

## Pulmonologist Martin Tobin Testimony on April 8, 2021



**Prosecution:**

Let's walk through exhibit 949.

Brad, if you could advance.

And Doctor, tell us what we're seeing.

**Dr. Martin Tobin:**

Okay. Yep. Now you can see the car is being rotated. You're able to see Officer Chauvin. You're able to see Officer Kueng and then Officer Lane down at his feet. You see underneath Mr. Floyd, and now the car has been rotated. Now the car has been removed. And so you're able to see how they're positioned at different points. In terms of with Officer Chauvin with his left knee on the neck, his right knee on Mr. Floyd's arm and chest. And then you can see here Officer Lane holding his legs, and then you can see Officer Keung with his knee on his torso.

**Prosecution:**

This represents a snapshot in time, as you told us. Did the officers' positions change over time as they were there on the ground?

**Dr. Martin Tobin:**

Yes, the officers' positions changed over time, and also the position of Mr. Floyd himself changed over time, and these become relevant in how we evaluate everything.

**Prosecution:**

And was it something you factored into your analysis then?

**Dr. Martin Tobin:**

Yes.

**Prosecution:**

Did you consider where Mr. Chauvin's left knee was during the encounter?

**Dr. Martin Tobin:**

Yes. Officer Chauvin's left knee is virtually on the neck for the vast majority of the time.

**Prosecution:**

And when you say vast majority, are you able to [crosstalk 00:01:41]-

**Dr. Martin Tobin:**

It's more than 90% of the time in my calculations. There are certain times where it becomes difficult because you don't get a good view of where it is. For example, I know that Officer Chauvin's right knee is on his back 57% of the time. The reason I'm not able to save for the 43% is that I don't get a good view. I can't, other times don't have a good view of exactly where it is.

**Prosecution:**

Did you focus on the first five minutes and few seconds?

**Dr. Martin Tobin:**

Yes. I focused on the first five minutes, three seconds, because that is up to the time that we see evidence of brain injury.

**Prosecution:**

If Mr. Chauvin's right knee was on his back from time to time, at other times, it was placed where in your observation?

**Dr. Martin Tobin:**

It was placed on his arm and then rammed into Mr. Floyd's left chest, so really whether you're making a distinction of whether the knee is on the chest per se or whether it's on the left arm and rammed in against the left chest, from the point of view of breathing, the effects are extremely similar.

**Prosecution:**

Let's turn to the number one on the ...

**Speaker 3:**

[inaudible].

**Prosecution:**

Oh, yes. [inaudible].

**Prosecution:**

I wanted to turn back to the notes that the number one here that written down for the reasons you told us for Floyd's low oxygen, Mr. Floyd's low oxygen. Handcuffs and the street. To talk about the first ones.

**Dr. Martin Tobin:**

Yes.

**Prosecution:**

Could you first, Dr. Tobin, tell us how these various mechanisms, the four that you've discussed, handcuffs on the street, knee on the neck, prone position, knee on the neck, back, knee on the back, arm, and side. How do those mechanisms fall into your work of either respiratory physiology or clinical medicine?

**Dr. Martin Tobin:**

They don't have an awful lot to do with clinical medicine, but they are directly related to my work in physiology, so in understanding the forces that the body has to cope with. These are crucial in terms of the various forces that are involved in physiology.

**Prosecution:**

Then turning to the first one in handcuffs and the street, the very first one. What is the fact of the handcuffs in the context of what happened to Mr. Floyd?

**Dr. Martin Tobin:**

The handcuffs are extremely important in Mr. Floyd. But the handcuffs on their own, just handcuffs per se, are not that important. It must be the handcuffs combined with the street. And it's because of the positioning of the handcuffs at the back and how he's manipulated with the handcuffs by both Officer Chauvin and by Officer Keung, how they manipulate the handcuffs, and they're pushing the handcuffs into his back and pushing them high. Then, on the other side, you have the street, so the street is playing a crucial part because he's against the hard asphalt street. The way they're pushing down on his handcuffs combined with the street, his left side, and it's particularly the left side. We see that. It's like the left side is in a vice. It's totally being pushed in, squeezed in from each side, from the street at the bottom and then from the way that the handcuffs are manipulated. It's not just the handcuffs. It's how the handcuffs are being held, how they're being pushed, where they're being pushed that totally interfere with essential features of how we breathe.

**Prosecution:**

Mr. Floyd is pancaked between the pavement underneath him and then force on top of him.

**Dr. Martin Tobin:**

Precisely.

**Prosecution:**

Now, could you help us to explain how this mechanism, the handcuffs and the street, how does that explain the shallow breathing that you've described?

**Dr. Martin Tobin:**

Yeah, so this gets back to how we breathe, and this is fairly simple. The way we breathe, we have two big muscles that help us with breathing. We have the diaphragm, and we have the rib cage muscles. The diaphragm does about 70% of what we need for breathing, and about 30% of it comes from the rib cage. And when the diaphragm contracts or the rib cage contract, they expand the chest. And when you expand the chest, then air flows in from outside, and it's coming in. And that's all that happens on inspiration.

But to expand the chest, there's two crucial actions that have to happen, and we've referred to these by the terms pump handle and bucket handle. Bucket handle is simple. If you have a regular bucket that you carry water with and you lift up the handle of the bucket, the handle comes up like this. And so when you contract your diaphragm, you are performing a bucket handle movement on the rib cage. So you contract your diaphragm like that, and each time as you inspire, you can see it yourself. As you inspire, each of you there in the jury, you inspire, you see that your rib cage is going outwards like that. That's a bucket handle movement.

The second movement that you have is called the pump handle, and this reflects to an old water pump that would be in the yard for pumping out water. And so you have the handle at the top of the pump, and you lift up the handle of the pump each time, and the water comes out the spout at the bottom, so you're filling up, get your container of water. With that action, you're lifting up here. This refers to the front to back movement of the chest wall, so with the pump handle,

your chest goes out with each breath. And so you can do it yourself. As you take a deep breath, you can feel that, front to back, you're expanding your chest. The front to back expansion of your chest is with your pump handle.

At the same time, you're doing both of them at the same time. At the same time, you're doing that, your chest is expanding from side to side, and that's with your bucket handle. Both of these are occurring, and these are vital. Without these, you can't breathe. If you don't have the bucket handle working and the pump handle working, there's nothing happening. There's no way air going to get in there.

**Prosecution:**

Doctor, in this case, were you able to observe whether Mr. Floyd's breathing was impacted by the handcuffs and the placement on the street?

**Dr. Martin Tobin:**

Yes, I was.

**Prosecution:**

What did you observe, Dr. Tobin?

**Dr. Martin Tobin:**

What I observed is, particularly, is in terms of the hands of the police and the handcuffs, particularly on the left side. They were forcing his left wrist up into his chest, forcing it in tight against his chest, forcing it high up. And you have to keep in mind that the opposite side of this is the street, so he was being squashed between the two sides. And so this meant that he couldn't exert his pump handle because, I mean, the street totally blocked his pump handle. There was no way he could do any front to back movement. And again, the way they were pressing in on the back, there was absolutely no way that he could do any front to back movement.

Then, in addition, because of the knee that was rammed in against the left side of his chest ... Sometimes the knee was down on the arm or in against the chest, so this would have the same effect. Basically on the left side of his lung, it was almost like a surgical pneumonectomy. It was almost to the effect as if a surgeon had gone in and removed the lung. Not quite, but along those lines. There was virtually very little opportunity for him to be able to get any air to move into the left side of his chest. So he was going to be totally dependent on what he'd be able to do with the right side.

**Prosecution:**

Have you selected any footage from the body-worn cameras that you feel depicts Mr. Floyd's struggles to breathe?

**Dr. Martin Tobin:**

Yes.

**Prosecution:**

I'm going to show you what's been marked as state's exhibit 944. And first, would you describe what it is?

**Dr. Martin Tobin:**

What you're seeing here is-

**Prosecution:**

Dr. Tobin, the jurors aren't seeing it yet. It's just describing it for the record.

**Dr. Martin Tobin:**

Oh, I'm sorry.

**Speaker 3:**

It's just [inaudible] on what it is.

**Dr. Martin Tobin:**

They will not see this. I'm describing what I'm seeing.

**Prosecution:**

For now. Yes.

**Dr. Martin Tobin:**

Yeah. Okay. That's fine. What I'm seeing is that his left hand is being grabbed by the police officers, so that's a handcuffed left hand and it's being pushed into his chest, so he's just not able to expand that. In addition you, what I'm seeing-

**Speaker 3:**

All we need is the foundation for it.

**Dr. Martin Tobin:**

Oh, I apologize. I apologize. I didn't.

**Speaker 3:**

So let's hold off and turn the page. I'm sorry.

**Dr. Martin Tobin:**

Am I misunderstanding?

**Prosecution:**

Your honor, we offer state's exhibit 944.

**Speaker 3:**

Any objection?

**Speaker 4:**

No, your honor.

**Speaker 3:**

944 is received. All right.

**Prosecution:**

Now, Dr. Tobin, the jurors can see it.

**Dr. Martin Tobin:**

Okay. I apologize.



**Prosecution:**

No, no. It's quite all right. Would you tell us what's the significance?

**Dr. Martin Tobin:**

I mean, now you're able to see here with the yellow arrow, you're able to see that the officer is holding Mr. Floyd's left hand. He's holding it very firmly. There's a very firm grasp on it. And then Mr. Floyd's left hand is being pushed in against his chest. Also, we're able to see just on the side that Officer Chauvin's knee is coming in, and that's compressing in against his side as well. The ability to expand his left side here is enormously impaired.

And also you're seeing that the size of the chain between the two, the right side and the left side, is very short, so his whole left arm is also being pulled over, and so it's preventing him also from expanding the right side. I've been focusing on the bucket handle and the pump handle on the left, but you can also see here that these are impaired, his ability to expand his chest. And of course, the key factor you must keep that isn't kind of in a sense seen here in one sense is the street. The street is what is having a huge effect because he's jammed down against the street. And so the street is playing a major role in preventing him from expanding his chest.

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**Dr. Martin Tobin:**

One two, three, four, five, six, seven, eight.

**Prosecution:**

So that was roughly a 17 second clip?

**Dr. Martin Tobin:**

Right.

**Prosecution:**

And you counted seven, or eight breaths?

**Dr. Martin Tobin:**

Between seven and eight. Yep.

**Prosecution:**

And did you use this to calculate a rate of respiration?

**Dr. Martin Tobin:**

Yes, because it's simple. Once you have 19 seconds and you count out the number of breaths you have here, and if, say, you count at seven breaths, that would come out at a respiratory rate of 22.

**Prosecution:**

Is that number, the respiratory rate of 22 significant to this case?

**Dr. Martin Tobin:**

It's extremely significant.

**Prosecution:**

Why is that?

**Dr. Martin Tobin:**

Because one of the things in this case is the question of fentanyl and if fentanyl is having an effect and is causing depression of the respiratory centers, the centers that control breathing, that's going to result in a decrease in the respiratory rate. And it's shown that with fentanyl, you expect a 40% reduction in the respiratory rate. So with fentanyl, his respiratory rate should be down at around 10. Instead of that, it's right in the middle of normal at 22.

**Prosecution:**

So you didn't see a depressed rate of respiration, or breathing rate in Mr. Floyd?

**Dr. Martin Tobin:**

No, it's normal.

**Prosecution:**

And so what does it tell you bottom line with respect to fentanyl as it relates to Mr. Floyd.

**Dr. Martin Tobin:**

Exactly. In terms of fentanyl, one of the major changes you see in fentanyl is a slowing of the respiratory rate. And again, we would be expecting a 40% reduction in the respiratory rate with fentanyl. The norm of the respiratory rate is 17 breaths per minute, plus or minus five. So that would mean a normal respiratory rate of between 12 and 22. That's the normal range of respiratory rate. And so if it was with fentanyl, you'd be expecting a respiratory rate of 10. Instead of that, you counted here yourself and you can see when you counted yourself that the respiratory rate is 22. So basically, it tells you there isn't fentanyl on board, that is affecting his respiratory centers. It's not having an effect on his respiratory center.

**Prosecution:**

So Mr. Floyd's respiratory rate was normal at 22, just before he lost consciousness?

**Dr. Martin Tobin:**

Correct.

**Prosecution:**

So the jury may have heard some other information in the case about the fentanyl, related to an elevated carbon dioxide level in Mr. Floyd's body in the emergency room. Was that significant to you?

**Dr. Martin Tobin:**

Yes, that's very significant as well.

**Prosecution:**

How so?

**Dr. Martin Tobin:**

Because he's reported that carbon dioxide level in the arterial blood in the emergency room of 89. That's a very high level of carbon dioxide. And so you have to take into account what are the factors that might have led to that? And there's a particularly important factors in Mr. Floyd to explain why his carbon dioxide was found at 89 in the emergency room.

**Prosecution:**

So doctor, would you first tell us, what would normal have been for carbon dioxide levels?

**Dr. Martin Tobin:**

The normal carbon dioxide level in you or me is 35 to 45 millimeters of mercury. That's the norm. You don't need the millimeters of mercury stuff, but they are the units that are given in the hospital chart.

**Prosecution:**

So, you said that there were significant factors in the case of Mr. Floyd. Would you help the jury understand what those were?

**Dr. Martin Tobin:**

Yes. The important factors are that we know that he made his own last spontaneous effort to breathe at 20:25:16. After that, you can look at the videos and you see, he makes no breath. The last breath he took was that 20:25:16. Then we know after that, he stayed on the street for another three minutes or so. Then he's placed into the ambulance and we know that in the ambulance, they attempted to put in an airway and i-gel. And you can see that on Officer Lane's body cam, you can see all of that happening. And then you can see the time at which they actually successfully inserted the airway, and when they gave him the first breath. And that is a gap of nine minutes and 50 seconds from when he last took a breath.

**Prosecution:**

And why is that significant?

**Dr. Martin Tobin:**

That's very significant, because we can calculate what is the rate of increase in the carbon dioxide in somebody who doesn't breathe. If somebody doesn't take a breath, carbon dioxide increases at a predictable rate. And that rate is up to 4.9 millimeters of mercury per minute that it increases. And so he has not taken a breath for nine minutes and 50 seconds, so you would expect just on that basis, that he's carbon dioxide level will go up by 49. So you add 49 to the normal values of 35 to 45. And then you add that and you're going to get a value of between 89 and above. And so it comes out virtually identical to the value that they've found in the emergency room of 89.

**Prosecution:**

So doctor, what's the punchline with respect to that, what does it tell us?

**Dr. Martin Tobin:**

The significance of all of that is it's a second reason why you know fentanyl is not causing the depression of his respiration. What you're seeing is that the increase in his carbon dioxide that is found in the emergency room is solely explained by what you expect to happen in somebody who doesn't have any ventilation given to them for nine minutes and 50 seconds. It's completely explained by that.

**Prosecution:**

So when the person then is not breathing, then carbon dioxide would naturally continue to build up in the body?

**Dr. Martin Tobin:**

Yes.

**Prosecution:**

And that's what matches what was seen in the OR for Mr. Floyd?

**Dr. Martin Tobin:**

Precisely.

**Prosecution:**

Now, you said that there were other things that were significant, that were related to the rate of respiration, and we talked about fentanyl.

**Dr. Martin Tobin:**

Right.

**Prosecution:**

Was there anything else?

**Dr. Martin Tobin:**

Yes. There's two other things that are very important to the respiratory rate, because you saw it with your own eyes, exactly, his respiratory rate. And the first thing is that if you have somebody who has underlying heart disease and the heart disease is so severe that it's been said that it's causing shortness of breath, that it's causing you difficulty with breathing, if somebody has heart disease that's causing shortness of breath, virtually all of those patients are going to have very high respiratory rates. They're going to have respiratory rates of 35, 30, over 30, even over 40 when you have heart disease that can give you a shortness of breath. Instead of that, we find that his respiratory rate is normal at 22.

The second thing that's important about the respiratory rate of 22, is if you have somebody where the primary problem in the body is airway narrowing, where you have somebody where there is that the airways are being compressed, there's narrowing in the neck, or there's narrowing like in somebody in the chest. But the response, the physiological response to airway narrowing is a normal respiratory rate, and that is what he has. So it's the expect. But the respiratory rate that you see that's normal is the expected physiological response in somebody who has airway narrowing.