Sawbones 316: Masks

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[theme music plays]

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

Sydnee: And I'm Sydnee McElroy.

Justin: Now, Syd, tell me if I'm off base here, but as this coronavirus situation continues to unfold, uh… we didn't think it made sense to, week in week out, sort of give you what you're already obsessively reading on your phone 19 hours a day.

Sydnee: I assume. I am. I assume everyone else is.

Justin: Sure. So we uh, thought that we could do some episodes that might provide a little additional context. A little background, a little history. Because as they say… history is the roadmap by which the lines of the future are drawn by navigators.

Sydnee: Do they say that?

Justin: As they say.

Sydnee: That's a lot that they say. It's weird that that caught on as a saying, considering how kind of convoluted it is.

Justin: And verbose. Yeah. Yeah. I'm as surprised as anybody. I mean, congrats to Isaac Newton. I don't know how that quote hung in there so long, but congrats to you, sir.

Sydnee: Uh, I wanted to do some topics that would be true to the spirit of our show, medical history. Y'know, exploring medical history, and how did we come up with things, and all the mistakes we made. But were adjacent to, I think, the relevant issues of today. Because they're on everyone's mind, and it felt disingenuous to just pretend like it's not happening.

But at the same time, I know that a lot of people like to listen to podcasts to escape a little bit. So, uh… I thought we would start with the history of medical masks, of surgical masks and N95 mask, and… then, obviously, we can talk a little bit, at the end, about what that means for healthcare workers today. But uh, but let's delve back into the past.

Justin: Let's go. Hop in the Sawbones time machine. A new trademark that I've just invented.

Sydnee: Uh, before people began wearing masks, they had to accept that they needed one. Which doesn't seem like a huge hurdle, except, as we know, if you listen to our show…

Justin: They're all huge hurdles.

Sydnee: We had to understand, really, the idea that there were germs that spread disease that could be, uh… expelled… through your mouth.

Justin: Right.

Sydnee: Right? Or nose. Somewhere on your face.

Justin: And that—so, it sort of started, like… and we've covered this a little bit, but like, this idea of like, protecting yourself from bad air? Right?

Sydnee: That's true. If you look prior to—I mean, really, the history… as we get into the history of the mask itself, it's late 1800s, early 1900s is the

birth of the mask. Prior to that, if you did wear some sort of facial covering for a med—quote unquote "medical" reason, it would be because of the miasma theory of disease. The idea that bad air, some sort of bad smell, something like that, carries disease with it, and you might inhale it and get sick yourself.

Justin: Right. So you have a mask that would sort of filter the bad air.

Sydnee: Exactly.

Justin: Sometimes with like a sachet of potpourri…

Sydnee: Yes. Now, you are talking about plague times. The big beak masks that held the little… yes. Something good smelling. Actually, y'know, it's funny. You could either put something good smelling in the nose, to like, repel the bad smells, or you could put something bad smelling that would also repel other… like, it was so much worse.

Justin: Given the choice…

Sydnee: There were many ways to repel bad air.

Justin: Yeah. I'm fully gonna go the first one, though, if I'm gonna smell it all day. I think I definitely would want to go…

Sydnee: I would say the potpourri won out for most people.

Justin: Yeah.

Sydnee: There were also, prior to that, there were like, some suggestions of masks, from like, Pliny the Elder. Our friend, Pliny the Elder. Uh, who wrote natural history about, y'know, everything. Everything natural. The history of all natural things.

Justin: The whole natural world as I understand it.

Sydnee: [laughs quietly] He advised that, if you needed to wear a mask – and again, this would've been a very sort of nonspecific use case. Like, if you need one for whatever you might… we don't know why you'd need them, but if you did… he recommended animal bladders.

Justin: Mm.

Sydnee: As a good material to use.

Justin: I don't know enough about animal bladders to know if that would be a good pick or not.

Sydnee: Uh, I… I'm not gonna try.

Justin: Yeah. I guess?

Sydnee: I mean, I guess?

Justin: I don't know.

Sydnee: I don't know. Let's not. We don't need to go to there. No matter how desperate things are, animal bladders are low on the list of suggested alternative materials.

Uh, Da Vinci advised using a wet cloth for protection. Like, to protect your face. That was actually a bad idea. The wet—wet is bad. As we'll get into. Wet masks are not great masks.

Justin: Da Vinci doesn't get up into the mix a lot on Sawbones.

Sydnee: No. I always had to imagine that, if you look into the history of mask wearing, there's a lot of overlap between medical and occupational type hazards. Like, are you trying to prevent some sort of disease state, or are you trying to prevent a noxious inhalation injury of some sort? Like, y'know, whether you're, um, doing art of some sort, or in, y'know, your work as a miner, or in certain kinds of factories. That kind of thing. So like, you get a lot of crossover.

Justin: But it—I'm assuming it's a different… very different sort of… uhh… filtering that you need.

Sydnee: Not really.

Justin: Really?

Sydnee: No.

Justin: Huh.

Sydnee: No, the N95 mask that we'll talk a lot about at the end of the show, and that you've heard a lot about, probably, in the news, uh, is used in occupational hazards to prevent inhalation of substances, just like it is in the medical world.

Justin: Huh! Wow, fascinating.

Sydnee: Yeah. Uh, but, the first kind of concept of like, the masks as we know them today, and wearing them for the reasons we wear them today, really starts in the late 1800s with a German bacteriologist who actually helped create the field of hygienics. He was one of the early, like, y'know, keeping things clean and keeping ourselves clean and preventing disease is a field unto itself, and should be respected and studied, and y'know, taught.

Carl Flügge, who—

Justin: Mmm, that's a good one! Flügge.

Sydnee: Yeah. Flügge. Uh, who demonstrated that you could spread infectious particles – y'know, germs, as we were beginning to understand them – through tiny little droplets in the secretions from your nose and mouth that you couldn't see.

Justin: Right.

Sydnee: So the idea that like, not just coughing or sneezing. Which we kind of—I mean, you know, right? 'Cause like, it's wet.

Justin: Right.

Sydnee: Y'know. If you cough, and stuff flies out of your mouth, okay. If you sneeze, it's wet. So you assume there's something there. So the idea that there were germs in that wasn't too wild to accept. But just talking… you expel… y'know, minute secretions when you talk.

Justin: Uh… it's like just now occurring to me that…

Sydnee: It's just now occurring to you? [laughs]

Justin: Not kidding. I never really thought about—I just always sort of thought it was through like, spit. It's just now occurring to me.

Sydnee: You're just—you can be… I mean, obviously, the amount—the number—

Justin: Like wet cough, I get. And like, wet sneezes, I get. But I just assumed it was through like, droplets.

Sydnee: Well, they're minute, like, microscopic respiratory droplets that are being expelled when you talk.

Justin: They're microscopic! Okay. Wow.

Sydnee: Yeah.

Justin: Man, I'm just—I really am growing a lot as a person.

Sydnee: [laughs] His work, uh, focused largely on tuberculosis. And he talked about the idea that tuberculosis could be spread by these invisible droplets that he called Flügge droplets.

Justin: Ahh! Of course he did.

Sydnee: That apparently didn't stick. Unfortunately, right? Like, wouldn't that have been…

Justin: Carl, maybe just let that one go by. You don't even—you got your Flügge droplets all over me! For the rest of time, that's your like… oh, I'm the germ spit? Like, the microscopic germ spit? That's my thing. That's my jam.

Sydnee: Flügge droplets. I'd take it.

Justin: Flügge droplets.

Sydnee: I'd take if. If they were called Sydnee droplets… ew.

Justin: Ew! It's bad!

Sydnee: No. Never mind. It's the first name made it weird.

Justin: Yeah, the first name would be bad.

Sydnee: But then, McElroy droplets, and it's like, you get to own it. So I want to own—like, Smirl droplets.

Justin: You have equal credit to McElroy.

Sydnee: I came late to the name.

Justin: Yeah, true.

Sydnee: Anyway, so, he began advocating for masks because of this understanding he began… y'know, not just of tuberculosis, but specifically that, and then, other illnesses could be spread this way. And the initial masks that he started advising people to wear, and the other physicians kind

of took up and agreed with, were basically just like… y'know those rolls of gauze?

Justin: Yeah.

Sydnee: Just that, stretched across your face a couple times.

Justin: Like, wrapped around your whole head, or like…

Sydnee: Well, I mean, it was that material.

Justin: Okay.

Sydnee: And you could hold it in place however you wanted to. But yeah, you could just wrap it around your head.

Justin: That's how mummies got started.

Sydnee: [laughs]

Justin: And eventually, like, this doesn't seem like enough. I should keep going. Doot doot doot doot doot… fast forward. Mummy. Mummy.

Sydnee: Just some—and they weren't very common at this point, too. You gotta know, this was like, the very beginnings of a handful of people wearing these things, and everybody else going, "[laughs] Okay. Whatever."

Justin: It's one of the hardest things, like… so often, people doing the right thing throughout history… the first people doing the right thing looked totally bonkers.

Sydnee: Yes.

Justin: And it's like… I don't know, how do you tell the difference between that and regular bonkers? [laughs] I just don't know.

Sydnee: And I mean, we're talking about wearing masks at a time where we still haven't like… Lister hasn't done his thing yet. So like, the whole idea of like, a sterile field in surgery has not been introduced. Gloves are not a thing yet. So…

Justin: Yeah.

Sydnee: This is a radical idea. Um, someone who we have not… I don't think we've talked about on the show before is Dr. Alice Hamilton. And I've now… sometimes when I'm doing research, I get sidetracked by somebody, and I just end up reading everything about them, and then I think, "Well, this is a whole other episode." And so, Dr. Alice Hamilton, for good reasons. Not for Sawbones reasons.

Justin: [laughs]

Sydnee: For good reasons, is deserving of her own episode of Sawbones. Um, but uh, so at some point, I'll do that. But anyway, she built upon this research. And we'll get into—she was an amazing figure in early occupational health, and is partially responsible for OSHA and… was an amazing person.

But, she built on this research, and showed that uh, scarlet fever could also be spread by what she called 'invisible sputum.' And she further showed that the number of—or, showed that if nurses worse masks while caring for patients with scarlet fever, that you could reduce the number of the people who would also get sick.

'Cause that was a common problem, is that you'd be… attendants to the ill would be caring for them. And because we didn't really understand exactly—or we were just beginning to understand how disease was spread, they would get sick. Or, they would carry it over to some other patient who didn't have scarlet fever to begin with, but now also would have that.

And so, just wearing these masks, they cut down on the rate of, y'know, nurses and attendants to the sick that got sick themselves. Um, they uh… she also advocated – she was one of the first to advocate for surgeons wearing masks while they're in the operating room.

Justin: Yeah. 'Cause they're—they got people open, and you don't want to get stuff in there, for sure.

Sydnee: Right. And again, she was talking about not just like, coughing and sneezing, 'cause that seemed obvious. Like, well, I'll just turn my head. I won't sneeze in the patient.

Justin: Right. I won't sneeze *into* the patient. I may be a surgeon, but even I, a common surgeon… I'm just kidding, surgeons.

Sydnee: But she—just talking—[laughs] Just talking, she pointed out. No, but you're talking in the OR, and you're talking. You're spreading these respiratory droplets into the patient. And it's funny, because in some of her studies, she actually counted, like, do you know how many words the average surgeon even says in surgery? And how much they're talking while they're doing this? Which is sort of like a subtle burn, I feel like, on surgeons.

Justin: Yeah.

Sydnee: Like, "Do you know how much you talk in the OR?"

Justin: [laughs]

Sydnee: But you do. I mean, you're in there a long time. You do talk, and of course, y'know, where I work, it's a teaching hospital. Everybody's talking and asking questions and explaining things.

So, masks became a recommendation in the OR because of that. And as a—as more people began to kind of accept the idea that, maybe masks were important, they began to see like, okay, we could use them in the operating room, and that's a good thing. We can use the—nurses can wear them. That could be good. And doctors. Anybody who's in close contact, taking care of patients, to avoid getting sick, could wear them.

And then, Dr. George Weaver in Chicago in 1918 showed that, not only could you put masks on medical personnel, but you could reduce the risk of diphtheria if you could also put masks, um, on the patients.

Justin: Oh, yeah. That makes more sense.

Sydnee: So, you began to say like, "Hey, we could—" And we've heard that here now, with COVID, right? Like, the idea of putting masks on the patients.

Justin: Right.

Sydnee: So, he did—he talked about like, reducing the risk of diphtheria among the nurses and among the other patients. Um, and then, building on that, Joseph Capp said the same thing for members of the military. This was during World War I now, and he's caring for a lot of sick people in a… y'know, members of the military, who all had different things, and are in one room, kind of together.

Justin: Sure, right.

Sydnee: And he observed that cross contamination was a big problem. Like, this person would come in with small pox. This person would come in with scarlet fever. This person had meningitis. And then, they'd all get the same things.

Justin: Right, right, right.

Sydnee: So put masks on the patients. So, now we have built on like, doctors, nurses, patients…

Justin: Is that common?

Sydnee: Everybody could wear masks.

Justin: Is that common to do? I feel like you don't see it a lot. But only through TV and movies or whatever. But I guess you got actors.

Sydnee: To put masks on the patients?

Justin: Yeah. Does that happen a lot in an actual hospital?

Sydnee: No. We don't—unless they're leaving their room, sometimes.

Justin: Mm-hmm.

Sydnee: Like, if they're having to go down for an x-ray or some sort of study like that, then they put masks on when they leave the room. But most of the time, when the patients… 'cause I mean, we're talking about a hospital where like, you're right next to the—like, the patients are all right next to each other.

Justin: Sure.

Sydnee: So, now, we can, if the patient each has their own room, and the people coming in the room are using appropriate PPE – personal protective equipment – then you shouldn't have to worry so much about that.

Justin: That makes sense.

Sydnee: But in a large military hospital where the beds may be pretty close together, and everybody's talking to each other… way more important.

Um, it's also worth noting, Dr. Weaver was also… he started to talk about the importance of cleaning and sterilizing the masks.

Justin: Mm-hmm.

Sydnee: If you're gonna use them again.

Justin: And we understand, at this point, germs and stuff, right?

Sydnee: Yes. Yeah, we are into the early 1900s where we have… we've begun to understand the germ theory of disease.

Justin: We've accepted… yeah.

Sydnee: Yeah. And uh, and also, about the fact that wet masks don't work.

Justin: Why is that?

Sydnee: They just absorb… like, the ability of them to, uh, capture particles is reduced, because they've—because of the liquid that's been absorbed there.

Justin: Oh. Weird.

Sydnee: Yeah.

Justin: Physics.

Sydnee: [laughs] Um, so… Now, like I said, now we have this idea that nurses and attendants and doctors, and now, the patients themselves, could all wear masks, and they were showing greatly reduced numbers of infection among all parties because of this. And then, the question began to turn to, okay, so we know that masks can work. But… what kind of mask?

Justin: Is there a good mask?

Sydnee: Yes, 'cause we're still just using rolls of gauze, basically, at this point. And so, then the question is like, well, we could probably improve on this. This was used out of… it is what we had.

Justin: Right.

Sydnee: So maybe there's a certain mask that's better. So the initial studies were just comparing like, coarse gauze to medium gauze. What they call butter cloth.

Justin: Mmm.

Sydnee: Not like your shirts, but like…

Justin: [laughs]

Sydnee: [laughs] But like, a very close-knit gauze.

Justin: Okay.

Sydnee: Right? Um, and they would—the way that they would test the masks is, they would get volunteers to rinse their mouths with a bacterial solution.

Justin: Eugh…

Sydnee: So like, just like… swish and spit this solution of serratia, is the kind of bacteria, in case you're interested.

Justin: Gross.

Sydnee: Uh, and then, they would have them put a mask on. And they would lay out like, auger dishes. Petri dishes on a table in front of them. And then, they would talk with the mask on of the different substances.

Justin: Talk to the petri dishes.

Sydnee: Yes. And they could talk, and they would have three different trials. Talk softly with the mask on, talk loudly with the mask on, and then cough with the mask on, to the petri dishes.

Justin: [laughs]

Sydnee: And what it showed is that the closer the mesh, the fewer bacteria that were able to get through.

Justin: Okay.

Sydnee: Whether you were talking softly, loudly, or coughing.

Justin: It doesn't matter if you shout at the petri dishes.

Sydnee: [laughs] You could shout at the petri dishes all day, but if it's close enough mesh, the bacteria can't get through.

Justin: Yeah, you're fine.

Sydnee: And again, they proved that the wet mask wasn't helpful. And uh, this was around the same time. By now, we're moving into like, Lister has developed sterile technique, and Halsted made gloves, and people started wearing gloves. And alongside of this, it just became commonplace, if you were gonna work in an operating room, you should wear a mask. And the standard—y'know, first it was the surgeon, then it was all the attendants, and then it was… y'know what, if you walk in that operating room…

Justin: You should probably get protected from these bad germs.

Sydnee: [laughs] They tried to find—like I said, they knew a close mesh was better. They continued to try to build upon that. They did, like, for a while, like a deflection mask, which was like, completely impenetrable, and then had these like, wings on the side to like, force the expelled whatever back behind you.

Justin: It's a little intense. Kind of a, uh, I don't know, Doctor Fate helmet deal.

Sydnee: Uh, but it—

Justin: Rocketeer looking.

Sydnee: What they found is that like—

Justin: [mumbling] Let me see a picture.

Sydnee: While that might change the direction of the expelled germs, it does not—it does not reduce the number of expelled germs that are collecting in the operating room as a whole. Like, you could still swab around the operating room and find bacterial colonies growing.

Justin: Yeah.

Sydnee: So while this was maybe a step forward, it was not—we were not quite at the place where we had the best mask yet.

Justin: Right. Yet. How do we get to the best mask?

Sydnee: Well, I'm gonna tell you that, Justin. But before we do that… let's go to the billing department.

Justin: Let's go!

[theme music plays]

[advertisements]

Justin: Alright, Sydnee. Walk me down the road to the best mask. Where do we begin?

Sydnee: We begin with a, uh, an outbreak of plague, and a Chinese physician named Lien-teh Wu, who was called in by the Chinese Imperial Court to help deal with this new outbreak of plague. It was different than the plague that we had been used to in history. Different than like, the bubonic plague. It was faster. It was more deadly. People got very sick very quickly. It was an outbreak in northern China. And they weren't quite sure how to deal with it. What to do about it.

Uh, and he realized, pretty quickly, he was called in to examine these patients and evaluate them and try to figure out what was going on. And he—the common theory at the time was that this must be spread by fleas.

Justin: Okay.

Sydnee: Right? Like the plague is known to do.

Justin: Sure.

Sydnee: But he said, "I think this is airborne. I think that there's—this is coming from patient to patient. I think they're expelling it to each other. This is like, a pneumonic form of the plague. A lung form of the plague." And he… because he had this theory, he decided, "Well, if I'm gonna examine these patients, I need protection for myself."

Justin: Yeah.

Sydnee: "I don't want to inhale this and get sick, too." So he took the gauze masks that people were using, and he actually layered them with like, cotton, to filter out more material.

Justin: Oh, smart.

Sydnee: And so, he built these new masks that he would wear, um, to help protect himself. And it took a while. When he first proposed this method of transmission and this mask to wear, a lot of people were like, "Whatever. No. This is ridiculous."

Justin: "Seems like overkill to me."

Sydnee: Um, and a lot of the reaction, too, was very racist from physicians throughout especially the western world. Like, I don't even know—no, we're not gonna wear that silly mask. 'Cause it was a lot bulkier, it was a lot bigger than the masks that they were used to. And they're like, "No, we're not gonna do this."

Um, but it was put to the test when a famous French physician, Dr. Mesny, decided he was going to prove this new doctor wrong, this young doctor wrong…

Justin: Oh.

Sydnee: By going and examining the patients himself without a mask on, to show that there's no danger, and it's totally fine.

Justin: Cool. Certainly a better way of doing that.

Sydnee: And then, 48 hours later, he died.

Justin: Wow!

Sydnee: Of the plague.

Justin: That's a lot of germs he got, huh?

Sydnee: And… that is what is recorded. Perhaps it was not quite that fast. One way or another, he did get sick, and unfortunately, did pass away.

Justin: It was just the two of them, so Lien-teh Wu got to report. "No, it was about 48 hours. He just beefed it. This is wild."

Sydnee: And that—

Justin: He went, "I'm fine!"

Sydnee: After that, people believed it. And that was the mask that, as we went through all these years of like, operating room masks and surgical masks, it was quickly the mask that took over from the gauze mask, uh, the cloth masks, the deflection masks that I described… all these different masks just did not outperform this filtered, y'know, layered gauze cotton mask that soon became kind of like… synonymous with physicians.

Like, especially if you look back to like, the Spanish flu days, there's so many… uh, somebody pointed out that the picture of somebody wearing one of those masks in a black and white picture in a newspaper was so

photogenic, that they thought that was part of why it caught on so quickly, because it's that white… big, white rectangle across your face that would show up so well.

Justin: Right, right.

Sydnee: In these pictures. And those are just—you can find tons of them, of medical professionals wearing these masks. And so, everybody wore these masks, and…

Anyway, this was the type of mask that was the standard in medical care for a very long time. Until… really, we get to the tuberculosis outbreaks. The multi-drug resistant tuberculosis outbreaks of, mainly, the 1990s.

Justin: Wow, really?

Sydnee: Yeah. Um, after HIV became, y'know, more commonplace, we saw more patients than we had before that with tuberculosis, and specifically, with strains of tuberculosis that were resistant to a lot of different medications.

Justin: Mm-hmm.

Sydnee: Um, and because of that, the standard gauze, y'know, cotton mask, the surgical mask, I should say. At this point, we're just calling it the surgical mask.

Justin: Surgical mask.

Sydnee: The surgical mask was not enough to protect you from tuberculosis.

Justin: Is the surgical mask like what Lien-teh Wu created?

Sydnee: Yes. It was. It was not identical, but it's built off that.

Justin: I think this is like, really thin, though.

Sydnee: It is. It is pretty thin.

Justin: Oh.

Sydnee: Well, I mean… yes, because now, we have the technology to do the same thing he did without multiple layers of—

Justin: Ohh, right. Okay.

Sydnee: Yeah. But same idea, like a filtering mask.

Justin: Right.

Sydnee: Uh, but not a respirator. This is not what we would call a respirator. Um, which is where we get into the N95 mask.

So, for tuberculosis, we needed better masks. These surgical masks were not gonna cut it. And so, really, at this point, you see the medical community kind of turn to… specifically, like, the mining industry. And to like, the industrial world to look for something better for healthcare workers to wear.

The original respirators… because it was not… it was not too long into mining that people started to figure out that you got sick from mining. I mean, even if we didn't know what black lung was, coal workers' pneumoconiosis. We knew that people got sick when they did certain jobs.

Justin: Right. Right.

Sydnee: Not just mining, but all kinds of occupations, where you will inhale things that can be damaging. And so, the initial respirators that they would have people wear were these like, big, giant, bulky… like, I saw somebody say, basically, if you can imagine being in a really hot enclosed space, wearing like, rubber wrapped around your head, that's what it was like. [laughs] The original respirators. And as you can imagine, that would be incredibly uncomfortable.

Justin: Can you help me clarify 'respirator'? 'Cause whenever—when I hear the term 'respirator,' I've always thought of like, something mechanical, that has some sort of mechanical component to it. What does that mean, a respirator?

Sydnee: Uh, it has to do with just the ability of the um, mask to like, redirect. Like, I'm gonna get—tell you what. I'm gonna get into the actual way the N95 works, and think that'll answer the question better.

Justin: Got it.

Sydnee: Um, so, they—so, the original—like I said, the original respirators were not, um, easy to wear, and as a result, were not worn all the time. Right? If something is that bulky and uncomfortable, you're gonna get a lot of people who aren't really compliant with it, 'cause they can't… y'know, they're gonna maybe pass out, 'cause they're so hot.

So anyway, in 1970, the Bureau of Minds and the National Institution for Occupational Safety and Health said, "We need to have some sort of single use respirator. Something that isn't this big, bulky head thing, that you can just wear like a mask, that will still protect you and filter out particles and all that kind of stuff… but won't make you pass out while you wear it."

Justin: Right.

Sydnee: And that is, by 1972, they had created—3M had created the first single-use N95 dust… that's what it was for initially – a dust respirator.

Justin: Hm.

Sydnee: And it is called that because it filters out 95% of particles that are point three microns or smaller.

Justin: Okay.

Sydnee: Or larger. Sorry. Point three microns or larger.

Justin: Yeah.

Sydnee: So that's where the 95 comes from.

Justin: Not very catchy, still.

Sydnee: N95? [laughs]

Justin: N95. It's easy to forget.

Sydnee: It sounds intense.

Justin: Yeah, it does. It sounds like, "This is the 95th one. We finally got it right."

Sydnee: Uh, the original respirators before the N95 had had like, fiberglass in them, to use as like a filtering material. So instead, they used these um… basically it was like—it was described as like, stiffer gift ribbons. And they had all these like, um… it was like a melted polymer, and they created all these tiny little fibers. Like, imagine little piles of sticks, is a good way to think about it.

And there's big spaces in between them. And as particles – so that's in that mask, between you and the outside world. And as whatever the particles are, whether we're talking about workplace exposures, like, silica. Or we're talking about coronavirus, or any other sort of viral particle or germ. Um, as they pass through your mask into your face, they have to go through all these sticks. And they get stuck.

Justin: Like KerPlunk.

Sydnee: [laughs] It's just like KerPlunk.

Justin: It's like playing KerPlunk with germs.

Sydnee: Um, in addition, they also have an electrostatic charge that pulls things to them. All these little sticks.

Justin: Oh. Unlike KerPlunk. Maybe.

Sydnee: Right. This is why this is—this is a respirator, and not a mask.

Justin: Okay.

Sydnee: All of this technology that I'm describing.

Justin: It's not just filtering.

Sydnee: No.

Justin: Right.

Sydnee: Uh, and because there are all these… but you can still breathe through it. I mean, that's the other thing, though. Like, something that can stop that many particles, you run the risk of it not being breathable.

Justin: Yeah, they messed that up for years, and it was a tough time, I would say, for everybody.

Sydnee: Well, the old respirators were almost impossible to breathe through. I mean, especially if it was hot and you were down in the mine for a long time. So, this really solved that problem.

And the other thing that was great about the N95 respirator is that, the particles add to the filtering ability.

Justin: Ooh! Okay.

Sydnee: So the longer you wear it, the better it works.

Justin: Oh, that's smart. That's so cool.

Sydnee: Yeah. To a point.

Justin: Oh, of course.

Sydnee: To a point. Because…

Justin: And I'm assuming there's not a little sticker that turns from green to red when that happens. [laughs]

Sydnee: No. No, there is no… uh-uh. But there is a point where it's got so many particles in it that like, you can't breathe. [laughs]

Justin: Yeah. Then it's bad.

Sydnee: Then it's bad.

Justin: That's—even a layman could tell you that.

Sydnee: It's not gonna work anymore. Um, so, like, in a dusty environment, it works for about eight hours. You could probably get more use out of it, um, in certain medical situations. But generally speaking, that's the recommendation. Which, like, you have to add up for yourself, if you're gonna reuse them.

Justin: Hm.

Sydnee: Time. How long were you wearing it that day?

Justin: Oh, right right. So like, half day… yeah yeah yeah.

Sydnee: Yeah. And count up the hours and everything, so that you keep track. Um, so, this technology existed. The medical community in the '90s turned to this and said, "This is what we need. This would help us with tuberculosis. We would like to start using these masks."

And up until now, this is the only context in which I wore an N95 mask.

Justin: What do you mean?

Sydnee: Tuberculosis.

Justin: Okay.

Sydnee: When I was introduced to the idea in medical school, I was told, "You need an N95 respirator if you're caring for somebody with tuberculosis. You'll almost never need one of these things." But, we were required to go through what's called a fit test, where basically, they take you to a room, they put the mask on you. There's like, a little metal piece over the bridge of your nose that they have to like, kind of flex… or you can. Y'know. So that it—you want a tight seal.

Justin: Sure.

Sydnee: If it doesn't have a tight seal to your face, it doesn't work.

Justin: They don't work with beards either, right?

Sydnee: Right. So facial hair is a huge problem, as you can imagine, to get a tight seal to the face. So, you put it on. You make sure it's adjusted properly. You got a tight seal, and then you can spray something in the room, like something that smells bad, and see if you smell it. And if you don't, then it worked.

Justin: Great.

Sydnee: It's a fit test.

Justin: Cool.

Sydnee: So that was part of… everybody, I think, in any kind of – not just in med school, but if you're gonna do any sort of like, clinical medicine of any kind. Whether doctor, nurse, respiratory therapist, everybody. You

would have to get one of the—you would have to do one of these fit tests so that you know how to properly do the mask. Right?

Justin: Right.

Sydnee: And to make sure… that's also how they make sure the masks work. That's why there are only certain masks that are certified for this, that can actually work. Like, and if they don't carry that seal of approval, you can't be certain that they're going to work the way that they should.

Justin: But these weren't something that you were putting on day in and day out.

Sydnee: Almost never. I could count on one hand the number of times I had to wear one. Uh, because we thought, perhaps, a patient had tuberculosis, and so, when we cared for the patient, we had to wear one in the room. Even when I cared for tuberculosis patients when I've worked overseas, I didn't wear them regularly. They weren't available, either. But I also didn't wear them, and I do not have TB. My PPD is still negative.

Justin: Uh, why not wear them with every respiratory thing that you suspect?

Sydnee: 'Cause for the vast majority, they're not necessary. For the vast majority, your surgical mask is okay. You could get away with that. Um, and you also, of course, are gonna wear other proper protective equipment, depending on, y'know, what room you're in and what you're doing. But for the majority—especially if you talk about like, uh, in the OR… if you wear—the surgical mask was really created to, um, stop the doctor from infecting the patient.

Justin: Right. Okay.

Sydnee: So, you can—if you are the one who is concerning to be the vector of disease, a surgical mask is fine.

Justin: Okay.

Sydnee: That will hold in the vast majority. I'm not saying it's 100%, but it will work just fine for those purposes. Um, the N95 is not necessary for most cases.

Justin: Complete overkill.

Sydnee: Yeah. It's just—I mean, it's great when you need it, but you don't need it most of the time.

Justin: Mm-hmm.

Sydnee: Except… and like you said, it is important to note that, um, facial hair messes with them. They're not really—they don't work great for kids most of the time. For most of us, they work most of the time. They're not for everybody. There are some issues.

But, now we need them.

Justin: A lot of them.

Sydnee: Yes. Now we need a lot of them. All of our healthcare personnel that are caring for patients with coronavirus, with novel coronavirus, with COVID-19, need this. Um, you can put, like I said, a surgical mask on a patient. I've seen that recommendation a lot, who is either a person under investigation or been diagnosed. You can put the surgical mask on the patient right away, if you didn't have access to an N95 right away, and that is gonna help.

But it doesn't help if the patient needs an airway. If you're, y'know, if you're gonna be intubating a patient, then you can't… you need protective equipment. You, the medical professional, need protective equipment.

So, now, we need N95s. We need these respirators. Uh, they have—it's really weird, 'cause it was really something that I… I could count on one hand the number of times I wore in the hospital.

Justin: Yeah.

Sydnee: Up until now. And now, you need them. Like I said, you can reuse them, but you have to be really careful, because the—they are… like, if you walk into a room, and are exposed to coronavirus particles on the exterior of your mask…

Justin: Yeah. Then it's bad.

Sydnee: Well, now it is contaminated. And you can't, then, just wear that same mask into the next room with a different patient. Especially, what if they don't have it?

Justin: Right, right.

Sydnee: Y'know, and more—more worryingly, if you go to remove that mask, and you touch the surface of the mask…

Justin: Oh, of course. Yeah.

Sydnee: That's a big problem with masks, is not touching them, because they don't work very well if they're… they're trapping viral particles on the outside, and then you're touching them.

Justin: Touching the outside of them. Right.

Sydnee: Yeah, that doesn't work. Um, so, while they can be reused, it's ideal—in an ideal world, you wouldn't have to. And if you are gonna reuse them, you have to put some sort of covering over the outside of it. So like, you'll see… it's commonplace, at least around here, to put an N95 on, and then put a, um, surgical mask over top of it.

Justin: Okay.

Sydnee: Um, now, you still should not wear it into another patient's room, ideally. I have read that, across the country and across the world, people are doing that. Because they have no other option.

Justin: Right. Well, of course. Yeah.

Sydnee: Like, this is your mask for the week. Make it—make it last. But ideally, what you would do is, if you're gonna reuse it, just reuse it for that one patient over and over again. But um…

Justin: I heard some people—and you did this, right? Like, leaving their mask outside the patient's room.

Sydnee: Mm-hmm. In a paper bag. Yeah. Uh, again, if the mask is wet, it's not going to work, so don't…

Justin: Don't get it wet.

Sydnee: Yeah. I mean, if it's—

Justin: Like Gremlins.

Sydnee: If it's wet, you need a new one.

Justin: Don't get it wet. Don't feed it after midnight. I don't even know how you'd do that. [laughs] Honestly.

Sydnee: And then, of course, alongside the N95 respirator now, to properly protect yourself when caring for a patient who has coronavirus, you need gown, you need gloves, and you need some sort of eye protection. Ideally, those face shields. Have you seen those?

Justin: Yeah.

Sydnee: Those are the—that's the best. That's better. With that and an N95 underneath is much better. Goggles are all that was available when I was recently working, and so, goggles with help. But ideally, one of those face shields is better.

Justin: Does that keep it from going in your tear ducts?

Sydnee: Just any—well, anywhere in your eyes.

Justin: Sure, right.

Sydnee: Not just the tear ducts, but anywhere on your eyes.

Justin: But especially the tear ducts, you'd think?

Sydnee: [laughs] Sure. Especially the tear ducts.

Justin: Thanks.

Sydnee: And then, of course, hand washing. Not touching your face. Not touching the outside of your gown. Your gloves. I mean, your mask. There's a very specific way to don and doff personal protective equipment, and before… I mean, that's important to know. It's not something that you can just throw on and go in a room and be safe. You have to know how to put it on and take it off appropriately.

Justin: Sure.

Sydnee: Or else you'll end up accidentally infecting yourself, or perhaps someone else. The uh… the cloth masks – that's a big question a lot of people have asked, about the home made masks.

Justin: Sure.

Sydnee: Um… it's sort of a—it's a double-edged sword. If you—if they're made effectively and used appropriately, there is a place for them. And certainly, if we're not gonna have enough standardized, y'know, NIOSH certified N95 masks, we need something.

Justin: Yeah.

Sydnee: And I've seen recommendations out there, like, "Well, you can just use a bandana." Well… no, that's not… [laughs] That's—that's barely effective at all. So, these masks are definitely better than that. Um, homemade masks. There's just—there are ways to make them. I've seen a lot of people using like, filtering material, which is way better than just like, a piece of cotton.

Justin: Right, right.

Sydnee: And so, those are better. Uh, and the uh—but the thing is, like, if you're gonna wear 'em, again, you cannot get them wet. Uh, they uh… need to be sterilized, if you're going to reuse them. Some of them that are cloth can be like, washed and sterilized and all that in between uses. And so, you would need to do that and completely dry it out.

Um, and they certainly shouldn't be used to give you like, a false sense of security.

Justin: Right. Know that you're still at risk.

Sydnee: Exactly. And so, if we're talking about, as an adjunct for medical personnel who have no other options at that point and need something to keep them safe, then, this is great. And all the people who are making them, thank you. You're doing a huge service. Keep it up. Yes, we need these.

However, if you're making one so that you can wear it so you can go back out in public and… [laughs] Go hang out with friends, or go not social distance because you think that you have this mask on, and now, y'know, now you're safe… no. Then they would be giving you a false sense of security. No, you can't. They're not going to do that.

Justin: Y'know what? Don't do it, even if you have an N95.

Sydnee: Well, no. You shouldn't be, right? You shouldn't be wearing a surgical mask. You shouldn't be wearing an N95. You should not be wearing those around just so that you can go—if you are a well person, just so that

you can go be out in the world more. No. Healthcare workers need that equipment, not you. Stay home. That's the best thing you can do.

Justin: Yes.

Sydnee: So, uh, y'know, I think it's… I think it's a tough thing. I know a lot of doctors have said, it shouldn't come to the point that we have to use homemade masks. But obviously, it has come to that point in some parts of the country. And they're definitely better than trash bags and bandanas, which are—which are also being used.

If they do keep you from cov—touching the outside of your mask… that's the other thing I thought they would be very helpful for.

Justin: Sure.

Sydnee: You won't accidentally grab the front of your N95 if you've got that barrier there.

The other thing, though, is just stay home. [laughs]

Justin: Yeah.

Sydnee: That's for everybody else who's not a healthcare worker and doesn't have an essential business that they have to work at. Just stay home.

Justin: Yeah, please. I'm—I'm worried about, uh… y'know, I'm, of course, a little bit biased here, 'cause I… care very much about one particular healthcare worker. But um, y'know… they're doing their best, and it's bad in some places, and it will get worse. So do the—do what you can do. Do this thing that you can do, if possible. Please.

Sydnee: Yes. So you stay home, and let the healthcare workers wear the masks so that they have them when they need them, so that they can take care of… everybody else who's sick.

Justin: And I've been driving around… like, when I'll go to pick up like, groceries or dinner or whatever, on my essential trips where I'm sterili—I'm just gargling hand sanitizer… no. We don't have hand sanitizer. That would be good, though. Uh…

Sydnee: We do wash our hands. Wash your hands. 20 seconds.

Justin: Yes. Uh, Sydnee's mom got us one pack of Clorox wipes that she used to disinfect after the hospital. Those are pretty intense. [laughs] Those are like…

Sydnee: Those are not made for your skin. [laughs]

Justin: No. They are not for skin. They are…

Sydnee: Those were for, uh, my phone and my watch, and um… yeah. That is what those were for, when I came to the door, and then I would wipe down the door handle.

Justin: Yeah. But I see, like… I still see some local dummies, like, hanging around. Especially like, teens and 20 year olds. If you know any local dummies in your neck of the woods, tell them to like, just take it seriously, please. [laughing] Just to… I feel like if everyone could reach out to one… local dummy, then we could get to a lot of them.

Sydnee: I would not call them that, though, if you're going to reach out. There's probably—I would say, the more effective way is to say, "Hey, I'm concerned…"

Justin: "That you're dumb…"

Sydnee: No. That your behavior may end up in you getting sick, or somebody you care about getting sick, and y'know, could I help—is there anything—y'know, is there a reason why you need to be out now? Maybe there's an errand you need. Maybe you need food or something, and I could help with that. Let's talk about this from six feet away.

Justin: I've resorted—

Sydnee: Or even better, like, could we talk on the phone about it? Now that I've insulted you, could I have your number so I can call you from the safety of my home and discuss with you why you shouldn't be doing this? [laughing]

Justin: I've resorted to just shouting out the window. "Six feet! Six feet! Come on!"

Sydnee: Please!

Justin: Please.

Sydnee: Please. Uh, I would not advocate calling the police. I've seen that advocated. I would not.

Justin: [laughing]

Sydnee: I would not advocate that. There's a lot of other issues, I think, with using that as like, your…

Justin: Just paintball guns, folks.

Sydnee: No. No!

Justin: I'm kidding! It's just a joke, Syd! Sheesh! You're so mad.

Sydnee: I don't want anybody to think you're serious. I don't know, I mean, the best you can do is just remind people that like… you're not a bad person. You care about others.

Justin: Just do this.

Sydnee: Y'know, I know you're not a bad—

Justin: Just one thing.

Sydnee: I know you're not doing this because you are malicious and wish harm, and you probably don't think this is a big deal. But it is. And I'll give you the benefit of the doubt and say I know you're a good person who wants to do the right thing, and so, let me just encourage you.

Justin: Yeah. Um, folks, that is gonna do it for us for this week. Thank you so much for listening. Thanks to the Taxpayers for the use of their song, Medicines, as the intro and outro of our program.

We are gonna be, uh… next, uhh, let's see… or actually, I guess—well, this coming Friday, next Fri—I don't know when exactly you're listening to this. But it will be on um, April the 3rd, from eight to 11:00PM Eastern time. My brother, Travis, is doing a Cincinnati Underground Secret Society show to raise money for, uh, equipment for healthcare workers responding to COVID-19. Tickets start at five dollars, and are available at bit.ly/CUSSLive. Bit.ly/CUSSLive. Sydnee and I will be on that stream at some point, and we hope you will join us in raising some cash.

Sydnee: Yeah. And thank you everybody out there for, um, staying home and staying safe and washing your hands, and… being good… good believers in science.

Justin: Stay hopeful, stay home. That is gonna do it for us for this week.

Sydnee: Knowers in science. Not believers. Knowers.

Justin: Knowers.

Sydnee: Yeah.

Justin: Not as catchy. That's gonna do it for us for this week. Until next time, my name is 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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