure.

How many of you read the little piece in the Huffington Post that our patient clinic coordinator sent? I mean you're about to die. Do you want us to do this? I mean it's really a funny kind of consent and we knew that his was not this dire in the sense of the time issue that we had here, but I would argue it's almost impossible to get an informed consent in class. We go through that process. But nonetheless, you know, it's probably any **[unintelligible 00:57:58]** individual. It's not much of an informed consent the way people think about it.

Student 2: Would you have described- told him what was going to happen?

Teacher: Yes, in fact we do. We dont even use Novocain or lidocaine, you know, to numb this up so it doesn't hurt particularly to do this. We'll get a **[unintelligible 00:58:19]** . You do hit the floor up. He's already having pain on that side of his chest. It's not a very painful procedure and you go to the top of the ribs, you shouldn't have any real risk. The major thing is causing a pneumothorax if one wasn't there in the first place, but based on your best sense of whats going on. Right. Again, this notion of a lot going on in your mind, Kendra saying there's all these things happening. What do I do? I actually think, and this may sound a little bit harsh sometimes, but I think it helps to step back. Almost forget that there's a patient there for a moment and focus on the science that you want.

This is a problem now. It's a scientific problem that you have been learning about. How do I deal with his problems? His hypotension, his shortness of breath, his hypoxemia. What does this all mean to me? How do I think about that? You know, and then come back in a sense to the patient. Because as much as you're struggling, you're going back to your patients early in your careers like this and you're **[unintelligible 00:59:31]** . It's very distracting, right?

You've got to compartmentalize a little bit. Okay, now I have the science problem. What am I going to do about the blood pressure? How do I think about the blood pressure? How do I think about the reading? What are the things I'm going to do? You guys worried about the steroids. But he's had this attack for a couple of days and he's got inflammation. He needs steroids. Yes, he might have an infection. In the acute phase, what does your body do when you're acutely stressed? in terms of steroids in this part homeostasis two see how it's really gotten [inaudible] ?

Student 23: Neutrophils can marginalize.

Teacher: Neutrophils can marginalize, so your immune system is geared up, and your body makes a lot of steroids. You have a stress response. That stress response is in part releasing cortisol. That's what your body does. It actually enhances, short term, your immune system and your ability to deal with the stress. Beginning steroids in the short term like this is not a problem even if he's got bacterial pneumonia. Do not worry about that. If he has asthmatic inflammation you can give steroids to quiet down the asthmatic inflammation. You have a bunch of reasons to for potentially giving them.

Student 2: How would you give them?

Dr. Schwartzstein: Intravenously, probably.

Student 2: Okay.

Dr. Schwartzstein: You'd want that effect, really. In fact all steroids get good intravenous levels but it's just going to take time for it to be absorbed. You want to get something on board as quickly as possible. Matt, Jeff, I would think you guys wanted to bring up some points?

Jeff: I just want to add being your nurse for the board simulation, what a difference. I don't know if you can all appreciate this. It's sort of hard when you're yourself to appreciate what you know now and what you can do. It's a big difference. Appreciate what you know. You treated a patient with a severe asthma exacerbation who was about to die. You did all the right things. It only took you like 20 minutes and I think that's pretty special.

I think you guys should be very proud of where you are. I'm impressed. I think there's not really another time where you grow this much as the first year of medical school. Maybe internship is the time where sort of you in the fire, but times like this it's an opportunity to reflect on how much you've really taken in and you can apply. I think you guys did an excellent job and I think all of you were all keyed-in. I think your hushed silence was like **[unintelligible 01:02:06]** and I appreciated that. Of course Molly **[unintelligible 01:02:10]** did a good job too. I just want you to appreciate that.

It's harder to self-reflect because we're always so self-critical but you should appreciate that you really did an excellent job. Each simulation has been this very steep learning curve and you're really functioning at a quite high level for your level of training.

Dr. Schwartzstein: I just want to pick up on one thing because I noticed in the first simulation there was a lot of nervous laughter, which is pretty common for early simulations. There was very little of that this time because you were now focused, as Jeff was saying, on what was going on and how you were thinking about it and what you needed to do about it next. Matt?

Matt: Not much else except I will also say that as someone who is maybe a little bit more close in the training, this scenario will come for you guys again soon. Just take away the lessons that you learned about how to systematically and medically to assess because it's definitely optimal. I thought that was awesome, it was awesome.

Dr. Schwartzstein: All right. Thank you everybody. [Applause] I'll take any questions from the group.

Student 24: Have you intubated a patient?

Teacher: Would I have intubated a patient? Well, I'd have to ask you what was the indication for intubation?

Student 24: I don't know if they have to intubate as a solution; but if they're really nervous, is it possible to maybe sedate them, intubate them, and would that also reduce the potential for developing pneumothorax?

Dr. Schwartzstein: Doing any procedure, you have to weigh the risks and benefits, right? What's the downside of doing an intubation and putting them on mechanical ventilation? What are the potential problems associated with that? I would think about that.

Student 25: I don't know about the intubation itself, but then you have to extubate. Then the complications of the sedation itself to do both procedures, and then infection of having a ventilator tube in and-

Dr. Schwartzstein: Right. So we've talked about how this alters our defense mechanisms. I can't cough, I now have a conduit that goes past my larynx, it's the way bacteria enter. Now I have associated pneumonia, it's a really bad thing. It doesn't happen immediately but it puts you at risk for that. So what am I going to do intubation for? I can give higher concentrations of oxygen, so if I was really having a problem oxygenating that could be a reason. What else might be a reason for using a ventilator?

Student 26: I would like to mention too, we had a patient who was getting very tired. He was working so hard to breathe and then he couldn't keep up.

Dr. Schwartzstein: Right. So his ventilatory pump might not be working so well, it's got a lot of airway resistance. Is it looking like he's not keeping up? Is the PCO2 rising? That could be one of the indicators that you'd be looking for. Is there a control problem? I didn't think so. Is it a pump problem? Well we were worried about it but

we didn't have evidence of it yet. Was there a gas exchange problem? With his tension pneumo we started having oxygenation problems but that intubation might have actually made that worse because now that positive pressure going inward would have made that tension pneumo worse. So probably not because we didn't have any real indications for intubating here and the potential problems if we were to do it.

Student 27: Is there a baseline heart rate at which you would not have given albuterol?

Dr. Schwartzstein: Is there a baseline heart rate for which I would not give albuterol? Again, it depends on what you think is driving the heart rate. If the heart rate, really, you can't think of anything other than this is from the respiratory problem, I would probably say just about no. Although we would rarely see a heart rate probably above 150 just from respiratory issues. If he went into atrial fibrillation and had a rate of 170, then I might be a little bit leery about giving albuterol in that scenario. But for a sinus tachycardia that I thought was due to a respiratory problem I would go ahead and treat it.

Jeff: I think these are great questions and you're going to encounter these on your clinical rounds. I think an equal question in another vein would be should we give diuretics to a patient in heart failure with a blood pressure of 80/40? Well yes because they're in full-on heart failure and they can't breathe, but no because their blood pressure's so low. But why is their blood pressure so low? You have to reason out what would be the risks, what would be the benefits, just like a procedure. Giving a medication is kind of like a procedure. It just takes applying what you know to that situation and trying to make the best decision you can.

Dr. Schwartzstein: I'll tell you we have one question on the final exam where there is no right answer in the sense of the outcome, and we tell you that. The issue is we want to see your reasoning in terms of what you think is going to happen because that actually mimics what you do every day in medicine. You don't always know what the right answer is, you don't always know what will happen. But if you can predict, and that's really what we've been trying to work with you on in this course, to be able to predict, "If I do this I might have this happen and I might have that happen and the outcome will help me understand better where they were before I did that intervention," whether it was a drug, a procedure, whatever it is. We actually have one question on the exam that asks you to do that sort of thing.

Student 28: I'm wondering if there was anything that could possibly contributed to the right lung. He was desaturated before the pneumothorax but it seemed like it got a little bit worse.

Dr. Schwartzstein: Yes, that's a great question. We've talked about how there was a totally healthy person who had a spontaneous pneumo, though they actually don't get really hypoxic. But what else is going on in that lung right now?

Student 29: Asthma.

Dr. Schwartzstein: You've got an asthma attack, right. So that's again, we've talked about how these diseases interfere with the normal reaction, the normal hypoxic

[unintelligible 01:08:13] . It's not as good as if you were healthy. That inflammatory process is probably what's doing that. All right, let's give you a little break and then we'll come back and go back to the **[unintelligible 01:08:31]**

[01:08:36] [END OF AUDIO]