

Sawbones 347: Hypodermic Needles

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Intro (Clint McElroy): Sawbones is a show about medical history, and nothing the hosts say should be taken as medical advice or opinion. It's for fun. Can't you just have fun for an hour and not try to diagnose your mystery boil? We think you've earned it. Just sit back, relax and enjoy a moment of distraction from that weird growth. You're worth it.

[theme music plays]

Justin: Hello everybody, and welcome to Sawbones: a marital tour of misguided medicine. I'm your cohost, Justin McElroy.

Sydnee: And I'm Sydnee McElroy.

Justin: Well Syd, some exciting news on the COVID front. Not the present situation, which is, uh, dire.

Sydnee: Yes.

Justin: Um...

Sydnee: Yeah, I hope everybody is staying safe out there as much as you can. Stay home. If you can't, wear your mask when you go out, social distance.

Justin: Also, remember that depending on the state you live in, your governor or government may not be looking out for you. So don't necessarily take their guidelines to be the safest practices. You need to be responsible for yourself and your family. Which means staying home and staying safe.

Sydnee: Back when all this started in March, I feel like a lot of people were being really cautious and taking it very seriously, and I understand that fatigue has set in. But I would say that for a lot of us who are in states that weren't initially impacted strongly, we now need to take it that seriously and be just as cautious as everyone was back in March.

Justin: Yes. If not more so.

Sydnee: But we're not doing a whole episode about that.

Justin: No, ma'am.

Sydnee: No. It just, uh, the announcement from Pfizer, which I'll talk a bit about at the end of the show, about their vaccine progress— which is good, good news overall. That's the, um, T... L... D... R.

Justin: There it is! Look at you!

Sydnee: [laughs] Is the announcement was good news.

Justin: Okay. Wait, the Webby awards are here.

Sydnee: [laughs]

Justin: Best Internet Acronym goes to Sydnee McElroy? God Syd, congratulations. No— no, sorry, I'm reading here, Most Improved. But still. Huge achievement.

Sydnee: Thank you, thank you. But that's not what the whole show is about. We do want to talk about medical history. And something, Justin, you asked me about kinda tied into vaccines and the COVID vaccine, and the fact that it is flu vaccine season and everybody should be getting their flu shot.

Justin: I have realized that I am our most prolific Sawbones episode suggester.

Sydnee: Uh huh, that's true.

Justin: Mainly because I have so many gaps in my understanding of the world around me that I am frequently plagued by, like, "Wait, Syd, Syd, how did we know that we could squirt medicine into people? How do we do that? How did we figure it out?"

Sydnee: Well, it's really interesting. You asked me about the history of hypodermic needles and it was something I'd never really thought about investigating. I— I don't know why that— I am so curious about disease and treatments, but like, the equipment didn't occur to me as an area of interest. But it definitely is. And there's a whole history there and a lot of people have written about it. So, it's not— it's not a wild question to ask.

How did we come up with the idea of a needle? What brain conceived of it? Because I think they're so terrifying to so many people, right? Like, it's a— it's a fear.

Justin: That's what prompted my thought of it, as our daughter has a real— our oldest daughter, Charlie, has a real genuine phobia when it comes to needles. And I guess in my bad parenting brain I was thinking that if, like, if I knew the history of how bad it used to be, then maybe that would impress upon her the value of the current system. Now, saying it out loud, fellow parents, I realize, [laughs] this is a faulty plan.

Sydnee: No, I think if I— as I'm going to share this information with you, I think if we told her how it used to be it would just further terrify her of all of it. I don't think she'd be grateful for the modern needle.

Justin: How very American.

Sydnee: She calls the flu shot the "fssh."

Justin: The "fssh," because she doesn't wanna say it.

Sydnee: Yeah.

Justin: Yeah. Oh, and she has also stridently made it known to anyone who will listen that she will not be getting the COVID vaccine when it is available. [laughs] She'll tell anybody, "I'm not getting that vaccine."

Sydnee: Spoilers—

Justin: We got an anti-vaxxer right in our own home. [laughs]

Sydnee: [laughs] Spoilers: she will.

Justin: She will. Narrator: she will.

Sydnee: And she did—[laughs] she did get her flu shot. And she actually, afterwards, made the point of saying it really wasn't that bad.

Justin: We made her film a video, remember?

Sydnee: [laughs] There's a little parenting tip for you. There's a video of her saying, "Future Charlie, the flu shot was not that bad."

Justin: And I set a calendar reminder to myself on October 1st to remember that that video exists. So, if she gets worked up about it, I'll be ready with that flu shot video.

Sydnee: We need to set it sooner. We might need to get it sooner.

Justin: Yeah, I'll bump it up. Should have asked you first. Anyway.

Sydnee: Anyway. So, the idea of a hollow tube to deliver things into people is not new, as you may imagine. It's an ancient idea. The word 'syringe'—are you interested in the word syringe?

Justin: Yeah, obviously.

Sydnee: Which—

Justin: I'm here, aren't I?

Sydnee: Syringe, I think a lot of people use the term syringe to talk about, like, the whole thing. Right?

Justin: Yeah.

Sydnee: Like, the needle attached to the barrel with the plunger, and the whole thing together is a syringe. I mean, as you know if you've ever, like, given a child or an animal medicine, the plastic thing that you deliver it in is the syringe and there's no needle on the end.

Justin: Right.

Sydnee: So, the needle is not necessarily— but I think in our minds we tend to tie it all together.

Justin: Yeah.

Sydnee: The word syringe comes from the Greek 'syrinx', for a pan flute. Why? Why is it? Well, it's hollow, I guess that makes sense.

Justin: Hollow, yeah.

Sydnee: This is tied to— I found this myth here all this comes from. I put a little picture in there.

Justin: Oh, thanks Syd, yeah.

Sydnee: Pan.

Justin: I see a little—

Sydnee: There in our notes, there's a picture of Pan.

Justin: You've never put a picture in the notes before, this is really something. A real AV component for everybody to enjoy.

Sydnee: [laughs] Really a—

Justin: By everybody I mean me.

Sydnee: I'm really growing. Syrinx was a nymph in Greek mythology, and the god Pan tried to seduce her. So she was, like, running away from him and she asked some river nymphs to help her hide, escape, get away from the god Pan. And they turned her into reeds. These myths are always so...

Justin: A lot.

Sydnee: A lot. There's just a lot there. Anyway, she turned into these reeds that would make a horrible sound, I guess, was the idea, but instead Pan took the reeds and cut them into the pan flute which he is often pictured with. You see Pan and he's holding the little flute thing. Anyway, there you go. There's Syrinx, there's syringe, there's the whole history of that, in case you're interested.

Justin: Got it.

Sydnee: I am. I took a class in high school on Greek mythology. I find this stuff fascinating.

Justin: Mm hmm. Mm hmm. Mm hmm.

Sydnee: You don't. Okay. Moving on. [laughs] Early Greek physicians were inspired—

Justin: I'm allowed to not be interested in some things. That's okay. I'm a Roman myths guy myself. You wanna talk about Hades, we can talk about Hades.

Sydnee: That's true. I'm not interested in woodworking, so...

Justin: That's true.

Sydnee: There you go.

Justin: Daddy does woodworking, Mommy loves Ro...Greek myths.

Sydnee: Greek mythology. Among other things. Early Greek physicians were inspired by snake venom. By the idea that somehow in a snake bite they're delivering venom.

Justin: Oh, that makes sense.

Sydnee: And so, the idea of delivering— and a lot of these were like, not— again, the syringe did not have a needle necessarily attached. It was more like the idea of delivering a precise amount of an ointment or something to a site on the body or an open wound or something, as opposed to any sort of like puncturing, sharp instrument attached to the end. Do you know what I'm saying? Really think about— that's why I wanna conjure up that image of the way that you draw up, like, a child's medicine. Or I assume it's the same for animals. But like, it's not the needle. It's just the syringe part. That's why I'm kinda driving that home. Is that that idea came before.

Justin: Okay.

Sydnee: The first attempt at actually using a needle to inject something into someone, so to speak—

Justin: A hollow needle.

Sydnee: Yes.

Justin: Okay.

Sydnee: Like, the idea of the whole unit, not just, like, let's squirt some stuff in the right place, but the idea of an injection, so to speak, we really trace back to 1656. And I'm gonna preface this story with the dog lives, don't worry.

Justin: [laughs]

Sydnee: I know our audience. The dog lives, don't worry.

Justin: The dog does not die at this time.

Sydnee: No. Um, the first— that was the first... person to be injected. Was a dog.

Justin: Now, honey, I want— I need you to—

Sydnee: [laughs]

Justin: Let's take a trip back, I'm gonna back the car up and we're gonna look at that sentence one more time. You let me know if there's any problems with it.

Sydnee: I don't wanna say thing because that's— I mean, it's a dog, it's an animal.

Justin: [laughing] You can't say person, though!

Sydnee: Okay, well...

Justin: That one's taken. [laughs]

Sydnee: The first...

Justin: Being? Living being?

Sydnee: Sure.

Justin: Creature?

Sydnee: Mammal?

Justin: Not person. [laughs]

Sydnee: [laughs]

Justin: [quietly] I love you. It's the point sensitivity goes too far, [laughs] is when you just start boldly proclaiming all dogs are people.

Sydnee: I try to be care— I'm a cat person, but I try to be careful and sensitive to the needs of dog people.

Justin: Yeah.

Sydnee: You know. Anyway.

Justin: As all good jellicles should.

Sydnee: [laughs] Christopher Wren, scientist and philosopher and founding member of The Royal Society of London did these explorations initially. The Royal Society, by the way, I didn't know much about it. I think probably a lot of people do, but I don't much about the origins of The Royal Society. But basically, it was sort of like an informal group of guys — they were guys in the beginning — who got together and sort of talked about stuff. You know? Just like... science and...

Justin: Guy stuff.

Sydnee: No, I don't— I mean, maybe that too. I don't know. But like, understanding of the natural and biological world and all that kind of thing, and usually ended up like—

Justin: And probably cars. You know guys.

Sydnee: [laughs]

Justin: You get a bunch of guys together.

Sydnee: Well, it's 1656.

Justin: Oh, yeah. They're gonna be talking about cars. Gearheads.

Sydnee: [laughs]

Justin: "What do you guys imagine cars will be like?"

Sydnee: "Let's talk about what kind of posters of cars we'll have, with girls in them." [laughs] "And then we'll sell them at book fairs in the future."

Justin: [laughs]

Sydnee: Anyway, they would usually end up at the pub by the close of the night. You know. What I'm getting at here is I wish I was there.

Justin: There. You wish you were there and not here, got it.

Sydnee: I want to go to there and be part of this. This feels like a place that I belong.

Justin: Yeah. You would actually—

Sydnee: Historically.

Justin: hilariously, you would be the one in that group that knew the most about cars.

Sydnee: [laughs]

Justin: So, that would actually be, you'd be cock of the walk there.

Sydnee: I would blow their minds with my book fair poster, car poster knowledge.

Justin: [laughs] "I bring to you a vision from the future! It is... a babe!"

Sydnee: [laughs]

Justin: "A babe on a smoking hot rod!"

Sydnee: And then I would unroll it and it would accidentally be one of the cat posters from the book fair, and I'd go, "Aw, shoot."

Justin: "No, dang it! You guys have cats, right?"

Sydnee: And then they would all laugh and go, "Aww, he's hanging in there! Look!"

Justin: [laughs] "We love it!" And Leonardo Da Vinci is just, like, feverishly taking notes. [Italian accent] "This is the vision I have been waiting for!"

Sydnee: [laughs] We're all over the place here.

Justin: "Hang in there, the cat says!"

Sydnee: [laughs] Okay, okay.

Justin: "Huzzah!"

Sydnee: So, basically, after one meeting, Wren— after they, I don't know—

Justin: [normally] This is why we don't branch into other kinds of history, folks. [laughs] We're just scattershotting this.

Sydnee: I know, we're just... wow.

Justin: Sorry, I didn't realize this would be such a rowdy one, I'm just excited Biden won the election.

Sydnee: This has become an episode of Doctor Who. Doctor Who or Bill and Ted, I don't know.

Justin: Yeah.

Sydnee: One of the two. After one of the meetings, Wren decided to try out some of the theories that they had been discussing. So, I don't know that he has been having a few at the pub or not. We're gonna say we don't know. He may have quaffed a pint.

Justin: Okay.

Sydnee: But they were talking about putting substances directly into the blood of a person. Like, could you— like an injection. Could you inject something into somebody? Is that possible? How would you do it? Whether that be for, like, poisoning or something not nefarious, like something positive. And so, he decided to try it out on a dog.

Justin: Which lives.

Sydnee: Yes, which does live. And he described it like this. There are his words. "I have injected wine and ale in a living dog, into the mass of blood by a vein, in good quantities, 'til I have made him extremely drunk. But soon after, he pisseth it out."

Justin: And so kids, if you're wondering where Spuds MacKenzie came from.

Sydnee: [laughs]

Justin: There it is. There's the origin story, right there.

Sydnee: The story of the dog—

Justin: What's up to my other high 30s, low 40s Sawbones listeners that enjoyed the Spuds MacKenzie bit.

Sydnee: [laughs] The story of the dog is that, uh, maybe he had a hangover, I don't really know that part, but he lived. He was fine. He recovered just fine from this experiment. Grew old and fat and I think was stolen later, but we'll say—

Justin: I would'a stolen Party Dog if I could have, are you kidding me?

Sydnee: [laughs]

Justin: This guy knows how to hold his booze.

Sydnee: He survived his night of scientific fame and drunkenness and was fine. But this early attempt was an IV injection, right? Intravenous. So, they were actually trying to put it— which is not exactly what we're talking about with shots. But it—

Justin: Can you draw a distinction there?

Sydnee: Well, when you get a, when you get your flu shot, for instance, or another vaccine.

Justin: Or your "fssh".

Sydnee: Or your "fssh", they're not putting it in a vein, right?

Justin: Right...

Sydnee: Think about it.

Justin: [whispers] I don't know.

Sydnee: They're just sticking it in the muscle.

Justin: Okay.

Sydnee: It's an IM, intramuscular injection.

Justin: Okay, alright.

Sydnee: They're not putting it IV, intravenous, in a vein.

Justin: Okay, alright, got it.

Sydnee: There you go. Yeah, because you don't— you don't need to have a vaccine delivered into your bloodstream.

Justin: I'll take it, though. Hook it up.

Sydnee: When you get— same thing with insulin, it's not an injection that you get in your bloodstream. Like when a person has to give themselves an insulin shot at home or someone has to give someone an insulin shot at home, they're not delivering that into their bloodstream, their putting it subcutaneously, down into the subcutaneous tissue. If you get a medicine while you're in the hospital through your IV, that is an intravenous medication.

Justin: Got it.

Sydnee: So. Like antibiotics might be delivered that way. Among many other things. Anyway. So, these early attempts were mainly IV injections. Intravenous. And they were— basically, you would get a quill, because they're hollow, and some sort of animal bladder attached to the quill to hold whatever substance. I guess in this case, wine and ale. And I believe Wren later repeated this with, like, basically opium. It was like poppy juice, but it was opium. And you actually at this point would have to make an incision. Because if you think about a quill, that's a lot to puncture. I mean, quills aren't that sharp. I guess you could maybe file them, I don't really know. But you would actually cut open, to get to the vein, and then use the quill to puncture the vein and then deliver it from the animal bladder.

And usually they were— the early experiments were done with pain medications. That's where a lot of, a lot of these things were tried, was— there was no idea, like, what else would you wanna put in somebody. We didn't have a lot of medicines. We didn't really know what we were doing. So, the only things you would try these with were like, I don't know, maybe here's some— "alcohol numbs the pain, maybe some alcohol?" Or, "We're figuring out that this opium stuff is pretty cool, so maybe we give that to people?"

Justin: We almost kind of had the tool before we had the application for the tool.

Sydnee: Exactly. We didn't really know what to do with it, and so it really didn't take into the mainstream for like, 200 more years. Especially

because if you imagine these early experiments, all of a sudden we know how to deliver something like opium directly into the bloodstream, but we have no idea what the effects will be, how much, or the other effects of it.

Some of these early experiments were quite catastrophic and kinda pushed physicians away from this. And said, "Let's not do this." So, it wasn't until June of 1844 an Irish physician named Francis Rind injected morphine into, like, the side of the face around the cheek area of a patient who was in a great deal of pain. And for some reason, like, he did it in June of 1844 but then it was not published, like, an account of it wasn't published until March of 1845 when there was an article in the newspaper, like nine months later, about it.

Justin: Weird.

Sydnee: Where he detailed, like, how he did it and how he used a hollow metal tube and introduced the medication with a syringe. So, this is like the first account of somebody applying it in a way that actually helped and wasn't just to figure stuff out. And all of that kinda culminated in two doctors sort of simultaneously— you know, that happens. We've talked about this on the show before. Where, like, a discovery will be made by two different parties, almost at the exact same time, and it makes it hard to know who—

Justin: Yeah, it's a phenomenon.

Sydnee: Mm hmm, who really made it first. But, uh, two different doctors kind of discovered what we think of as the hypodermic needle as we know it today. There was a French doctor named Charles Pravaz, who gave a sheep that was bleeding some sort of substance to make it stop, a coagulant. And around that same time, there was a Scottish doctor named Alexander Wood who gave a human some morphine. And both of them used what we kind of think of as a hypodermic needle as we know it today.

Wood generally gets the credit for it, although he didn't call it 'hypodermic', he called it a subcutaneous needle. The word 'hypodermic' comes from a British physician. This is all over the place, this is like a really, like...

Justin: We're all coming together.

Sydnee: Like, global effort to come up with this thing. Charles Hunter who, uh, he actually argued with Wood. He was a contemporary, and he said, you know, I like this thing you got going on. I'm gonna call it a hypodermic needle, I'm not gonna call it subcutaneous, and my name's gonna stick, by the way. I've looked into the future and that's the one we're gonna use.

Justin: [laughs] "Trust me. Also, wait until you find out about cars."

Sydnee: [laughs] He argued that— Wood said you could only put the pain medication where you wanted it to work. So like, you had to deliver medications locally at the site of injury, or whatever. Whereas Hunter said, you know, I think you could just inject morphine into somebody anywhere and it would probably...

Justin: Seems you could have tested that really easily. Right?

Sydnee: Well, I mean, I think that they did and Hunter was right and that was borne out, eventually. But Wood gets the credit for the needle. One way or the other. He refined the device so that the needle was smaller. The original barrel of these needles, of the syringe, you know, you think about the big hollow part where the medicine goes. It was hard rubber, and the plunger, the part that you, you know, use to squirt, was made of leather.

Justin: Mm, wow.

Sydnee: Yeah. And they would have, like, oiled leather at the top to try to create a seal. Cause you've gotta have a seal. If you think about it, if you think about a syringe, there's the barrel and there's the plunger part that you squirt it with. But there's gotta be, like, what we think of now as like a little rubber seal part at the top of the plunger, or else the medicine would just fall out, right? It's gotta be sealed.

Justin: It's true.

Sydnee: So they would use, like, an oiled leather so the medicine wouldn't leak out. But all of this, you can imagine, was kinda cumbersome, because leather can warp and change as it dries, as it's stored, temperature and all that. You lose suction. So, eventually they replaced the whole thing with metal. Which was good in that it was a lot more stable, but bad in that you can't see through metal. I mean, *you* can't.

Justin: No, I can't. And even Superman has trouble with lead.

Sydnee: So, you couldn't really see how much medicine you were giving people.

Justin: Yeah.

Sydnee: So, they made marks on the plunger so you could kinda tell how much, but like, none of this is—

Justin: It's not the best way of doing it, yeah.

Sydnee: Right. This is not ideal.

Justin: Also, there's bubbles in there. You wouldn't be able to see them.

Sydnee: Sure. You wanna see what you're doing. So, eventually glass became the default. You can see through it, it doesn't warp easily. You can see where that would be the easiest way to do it. And in World War II specifically there was a version that was called a syrette that was popular. And this was like this little pre-loaded syringe.

Justin: Single serving of morphine?

Sydnee: Exactly. And you could just—

Justin: I just know it from video games.

Sydnee: Well, there you go. You can give somebody a syrette and you knew exactly how much you were giving them for pain relief in the field and you would just have those kind of stocked so you wouldn't have to take the time to, like, get out the syringe, draw up the morphine, all that kinda stuff.

And this was followed with introduction of glass syringes with detachable needles, so that the whole thing wasn't one unit. You could take off the needles, you know, easier to store. You know, you could use multiple different parts on different— you know what I mean? They're all interchangeable.

The first mass production of them for delivery was for the polio vaccine. That was the first time we made a ton of these at once, in 1954, after

Salk created the polio vaccine. That's when you first see these things, like, made in mass quantities.

Justin: Yeah.

Sydnee: And only a couple of years after that there was a New Zealand pharmacist, inventor, Colin Albert Murdoch, who made the first plastic syringe. Which was refined into what we think of today as a hypodermic needle. A plastic, disposable syringe, a separate needle, all single use, yadda, yadda.

Justin: They should have started with the plastic syringe. That's obviously the best one. Think about it.

Sydnee: W— well we didn't...

Justin: Sorry older guys. Sorry about your luck.

Sydnee: We didn't have plastic.

Justin: Should have asked the J-man.

Sydnee: Or cars. Or book fairs.

Justin: Or babes.

Sydnee: Maybe, I don't know, we may have had book fairs.

Justin: Hot rods?

Sydnee: I don't really... maybe we had book fairs. Um, of course, there were some problems—

Justin: They were so hard to create that it was a literally a book fair. Everybody would come for the one book that they had.

Sydnee: [laughs]

Justin: "Hooray for the book! It's done! Don't drop it. Aw, beans. That took me forever to illuminate."

Sydnee: There are issues that arise with this, but before we talk about that, let's go to the billing department.

Justin: Let's go.

[ad break]

Justin: This is the part that Charlie would like, where you admit that there's a bunch of problems with syringes.

Sydnee: No. I just mean—

Justin: The dark underbelly.

Sydnee: It's interesting— it was interesting to me, because like, the history of the development of the syringe is a lot like, I would imagine, the history of the development of any technology.

Justin: Cars, for example.

Sydnee: [laughs] Where you— I don't, I'm not gonna use the example of cars, because I don't... know enough. I mean, I know about cars, like, I know what— you know what I mean. I'm not, like, a car person.

Anyway, the idea of, like, we think we could put something directly into a human but we don't know exactly how to do it, and so we come up with one thing and it sort of works and then you gradually refine it, and then as materials become available, I mean, that's like, everything, right? Like, as we knew better how to shape things out of metal and out of glass, and then eventually with the invention of plastic, like, none of this is much different than a lot of technologies that have been refined, right?

What was interesting to me is that there were a couple of problems that are medical and relevant historically that would arise with the invention of the hypodermic needle as we know it today, especially once they got to something that could be mass produced and easily interchangeable parts and all that kind of stuff, that has great social relevance, medical relevance as we move forward. Beyond just like, "Good job, you made the best version of the thing."

First, doctors didn't immediately understand, like, infection.

Justin: Ah.

Sydnee: And why, if you didn't really understand germs or infection, why would you think you need a different needle for different people?

Justin: Yeah. Aw man, that seems bad.

Sydnee: Yeah. So, this was one issue, is when you first had a hypodermic needle, it was like this great new tool for physicians to use and they were very excited and wanted to use it on a lot of people, and used it on a lot of people. So, this is one problem that quickly arose.

Now, of course, it didn't take us— it wasn't long after the invention of an easily available— I mean, just because these ideas existed in the 1600s didn't mean anybody had access to them. By the time we had these easily available, mass-produced vaccines, or I mean, hypodermic needles, we did understand germ theory and that kinda thing. So, that problem was not long. But this did need to be understood.

Secondly, the quick relief of pain that you get when you give someone an injection of like, morphine was the big standard in the beginning, is so, um, I mean it's such a great thing for a physician to be able to do. Think about how little we could do before that. [laughs] That could provide a patient with immediate relief or a cure or any— I mean, like, we were so, um, lost in the woods with so many things. To have, "You can come into my office in pain, I can pick up this syringe of medicine and give you an injection and immediately solve your problem... "

Justin: Became a little too tempting to use it all the time?

Sydnee: Which is exactly what we see, if that there was this sort of overuse of morphine by injection as a default because there just weren't— and we talk about this on the show a lot, we move through this period of history where everybody got a lot of opium all the time in all their medicines, whether they be from doctors or from the patent medicine salesmen who came to your town, because it did something. You know. And a lot of medicines didn't.

Justin: [laughs]

Sydnee: So, there was a lot of overuse, and this led to the third issue, which is addiction really starts to become a problem as hypodermic needles— first as morphine is introduced to the public and more people experience opioids, but then secondly as syringes become easier to make and more widely available.

Justin: You got people who are getting for a taste for it and then also [crosstalk]

Sydnee: People who can buy the syringes— yeah, exactly. Because before that, if it was just something that maybe your doctor had one of, it would be really hard to give yourself an injection. But once they were something that you could buy... so, with that we have more patients suffering from substance use disorder, um, and as they became addicted to morphine, they had the tools.

So, all these problems sort of arise with the hypodermic needle. I think that's a really interesting social history because at the same time as we have this amazing medical advancement that makes it possible to treat people in a whole new way, and like, really the end of the hypodermic needle story— well, not the end, but the, for me, the culmination is the vaccine. It makes a vaccine easily deliverable.

You know. I mean, if you think about the process of, like, variolation, where we have to in order to inoculate you against a disease we have to cut you...

Justin: Ugh.

Sydnee: Yeah, and then rub substances into you. Like, the way that we used to do it before we could just give you a shot.

Justin: Yeah.

Sydnee: So, it's just, it's this huge advancement. But then obviously there are these unintended side effects from it.

Justin: Sure. Always are.

Sydnee: So, now we have these plastic interchangeable pieces, we have stainless steel needles. You will see glass syringes still, occasionally, for certain medicines. There are just certain substances that do better in glass. So, you will find those. And you'll see medicines that do come— I see them mainly in these little pre-loaded syringes. Those do exist. They're not morphine. I mean, they could be. But the ones I am most familiar with are certain vaccines. You'll see these little pre-loaded vaccines that come.

Justin: Do they save the syringes? Is it just the needles that get swapped out?

Sydnee: Everything gets... everything.

Justin: Seems bad for the planet...

Sydnee: Everything. [laughs] Everything's single use.

Justin: That's a problem number four that I just came up with. A lot of waste.

Sydnee: I mean, you could— now, I say that. You could autoclave things, for sure.

Justin: Yeah, that was the thing I was thinking about, was autoclave. Yeah.

Sydnee: But a lot of—

Justin: But that's so... slow?

Sydnee: There's a lot of stuff that's single use.

Justin: Yeah. [whispers] Autoclave, yeah.

Sydnee: Yeah, and that's— and then, but the advantage of, like, the preloaded stuff though, is the alternative is you have the little glass vials and, um, those work, like you can have a substance in a glass vial, you draw some out of it, inject it into the person, and you can use that glass vial on more than one person as long as you're cleaning it and everything. But, um, those are the two ways you could do it. Needles, in case you're interested, we talk a lot about in the medical world the size of needles.

Justin: The gauge?

Sydnee: The gauge of needles.

Justin: Wire is the same way, that's the only reason I know.

Sydnee: Well then, you can describe— what is gauge?

Justin: Gauge is the, uh, diameter of the instrument that you're using, be it wire or syringe. It's how thick it is.

Sydnee: Exactly. In a syringe, we're talking about sort of the opening.

Justin: In wiring, the lower the gauge, the bigger the thing.

Sydnee: Mm hmm. Same thing. Same thing.

Justin: Okay.

Sydnee: So, that's part of it, and then the length is the other part of it. And that matters because, as I talked about, some things we inject in the muscle, which would need to be a little longer.

Justin: IM.

Sydnee: Exactly. Some things as subcutaneous.

Justin: SC.

Sydnee: There you go. Which just go into the subcutaneous tissue. There's intradermal.

Justin: ... Id?

Sydnee: Sure, id, like if you've ever needed to have a tuberculosis test, a TB test.

Justin: Yeah, I think I have.

Sydnee: It goes right there under the skin. You make a little bubble. And then there's also, of course, intravenous, IV things, which will go in the vein.

Justin: You didn't let me say it.

Sydnee: Sorry.

Justin: It's alright. It's fine, its fine.

Sydnee: [laughs] And we even need needles that can go all the way into the bone marrow. IO, intraosseous. And we have all those different lengths and different gauges. The different gauges, by the way, are in part because different substances have different viscosity.

Justin: Mm.

Sydnee: And so, you need the gauge to be— you need it to be larger, which means the number is smaller, in order for a thicker, more viscous

substance to be pulled through the needle. Otherwise it just won't go through.

Justin: And in wiring, if you have thick, juicy electricity you need lower gauge.

Sydnee: [laughs] And example of a sub-cu injection, like I said, would be like insulin. And you would use, like, a 30-gauge needle. Like, a really tiny gauge. And if you've ever seen, like, an insulin needle, insulin syringe, it's little. It's a tiny little deal. Where, like, your flu shot that you got, or should get if you haven't gotten yet, you could use like a 22-gauge.

Justin: Sure.

Sydnee: Because it goes in the muscle there. In case you're curious, I have found that this isn't always widely known, maybe you already know it, but just in case. When you have an intravenous line placed, an IV line placed, they use a needle to puncture your vein, right? They don't leave the needle there.

Justin: Yeah, when you told me that it really kinda shook my world.

Sydnee: This is part of why I wanted to say this. The needle gets removed and what's left in place is like a little flexible catheter thing inside your vein. Not the needle. The needle is just to introduce it.

Justin: Crazy.

Sydnee: Yes, so— well, I feel like that's worth knowing, because for me, when I learned that a long time ago, it took a way a little bit of the fear of an IV.

Justin: Yeah, yeah.

Sydnee: Because I always used to think once you have an IV in place you have to hold really still or else you'll accidentally poke yourself with it or something.

Justin: [laughs]

Sydnee: And then when I learned that, I was like, "Oh, okay." Well, I mean, you still shouldn't like— I don't know why you've got the IV, but

don't, like, go wild with that arm. Don't, like, wave it all over the place or anything. [laughs] But I don't know, that brought me some comfort. And on another side note, I was thinking for our episode next week, because there's a whole other history of the needle that we haven't gotten into, and that's the history of needle exchange programs. Which I think pairs well with everything we've been talking about.

Justin: Classic Sawbones combo, I love it.

Sydnee: Yeah. So, I think we need to talk about, um, why they are evidence-based and effective public health tools. But the reason we talked about needles, the reason we wanted to get into this is because there was this big announcement just this past week about progress made on a COVID vaccine from Pfizer and Bi... BioNTech? Bio-n-tech? Do you think that's how they— they have then capital N there, so...

Justin: I dunno.

Sydnee: Biontic?

Justin: Biontech? Sure, let's go with that.

Sydnee: Uh, so the results that they have announced are preliminary results, but they're very positive results, from their Phase III vaccine trials. And all this is actually, I think, from what I've read, is even kind of a surprise to them, because the way that they were doing this, they were applying initially for these special, like, they were gonna release data to independent, um, reviewers as the process went, a lot earlier than normal. To try to accelerate things. And they actually have backed off from that, not for any reason other than just like, we're not gonna do that, we're just gonna kinda go by the books. And they have gotten... the preliminary results are way more positive than I think even they expected. They are seeing that patients who get two doses three weeks apart have 90% fewer COVID cases than patients who received a placebo.

Justin: Wow.

Sydnee: Which is huge. We thought maybe 60 to 70%. And of course, this is not the final result. That might change somewhat. But this is really positive early stuff. They're still in Phase III. They are not going to apply for emergency use authorization, that's what we're waiting for. And you'll see that, if you see like, people within the medical world talking about it,

they'll call it their EUA, Emergency Use Authorization. That is the moment where, like...

Justin: Make your dinner reservations.

Sydnee: [laughs] It's good to go.

Justin: Put the kids— go get your football...

Sydnee: Not when they apply for it, but when they get that.

Justin: The moment they apply for it—

Sydnee: No, when they get that, that is the big, like, that's the big hurdle. Now, there's a ton of other hurdles past that, but like, that's what we're waiting for. When one of these vaccines gets emergency use authorization to go for it. And they're not going to apply for that. They haven't yet, and they're not going to, until half of their participants have been observed for side effects for two months after their second dose. So, after they've received both doses we'll wait two months, and when half of their participants have been observed for that period of time and, you know, have not— have done well, have no had problems, then they will apply for the emergency use authorization. That should happen around the third week of November.

Justin: Okay.

Sydnee: So very soon.

Justin: Very soon.

Sydnee: Very soon. But this is all...

Justin: And that should be it for COVID.

Sydnee: This is good news. This is good news. Now, we still need more time to see how effective the vaccine is in preventing severe cases, preventing deaths, all that stuff. You can't bear that out in just, you know, these early months of data and stuff. There are side effects, but nothing too serious to suggest that the risks outweigh the benefits. So far, they're talking about things like fevers, chills, body aches, you know. Sort of what we expect.

And if the vaccine is approved soon, there's still the distribution hurdle. So, again, this is the other piece of it that has to happen is once, yes, you can give this to people, they have to make it and then find a way to give it. Like, how do we get it, what channels do we use for distribution, who gets it first, how do we stratify that? All that. Now... what has been happening the last few months, hopefully, is that all those plans have been put in place.

Justin: Hmm.

Sydnee: Hopefully.

Justin: Yeah... we hope, right?

Sydnee: That is what has supposedly been happening at various levels of government. I mean, I know I will personally say that through my own employer I've received, not like a plan, like a concrete plan, but like... the beginning of inform— I know that we're talking about it.

Justin: Yes.

Sydnee: And I know I'm not the only one across the country who is getting this sort of like, "Get ready, this is coming. We're going to notify you as soon as it's available," blah blah blah. So like, so obviously people are thinking ahead and planning and preparing. So, I'm hopeful. But the nitty gritty is that to give this vaccine to all the people who need it is gonna take some time.

Justin: Yeah.

Sydnee: And a lot of effort. They project that they could have 50 million doses available by the end of the year, and then 1.3 billion next year.

Justin: Yeah. I've heard a lot of talk about protecting our podcasters being sort of a top priority. So, I assume that's you, me, um, and then we'll kind of figure out the other 49,999,998 after that.

Sydnee: You think so? You think that'll be the... there's a lot of, you can read about it, there's a lot of literature suggesting how we risk stratify this, who gets it. Because it has to be an equitable distribution. It can't... [sighs] it's tough, because while some of the vaccines were made using a lot of government funding, which you would think would ensure that it's not just, like, because it's not all for-profit funding, then maybe you could

have some influence over how it's distributed. The Pfizer vaccine actually did not— it was not part of Operation Warp Speed and did not receive funding on the front end. Now, they have agreed, like, the plan was that they were going to receive government funding in the distribution phase.

Justin: Yeah.

Sydnee: So that moving forward, they would receive government funding. My understanding is that they haven't as of yet. So, but there is no suggestion at this point that it's gonna be something that, like, if you're rich enough, you could buy.

Justin: Let's hope we keep it that way.

Sydnee: Right? Well that's what— and it shouldn't be. That's the right idea, is that it should be something where we stratify— this is gonna sound really selfish.

Justin: Healthcare workers first.

Sydnee: [laughs]

Justin: Say it, Dr McElroy. Yes. Sydnee and all her upper-crust friends.

Sydnee: No, I know that sounds really— but like, I... I work in a hospital. [laughs]

Justin: I'm looking forward to never leaving the house once you are vaccinated and I am not. I will not be going anywhere. I don't go anywhere right now, but I will not go *anywhere*. I hope you are looking forward to going to, uh, the hardware store to pick up lumber.

Sydnee: [laughs]

Justin: That is where we'll find ourselves. The immune Dr. McElroy.

Sydnee: I— I— my understanding is that the top tier are gonna be frontline healthcare workers and at-risk, high risk populations are way up there, too. So, that would be people over a certain age limit, I don't know what the cut-off is gonna be, and people with certain chronic diseases.

Justin: Is there a possibility of— we've probably talked about this, but is there a possibility of there being another vaccine to support these

numbers? Like, different distribution channels and different manufacturing pipelines and stuff like that?

Sydnee: My— and this is just me, based on everything I've read about it, so this is my personal opinion. Not only do I think there's a possibility, I think absolutely there will be multiple vaccines available and being distributed so that these numbers that I just gave you for this vaccine will not be all the COVID vaccine that is available.

Justin: Right.

Sydnee: There will be other companies who will receive these emergency use authorizations later. Maybe— I don't know how soon. Maybe even others by the end of the year. But I think definitely moving into early next year. Who will start distributing their vaccines, too. So, this will— my guess is maybe this is the one some of us who are frontline healthcare workers get, but there will be other vaccines that you might get. I'm sorry Justin, you are lower risk. I have to imagine you would be lower down on the—

Justin: You're saying that because I'm incredibly physically fit.

Sydnee: [laughs] But there are plans in place to make sure that we can get it out there, equitably, to the people that who need it most, to the highest risk populations and healthcare workers and so on. Hopefully. That is the plan.

Justin: Thank you so much for listening to our podcast. We hope you've enjoyed yourself. Hope you're looking forward to that COVID vaccine. But also, again, right now you're staying safe, staying home, looking after people, reminding your family members, especially those in vulnerable populations, to please try to be as safe as possible.

Sydnee: Yeah. I know it's tough because we're going into the holiday season and a lot of people want to gather. I understand that impulse. But I've seen a lot of people say if you chose not to gather with your family members next year, it might be a way of guaranteeing we can all be here— this year, we can all be here next year to gather with your family members. So—

Justin: Not guaranteeing. I mean, pianos drop on people all the time.

Sydnee: Okay, well [sighs] you know what I'm saying. Like...

Justin: Meteors... tsunamis... [laughs]

Sydnee: I know it's hard. But I would really advise, like, this is the time to be as cautious as you've ever been during this pandemic, and if you have never been cautious during this pandemic, I can't believe you listen to our show. [laughs]

Justin: Yeah, welcome to your first episode of Sawbones.

Sydnee: But do it now. Now is the time. The end is in sight.

Justin: Thanks to The Taxpayers for the use of their theme song "Medicines" as the intro and outro of our program. Thanks to the Max Fun network for having us on and thanks to you for listening. We really appreciate you very much. That is going to do it for us, but be sure to join us next week for Sawbones, until then, my name's Justin—

Sydnee: And—

Justin: Oh.

Sydnee: And get your flu shot.

Justin: Get your flu shot.

Sydnee: You didn't say that.

Justin: Get your "fssh".

Sydnee: Get your flu shot. Get your "fssh".

Justin: Get your "fssh". Um, my name's Justin McElroy.

Sydnee: I'm Sydnee McElroy.

Justin: And as always, don't drill a hole in your head.

[theme music plays]

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