

TPWKY_EP 202_Cancer 1

EW: [00:00:00] Throughout this series, we'll be discussing many aspects of cancer diagnosis and treatment, and we will be sharing several personal stories related to cancer. Some listeners might find this content upsetting. Please listen with discretion.

Firsthand 1: Do you know that you can live without a jugular name? Those were the first words my surgeon told us after he removed said vein. During my second exigent surgery for squamous cell carcinoma, six months earlier, the newly discovered cancer was isolated to my tongue and lymph nodes. The cancer was brought on by the human papilloma virus. HPV as a Gen Xer, I probably got it long ago. However, my children are likely to be spared HPV and this kind of cancer. Because of the Gardasil vaccine, the cancer was removed with grid margins, meaning they probably gotten it all. Then came the radiation to sweep up any stray cells hanging around. I received the largest dose possible 30 sessions directed at my neck and mouth before radiation began, I was told there was a deterioration risk to surrounding bone structures. I brushed it off thinking, saved my life. Nothing else matters. However, the radiation did not stop an immediate recurrence. That's when it was wrapped around my jugular vein. Then I began chemotherapy. This required me to mask after each treatment so as not to contaminate the air with chemo, I was only a few treatments in when the world shut down due to the COVID pandemic because the public was buying up medical protection supplies. Oncology ran short and I had to source my own masks. Chemo worked where radiation had not. I'm in remission, but cancer is still a part of my life. As predicted, the large radiation dose ravaged the bones of my jaw. It's been seven years since cancer, and I still face an extensive eight hour surgery just to repair the damage from treatment itself. The inevitability is that without this procedure, it's only a matter of time before my jaw simply breaks. There was no saving my teeth. Eating without them and with a partial scarred tongue is difficult and limited. I needed physical therapy to learn to swallow again. Since dentures are contraindicated, I'll be living with the stigma and drawbacks associated with toothlessness for the rest of my life. Still beats being dead.

Firsthand 2: My name's Louise Baines and I have stage four triple negative breast cancer. I was first diagnosed stage three, eight years ago. At the age of 39, I had the standard treatment chemotherapy surgery radiotherapy, um, was eventually back to some semblance of normal. And then in 2023, I found a suspicious lump in my armpit, a new lymph node tumor. I had more surgery, more chemo, but at the end of that year, sadly, a CT scan found widespread bone mets and lymph node tumors in my chest. My world fell apart for the third

and most ominous time. I was told I'd need to be on treatment for whatever time I had left. Thought to be around two years, treatable to a point, but not curable. Seeing palliative chemo on my notes was a bit of a shock. Triple negative is aggressive and can become resistant to treatment. My first line of therapy, chemotherapy and an immunotherapy got me stable, pretty much obliterated all my bone mets, but I had progression after a year, so I moved onto a new drug. This was a targeted chemotherapy that had only been around for a few years. It gave me hope to find some of the ladies on that original trial were still stable or no evidence of active disease. Even after five years, I took part in a clinical trial with my primary chemo, which added a, an extra trial drug into the standard treatment, and I became fascinated with the science behind the treatments. Researching the history and development of each drug became really interesting to me. That first study didn't show any better outcomes than standard treatment, sadly. But being part of the research made me feel like I was helping in some small way. After my second line of treatment started to show resistance, after another year, I decided to look for another clinical trial.

I only have a few options left for suitable chemos, and while I'm still pretty fit and well, I don't want to use them all up too fast. I was approved for a trial at the Royal Marsden in the uk, and I'm being really well looked after. I'm on my second cycle of a targeted immunotherapy plus a standard immunotherapy similar to what I had as my first line. It's a phase one expansion trial, so the drug has shown some promising results in one type of cancer and is being expanded to include other difficult to treat cancers like mine. I'm quietly hopeful. I'm now two years into my diagnosis and I didn't expect to still be here. Research is very important to me and I'll be forever grateful for the extra time I've been given with my son and my husband and my friends. Statistics haven't [00:05:00] quite caught up with the current treatment, so I wouldn't recommend Googling for a prognosis. According to that, I should be in the ground long ago, but right now I'm living well and hopefully we'll continue to do so for as long as I can. Thanks to science.

EW: Thank you so, so much for sharing your story with us, and a huge thank you to everyone who has written in with their experiences. It is, I mean, it is so incredibly meaningful that so many of you are willing to put yourselves out there and share such an intimate part of your lives. These firsthand accounts are truly, truly are the backbone of this podcast.

EAU: They really are. Like, this podcast would not be the same without all of you and all of your stories. And we have a lot more that we're going to be sharing throughout this episode and throughout this series that we're putting together. So truly, thank you so much to everybody who took the time to submit

your story, to write in, to record yourselves. We really wish that we could have included every single story because they all mean so much to us. So thank you.

EW: Yeah. Hi, I'm Erin Welsh.

EAU: And I'm Erin Allmann Updyke.

EW: And this is, this podcast will kill you.

EAU: Welcome to our series on Cancer.

EW: On Cancer. Yeah. What, I don't know why a topic, what we made this decision. I mean, it's such a big topic. I mean, we made the decision because it is, it has affected so many people. It is such a big topic, and if we ever wanna go into certain cancer episodes in the future, we need to lay a foundation. And that's what we're doing. That's what we're doing. Right, right. We have got four absolutely info packed episodes ahead of us. Mm-hmm. Where we're gonna be covering this tremendously huge, monumental topic.

EAU: In only four episodes.

EW: In only four episodes. Oh, there's like a lot of material here.

EAU: Oh yeah.

EW: We'll, yeah.

EAU: You can't see our folders, but they're thick,

EW: they're, this is one episode's worth. Mm-hmm. Yeah. But when we first decided that we wanted to do these episodes, we immediately kind of, okay, we asked ourselves, what do we wanna cover? How do we wanna approach this? What aspects to focus on? Mm-hmm. And how to organize them in a way that made sense, right. So that we could just like, again, lay a foundation. Mm-hmm. So our goal with this series is to do that, is to kind of give you the background information about what cancer is, how we treat it, and also where do we go from here. Yeah. And so, with that in mind, our first episode, the one today mm-hmm. Explores what cancer is both conceptually and clinically. And how we came by that knowledge, the second delves into what's happening inside and outside of our bodies to make cancer so prevalent. And the third is all about treatment. Which is a lot a big, that's big episode. I mean, they all are. And the

fourth and final episode surveys the current landscape of cancer around the world and asks, you know, what, what can we do about

EAU: this? Yeah. Where do we go from here?

EW: Yeah.

EAU: So it's a lot, there's a lot of ground mm-hmm. That we're going to be covering, but as much as we are covering, there is a lot that will necessarily remain unexplored in this first of our cancer series. Yes. So please, everyone listening and watching know two things. Number one, uh, we have. A really huge list of sources for these episodes that we put together. Massive, massive. So if you want to read more, there is tons that you can look up and read just as a starting point. Mm-hmm. Um, and number two, these are not the only cancer episodes that we've ever done or that we ever will do. Um, we have a lot of plans to cover a lot of the individual cancers that we'll be talking about and touching on in this episode. Um, so we also would love to hear from you if you have particular cancers or particular topics that you wanna hear a lot more about. Yeah, I know, just like we know that we'll need to do colon cancer very soon.

EW: Yeah.

EAU: Um,

EW: and we will be doing, it'll let we us know your thoughts. Like, again, we always ask for thoughts. Yeah. But like, especially in this, what do you want to hear more about?

EAU: Exactly. Exactly. Yeah.

EW: And as you'll hear, you know, no two cancers or experiences with cancer are alike. And so we are again, so grateful to our firsthand account providers for showing us just a sample. Really? Yeah. Like a, a sample of the diversity of ways that cancer can touch our lives. I know, you know, in these episodes what we focus on is primarily cancer as like a biological phenomenon. Mm-hmm. Not necessarily the experience of cancer. Yeah. And so we are, again, eternally grateful to all of you who have provided this important context and, you [00:10:00] know, sharing your experience from, of someone who has been diagnosed with cancer, who's undergoing cancer treatment, who's has a loved one, who has cancer, who's a caregiver, you know, all, all of these different facets, right. That are so. Integral to the experience

EAU: we really like. Can't say enough.

EW: I know. I know

EAU: how much these firsthand accounts mean Absolutely everything to us. Yes. And in this cancer series especially, it's been so meaningful to get to hear from so many of you. So thank you again. Thank

EW: you. Okay. Okay. One more piece of business, just

EAU: a little bit.

EW: And that is, uh, quarantine time.

EAU: Quarantini time.

EW: Actually though. It's placeborita

EAU: time. It's placeborita time.

EW: Yeah.

EAU: Yeah. We, I guess this is an announcement that we're making. It

EW: kind of is.

EAU: Um, we've been doing this quarantining business since we started the podcast and it's actually one of the things that really clinched the idea of doing this podcast will kill you. Because Erin came up with the name quarantine and it was too good to pass up. Um, but we thought that. As we'll learn. So we've talked about alcohol before. Mm-hmm. Uh, and the problems with alcohol mm-hmm. In the past. And so we thought that this series today, starting today, would be a fitting time to no longer include alcohol in our quarantining recipes.

EW: Yeah.

EAU: So they're technically all gonna be placebo burritos.

EW: They are, they are. I mean, we're still gonna use the term quarantining because it's, it's really good. It's, I can't let it go. I can't let it go.

EAU: But I'm also quite proud of placebo. Rita, that's really good too.

EW: I re and I remember when that we came up with that. Yeah. It was on the, it was on the fly.

EAU: Yeah.

EW: Again,

EAU: it was, yeah. I think while we were recording, wasn't it?

EW: Yes.

EAU: Yeah, that was good.

EW: Yeah.

EAU: Okay.

EW: Yeah. Well, okay. So what is our quarantini,

EAU: what is

EW: it for this series, Erin?

EAU: We're drinking the crab.

EW: The crab,

EAU: because cancer,

EW: yeah.

EAU: It's, that's what it is.

EW: Yeah.

EAU: It's basically an affogato. I actually really wish that we had one that would be delish. So

EW: good. I could use a little caffeine

EAU: right now. A little, a little boost.

EW: Yeah. Yeah.

EAU: Um, but you can, it, you know, we'll still post a, a on our Instagram or whatever.

EW: Wow. We ringing endorsement of our social media.

EAU: Listen, we'll still

EW: post

EAU: we

EW: something.

EAU: Our social media game could probably use some work at this point, but we're trying our best.

EW: I know, I know, I

EAU: know. Um,

EW: we will post it there

EAU: and find

EW: it. You know, it's an a you can look it up the recipe, but also look up the crab because you know, we did make the effort.

EAU: You mean our version of

EW: Yeah,

EAU: yeah, exactly. Yeah. So follow us on social media. If you're not, is what we're

EW: trying to say. Social media. That's one way you can find what we're doing, Uhhuh. It's one of the best ways. Another great way is through our website. Our website. This podcast will kill you.com. On our website, you can find all sorts

of things like transcripts. You can find, uh, the sources for each and every one of our episodes. You can find a firsthand account form you can find, uh, contact us, form other things. That's all I'm gonna say. All links to Patreon and merch and other things.

EAU: All kinds of things.

EW: Yeah.

EAU: That's great. Um, thank you for rating, reviewing, and subscribing on your favorite pod catcher or on YouTube if you're watching this.

EW: Yes.

EAU: Uh, we're hearing the exactly right. Studios. Thank you to everyone. We are. Who is Thank you, thank you, thank you. Working right now.

EW: This is the longest intro of all time.

EAU: Are we done yet?

EW: Yes.

EAU: Okay, great.

EW: We're done. Let's take a break.

EAU: Okay. And then, and then get into it.

EW: And then get into it.

EAU: Thanks. Great. Bye.

Firsthand 3: My name is Amanda. In 2019 at 52, I was diagnosed with stage three triple negative breast cancer. The diagnosis was a shock, not only because of its severity, but because I truly believed I was doing everything right. For years. I followed a clean alternative wellness lifestyle. I ate organic, avoided plastics, used non-toxic products, took supplements, exercised regularly, maintained a healthy weight on a low carb diet, and didn't smoke. One pivotal decision was replacing annual mammograms with thermal imaging. It felt empowering. In hindsight, it was a serious mistake when I found a lump in my

left breast, I turned to thermal imaging. The scan came back, low risk for cancer. The practitioner diagnosed it as a cyst, suggested rebounding exercises and castor oil rubs, and confidently told me it was far too large to be cancer.

That reassurance was dangerously wrong. The lump didn't shrink. It grew quickly and painfully. When I finally saw a breast radiologist to aspirate what I believed was a cyst, my cancer journey began. I was thrust into aggressive treatment because my cancer demanded it. I underwent six cycles of chemotherapy, including the so-called red devil. I tolerated it well, and the results were remarkable. The tumor disappeared completely. Surgery followed first lumpectomy, then a unilateral mastectomy due to residual disease. Losing my breast was and remains a profound loss. I still [00:15:00] wonder whether earlier medical intervention might have changed that outcome. Radiation and oral chemotherapy followed during South Africa's COVID lockdown. The treatments were challenging but manageable. Cancer forced me to reevaluate everything I thought I knew about health. Over time, I stopped trusting methods that offered certainty without evidence and learn to hold space for both intuition and science.

My version of health today is far less rigid, less fear-based, and more informed. I have seen how vulnerable people are to misinformation wrapped in hope and sold as wellness. And if there's one message I hope people take from my story is that there's strength in questioning our beliefs and in choosing evidence-based care.

Firsthand 4: Hi, my name is McKenna. I live in Ormond Beach, Florida, and when I was 15 years old, I was diagnosed with stage three angiosarcoma, a rare form of bone cancer. My odds of survival were about 50/50. I underwent countless rounds of chemotherapy and had a surgery to remove my left fibula. Because of how aggressive the type of cancer I had was, cancer immediately became my entire life. I was pulled from school and spent most of my time in the hospital. It felt like I didn't exist outside of my disease. There was also just this chance I wasn't going to. Chemotherapy is also pretty violent in nature. It felt like every part of me had to be stripped away in order to get rid of the tumor. I lost my hair. My toenails will turn black and fall off. I had horrible mouth sores that kept me from eating. I had chronic insomnia. It felt like I kept giving and giving until, by the end, I was just the shadow of a person with really only my life left. I ended up responding well to treatment though, and I was able to go back to school for my senior year of high school two years after my initial diagnosis.

At first, I was excited to go back and felt it would be a new chapter for me where I could be a normal kid again. Instead, I began a whole different type of suffering sitting in a desk. I felt like I didn't know how to exist as a person anymore. I'd gone from being 15, still coming into my own to cancer, becoming my entire life. I now couldn't claim the cancer identity, but also physically and mentally. I didn't resemble the person I was before. Looking in the mirror, I followed disassociation to that person and couldn't grasp who I was. At the same time, I was suffering from PTSD. I was continuously having panic attacks and took myself to the emergency room on a couple of different occasions, convinced my cancer had returned, and I was going out to start the process all over again. I ended up becoming severely depressed and got to the point where I really didn't wanna be alive anymore, which brought on a deep survivor's guilt for even having these feelings people weren't very understanding of. This ended up being a really isolating and lonely time in my life, and I just wish someone had told me that what I was feeling was completely normal.

One in five people ended up with PTSD after cancer treatment. It took me years to find a sense of self and peace again. This past July was my 10 years cancer free. I'm eternally grateful for all the moments and experiences and things I've been able to accomplish since I was that 15-year-old. I'm truly so happy for my life, but I also wanna go back to tell myself that what I was feeling was okay. I didn't need to feel grateful for something that should have never happened in the first place. No matter what, I was always deserving of my life.

EW: 40% of us will develop cancer at some point in our lives. 17% of us will die from cancer.

EAU: Gosh, those are such sobering statistics, Erin. Really? Yeah,

EW: I know.

EAU: Wow.

EW: The number of times I double checked it. I know. And was like, confirm other sources. Is this right? It is. And again, you know, these are estimates, right? They are not destinies. Yeah. Our knowledge is always evolving. Treatments are always improving. We're putting more funding into prevention. And so we might see those numbers shift. Mm-hmm. In the upcoming decades or for future generations. And neither are these numbers globally consistent, you know, diagnosis, access to treatments and screening and demographics vary dramatically across countries. Right. But no matter how much you hedge or

qualify these estimates with, well, technically the undeniable reality is that cancer is extremely common and quite deadly.

EAU: Yeah.

EW: Why? Why, why that, that one word question has inspired countless research articles, medical foundations, textbooks, hospitals, memoirs, documentaries, podcasts. It has shaped lives, careers, relationships, perspectives. Mm-hmm. It holds the key to understanding not just this disease, but multicellular life itself. Over these four episodes, we might not fully answer this question of [00:20:00] why,

EAU: why? Yeah.

EW: But we are going to explore many different aspects, many dimensions of it, like why cancer is so prevalent.

EAU: Mm-hmm.

EW: Why it's so challenging to treat and prevent why each cancer is unique. Mm-hmm. And why, despite all these why's, we should still be optimistic about the future of cancer research. I

EAU: like that part.

EW: Yeah. But before we approach any of these individual questions, we need to start at the beginning. What is cancer?

EAU: What is

EW: cancer? What is it? Drawing the bounds around what cancer is and what it isn't is trickier than it sounds. Mm-hmm. Like, just ask our immune systems. Mm-hmm. And those boundaries have changed substantially over history. And so for my part of this first episode, I'm going to explore how our understanding of cancer has changed over time and how that has influenced the noise or the silence surrounding it.

EAU: Okay.

EW: Okay. In the early decades of the 20th century, after the dust had settled from vaccines, pasteurization, sanitation, and a septic technique and antibiotics, much of the world was surprised to find that a health revolution had taken place.

EAU: Oh.

EW: Infectious disease, which had four millennia made an early grave. The expected norm no longer held the power that it once held. Hmm. Children drinking pasteurized milk and vaccinated against smallpox could now more reliably expect to live long enough to experience the joys and disappointments of adulthood and adults drinking clean water and operated on by a surgeon with a clean blade. Were now more likely to feel the mixed blessing that came with the aches and ailments of old age.

EAU: What? This is so interesting already, Erin, because like I just, okay, keep going. Keep going. I just wanna know more.

EW: Is this cliffhanger?

EAU: Yes. Yeah. Yeah. You're just like, what is about to happen? What is happening? There's something ominous on the horizon there.

EW: I mean,

EAU: it's cancer.

EW: It's cancer.

EAU: Yeah.

EW: As infectious disease stole less of the spotlight, other diseases became more visible. Mm-hmm. We've talked about this phenomenon many times in the podcast, right? And among these diseases is cancer.

EAU: Mm-hmm.

EW: Cancer was not a new disease, of course, but at the beginning of the 20th century, cancer was not even in the top five leading causes of death in the United States.

EAU: Really?

EW: Yeah. It was eighth on the list.

EAU: Wow.

EW: Mm-hmm. Yeah,

EAU: it, sorry, remind me the year, 'cause my brain is,

EW: uh, like 1900.

EAU: Okay. Yeah.

EW: Yeah.

EAU: Not even in the top,

EW: not even in the top five.

EAU: Wow. Okay. Mm-hmm.

EW: Life expectancy was 49 years.

EAU: Wow.

EW: Which is a flawed metric. It doesn't take into account the effect that of infant and childhood mortality would have on those numbers. Right. Which was primarily from infectious disease, but overall, people were not living as long as they do today. And cancer was less prevalent.

EAU: Hmm.

EW: Partly because people were dying before developing cancer. Cancer happens to be a disease later in life. Mm-hmm. Most commonly, partly because our relative lack of knowledge about cancer meant that many people had cancer, but never realized it didn't do it. Mm-hmm. And partly because certain cancer risk factors such as smoking, were lower than in the following decades.

EAU: Interesting.

EW: Okay. So, for instance, at the turn of the century, a case of lung cancer was rare enough to point out to med students so that they saw it at least once in their careers.

EAU: Really?

EW: Mm-hmm.

EAU: That's depressing.

EW: Yeah. Over the first half of the 20th century. All that would change.

EAU: Yeah,

EW: all of it.

EAU: That's quite actually particularly disappointing with regards to lung cancer because were people just not smoking. We need to do tobacco as like an actual episode. Erin,

EW: I have that written in here multiple times. Uh, yeah. There are some really interesting trends about like smoking and of course it's, it's very different right. Country to country. Right. And by age group and stuff like that. Mm-hmm. But yeah, I mean, cigarettes were really became popular, especially after the World Wars.

EAU: Got it. Okay. Mm-hmm.

EW: Mm-hmm.

EAU: Okay.

EW: That

EAU: makes sense. Okay.

EW: Over the course of the 20th century life expectancy rose cancer research began to shed light on the disease so that more cancers were diagnosed and then lumped into this rapidly growing umbrella term of cancer. Cancer and certain cancers increased in incidents as exposure to carcinogens increased, like with lung cancer and cigarettes, even though cancer was not a new disease, even

though this rise was driven primarily by growing awareness and life expectancy, cancer became labeled as a disease of the 20th century. Hmm. It represented corruption. Consumerism and excess, the uncontrolled population growth happening within cities. The danger of non-conformity.

EAU: Oh,

EW: and the threat of invasion.

EAU: Okay.

EW: Yeah.

EAU: Wow.

EW: While microbiology had demystified, many long feared infectious diseases, cancer remained. One big question mark that scientists could not answer. If cancer cells were part of us, [00:25:00] why were they harmful? Why did cancer strike one person but not another? Why does cancer happen at all?

EAU: Mm-hmm.

EW: Science couldn't yet provide any satisfying answers to these questions, and so people did what they so often do. They invented their own. Broadly speaking, the explanations or rather blame really fell into two main categories, modern civilization or yourself.

EAU: Of course,

EW: you are to blame.

EAU: It's your fault. It's

EW: your fault. Yeah. Mm-hmm. Throughout much of the late 18 hundreds and into the 1970s, really all the way through that whole time. Wow. That vast amount of time. Okay. People diagnosed with cancer were told that they had brought it on themselves by bottling up their feelings, that it was the result of depression and a quote unquote, cancer prone personality type was constructed.

EAU: Was this just Freud who was diagnosing cancer?

EW: No.

EAU: Oh my God.

EW: This was before, this was before Freud, after Freud. That's gross. Gross. We can't blame Freud for this. I know. It's too bad. We, we do like to do that.

EAU: We do. But

EW: I'm sure he had a hand in it, but he

EAU: was a proponent,

EW: but he, yeah, yeah, yeah. So in, in her book, *Illness as Metaphor*, Susan Sontag describes this, this cancer prone personality type quote, the, for line, self hating, emotionally inert creature. She had been diagnosed with cancer. And so this is what a lot of people would, that's like how it, it, you were talked about, like, oh, well, you know, oh, this,

EAU: this creature.

EW: This creature. Yeah. Mm-hmm.

EAU: Okay.

EW: At that point, so this illness as metaphor came out in 1977, and at that point, cancer had been a subject of intense scientific scrutiny for decades, and yet this blame language persisted. People are afraid of what they don't understand, and our understanding of cancer is relatively new, incomplete, and constantly evolving. That imperfect knowledge has resulted in blame. It has resulted in fear and ha, and it has resulted in silence and euphemisms. When Ulysses S Grant developed throat cancer in 1884, his doctor acknowledged that cigars, they might have been to blame, but added that quote, depression and distress of mind was a more important factor, end quote

EAU: in the development of throat cancer.

EW: Mm-hmm.

EAU: Okay.

EW: Yeah. Obituaries in the early 20th century alluded to quote unquote lingering illness as the cause of death, rather than print the word cancer.

EAU: Really?

EW: Mm-hmm.

EAU: So they don't wanna call it cancer.

EW: They don't wanna call it cancer. And then even when the taboo on cancer kind of lifted. Mm-hmm. And there was an outcry for more research. There were, there was like an organization that was like, oh, we wanna meet to talk about breast cancer. And they were like, we can't print that.

EAU: So, okay.

EW: Yeah.

EAU: Great. Great, great, great, great.

EW: Yeah.

EAU: Cool.

EW: When cancer was mentioned during that period, it was off often in like lurid terms like Senator Matthew Neely used in 1928 during a speech demanding funds for cancer research. Quote, I proposed to speak of a monster that is more insatiable than the guillotine. It has prayed and still praise upon every nation. It has fed and feasted and fattened on the flesh and blood, and brains and bones of men and women and children in every land. The name of this loathsome Deadly and Insatiated monster is Cancer End quote.

EAU: It's so interesting, Erin. Yeah. To go back and look at these kinds of ways that we describe cancer and like compare that to what. How we fighting against cancer today?

EW: Oh yeah. I mean there are, there are entire books written about like the language that we use when we talk about cancer. And you know, more recently or since, since the 1970s, I guess the language is much more likely to be military coded.

EAU: Yes.

EW: Right. The war on cancer. Right. And all out attack defeating the enemy an aggressive,

EAU: aggressive,

EW: aggressive. Mm-hmm. Aggressive. Yeah. And that shift to this military language, it has not eradicated victim blaming, which can come in more indirect ways. Right. You know, healthy mind, healthy body, Ugh. Uh, the implication that cancer will defeat you if you don't fight hard enough. Yes. Uh, and also I think there's this tendency. That we all have, I think it's human of us, that when we hear that someone has cancer, we want to know what kind of cancer is it?

EAU: Mm-hmm.

EW: Oh, were they a smoker?

EAU: Mm-hmm.

EW: So that we try to find ourselves in that, well, we'll, right. We won't be right. That won't happen to us trying to underst understand because we didn't do this.

EAU: What was different about you? What's different about me? Why does this not apply?

EW: Why did this, I wanna make sense of this diagnosis. Yeah. And I want to, I don't want this to happen to me.

EAU: Yeah.

EW: And so we try to find that reason. We try to find the cause and effect.

EAU: Yeah.

EW: And today, the fear of cancer and the blame is as real and as palpable as ever. Surveys looking at fear of chronic diseases show [00:30:00] that people fear cancer more than any other chronic disease, even though heart disease kills more people.

EAU: It's the number one killer. That's actually really interesting. I did not know that, Erin.

EW: Mm-hmm.

EAU: That doesn't surprise me at all.

EW: No,

EAU: because it's the thing, I mean, I know like when you have a, if you're concerned about it, everyone wa wants to tiptoe around. Do we even say that we're concerned about cancer or do we not even say the word cancer yet? Right. Kind of a thing. Right. That still happens in medicine today.

EW: Still happens. Yeah. I mean, that's a whole

EAU: I know I have lot, I have

EW: too many feelings. I know, I know. And so, but yeah, I mean, why Yeah, like what is it about cancer that elicits such dread, and I, I don't think that it's an unreasonable fear.

EAU: Yeah.

EW: I, I would not say that at all. I'm, I, I have that fear. Mm-hmm. 40% of us will develop cancer at some point in our lives. But what that looks like or when it might happen, we have no idea.

EAU: Mm-hmm.

EW: It could mean a diagnosis in childhood, in middle age, or later in our lives,

EAU: or all of the above.

EW: All of the above. It could mean a simple curative surgery. Mm-hmm. Or a marathon of expensive and torturous treatments. It could mean delayed plans, canceled plans, or new plans. It could mean becoming a caretaker or being taken care of. It could mean hope, despair, clarity, a new knowing. It could mean every one of those things, some of those things, or none of those things. Cancer is unpredictable by nature, which is part of why it inspires such fear.

EAU: Yeah.

EW: It has touched every one of us ourselves directly or through our family, our friends, our neighbors, our colleagues. But we can't necessarily look to others' experiences to predict how our own story will unfold. Right? We want answers. What's my prognosis? Will this treatment work? How long do I have? Yeah. What side effects will I experience? What happens next? But most answers are best guesses formed by decades of research and always qualified with. It's likely that and, but we can't know for certain.

EAU: Mm-hmm.

EW: And that doesn't represent a failure on the part of the research community, which has produced a true wealth of information when it comes to cancer, what it is and how to treat it. Will more research help to fill in those knowledge gaps and shorten those error bars? In some situations, yes. Right. But the fact remains that cancer is so unpredictable because it is so variable. Mm-hmm. Cancer has many causes, many origins, many pathways, many outcomes. And each cancer is distinct. And I don't mean that breast cancer is just distinct from prostate cancer. No.

EAU: Yeah.

EW: Each individual case of breast cancer is unique.

EAU: Right.

EW: And as we'll discover more next week when we talk about like the cellular biology of cancer, oftentimes that uniqueness goes all the way down. Mm-hmm. To the cellular level with tumors made up of a diversity of cancer cells. Right. The more we've discovered about cancer, the bigger this term gets. So let's go back to the beginning

EAU: Okay.

EW: And see if we can trace its growth over time.

EAU: Oh, oh,

EW: right. Just like

EAU: a cancer cell.

EW: Sure. Cancer might be a defining disease of our time, but that doesn't mean it's only of our time. Fossil remains of humans and our hominid relatives show us that cancer has been a part of us for millennia and beyond.

EAU: Right? Forever and ever.

EW: Forever. A million year old jawbone found in East Africa with evidence of lymphoma.

EAU: A million?

EW: Yeah.

EAU: Wow.

EW: Yeah.

EAU: What kind of jawbone?

EW: What, like a hominid job? Oh, a

EAU: hominid.

EW: Oh, sorry. No, I'm sorry. I was like, no, I, I don't think I wrote the species down because I think it was like, we're not really sure what, but anyway.

EAU: Okay. Wow. Fascinating.

EW: But yes. Okay. Yeah. Uh, a growth in a Neanderthal skeleton from 120,000 years ago, an ancient Egyptian mummy from 400 CE with abdominal cancer, and that's just to name a few. I literally cut out so many more examples where I was like. There are papers, find them in our show notes. There's lots of

EAU: examples.

EW: Yeah. Uh, but looking beyond presence, absence to prevalence, cancer does seem more common today. Okay. Than in centuries or millennia past. And that's due to the mix of factors that I already mentioned. But it's kind of hard to be more specific than that. Like how much more prevalent. Right. Considering

that cancer doesn't always leave its mark on bone and that we've, you know, we've examined only a tiny fraction of the fossils or remains that have been left behind.

EAU: Exactly. Yeah.

EW: Okay. So what about the written record?

EAU: Oh,

EW: so starting in ancient Egypt, naturally we've got the Edwin Smith papyrus from about 3,600 years ago, which describes what sounds like a case of breast cancer. Okay. And this is paraphrasing a little bit, quote, if you put your hand upon his breast, upon those tumors and you find them very cool, there being no fever at all, they have no granulation. They form no fluid, they do not generate secretions of fluid, and they are bulging to your hand. End quote.

EAU: Okay.

EW: Yeah.

EAU: Could be.

EW: Could be. Yeah, could be.

EAU: Could be.

EW: Yeah. And although the, this [00:35:00] papyrus contains many remedies for all the other ailments that it is, has listed in there, there is no treatment for this disease.

EAU: Interesting.

EW: Basically says there's nothing.

EAU: Yeah.

EW: So following this, there was a relatively long period of silence when it comes to writings about cancer until we get to ancient Greece. Okay. Where cancer again, makes an appearance not in a medical context this time though, but a storytelling one. Hmm. So the Greek historian Herodotus, writing around 440

BCE, briefly tells the story of Atossa, the Queen of Persia, who developed a swelling on her breast and ultimately had it excised.

EAU: Okay.

EW: Was it cancer? Was it an ulcer? Or

EAU: fibroadenoma. Yeah. Right. Lots of benign tumors,

EW: but we don't know.

EAU: Right.

EW: We don't know. And it's in the Hippocratic texts written in Greece in the fourth and fifth centuries, BCE, which I still have to look up every time. Like if, if I were to go to trivia, and that was one of the questions I would not know. Uh, but this in, in the Hippocratic text is when we first find the words for Cancer and Carcinoma or their origins.

EAU: Okay. That's, that was gonna be one of my big questions.

EW: Yeah.

EAU: So that's a long time ago.

EW: Long time ago. So Carino, carino, and Carcinoma.

EAU: Okay.

EW: With Ks.

EAU: Okay.

EW: Now, Carino was used to refer to any non-healing swelling or ulcerous formation, including things like hemorrhoids or cysts.

EAU: Okay. Interesting.

EW: While carcinoma was generally reserved for non-healing growth.

EAU: Okay.

EW: Yeah.

EAU: Non-healing growth. This is so interesting.

EW: Mm-hmm.

EAU: Mm-hmm.

EW: Both words come from the ancient Greek for crab.

EAU: Ah,

EW: this is where crab comes from. Crab, okay? Mm-hmm. Mm-hmm. So apparently the appearance of a tumor surrounded by blood vessels branching out, reminded Hippocrates, and then later Galen of a crab in sand with its legs all spread out.

EAU: Interesting.

EW: Yeah.

EAU: So that's how they, okay.

EW: Yeah. I. Hippocrates also used the word methistemi for metastasis.

EAU: Oh, interesting.

EW: Methistemi means to remove or set free. And he thought that, quote, metastatic affectations are those which travel from one to another part of the body.

EAU: Yeah.

EW: End quote.

EAU: It's not wrong.

EW: Yes. I mean, he's not wrong. I don't think that like, I mean, given sort of the leading ideas about disease

EAU: Right.

EW: His word, the, or metastasis to him is not the same metastasis to us, but it is interesting.

EAU: Yeah.

EW: The, the roots of that.

EAU: Yeah.

EW: Yeah. Um, so then after Hippocrates, we run into Galen whose humoral explanation of cancer dominated Western medicine for centuries. A buildup of black bile.

EAU: Mm-hmm.

EW: Also known as melancholy.

EAU: Oh, that's interesting.

EW: Yeah.

EAU: That, that just persisted without people probably realizing they were doing that, but so sorry. So they were like, cancer is black bile. That's the, that's the, that's there.

EW: Yeah.

EAU: Done. Okay.

EW: Yeah.

EAU: God, it must be nice just to have an explanation for something, huh?

EW: I mean, sorry, we, we wouldn't know.

EAU: No. Yeah.

EW: We, we can't explain. We're

EAU: just all, I don't know.

EW: Yeah, yeah, yeah. We are. That's, that's, that's how we do it on this podcast will kill you. Um, but, so yeah, according to Galen, I mean, what you can, what you can do with black bile is you can maybe like drain a little bit of it, but it's really difficult to do. Also black bile. So black bile is melancholy and it's like depression and repress.

EAU: We don't know that. We talked about this in your, which episode was that? That you did all of the humors? Gallbladder.

EW: Gallbladder.

EAU: And we were like, what is black bile?

EW: Yeah. No, so I mean, I didn't put this in here, but like the, this is like, and black bile, not just specific, any of the humors really. Right. People knew what blood people knew, whatever phlegm, but black bile was this mysterious thing that no one could find. And then I think it was like SIUs.

EAU: Mm.

EW: I hope that's right. Was trying to find, he was trying to like confirm

Firsthand 3: Right.

EW: Galen's, black bile and the humoral theory. Yeah. And was like doing autopsy, we know this autopsy must be true after autopsy. And he was like, I don't find anything. I don't know where it is. What is this? And so it was kind of like the beginning of the end Okay. Which had already been under question blah, blah, blah. Right. Medicine was not stagnant for that long, et cetera.

EAU: Mm-hmm.

EW: So, um, but Galen for the most part was like, I, I don't think that we should treat this. I don't think that surgery is the way to go. It's only gonna speed up progression ing. And so unless it was like very small, he tended to opt to just do nothing it. Okay. Mm-hmm. And, uh, and later physicians kind of did the same thing. It was very much like some did surgery, some didn't, and many other, many other, many other phy surgeons, physicians contributed to this body of knowledge about cancer. But like, it was incremental and none of it really moved

EAU: the needle.

EW: Yeah. In terms of like, what does this do for the patient? Right. Or even like our understanding to then try to develop something. Okay. Um, and so even though, so Galen's black bile concept of cancer came to scrutiny as early as the 14th century. It overstayed its welcome though for much, much longer than that. Mm-hmm. No central hypothesis of cancer took its place and physicians remained largely helpless to [00:40:00] treat or even just understand this disease of many faces. That's

EAU: so interesting.

EW: And things started to change around the 18th and 19th centuries.

EAU: Okay.

EW: Alright. So, science and medicine during this period is marked by the invention of tools and techniques that allowed physicians and scientists to observe for themselves what had previously been invisible. The thermometer that indicated a fever. The, uh, stethoscope that detected a heart murmur, the microscope that revealed the cells that formed us and all of life. The taboo against autopsies had been declining for a couple of centuries, which allowed people to map out not only how the body worked, but also like when things went awry. Mm-hmm. With this new toolkit, patients were more likely to find confirmation and explanation of their vague symptoms. Surgery back on the rise, especially once antiseptic technique and anesthesia were introduced in the later half of the 19th century surgery revealed that the exhaustion and the aches that you had been feeling were likely tied to the tumor in your breast. Okay. That had spread to your bone. A slide of your blood cells viewed under the microscope pointed towards a proliferation of white blood cells as a contributor to the listlessness and abdominal pain you had been experiencing. As a medical topic, cancer was not unknown to the physicians of this era, but it evaded explanation.

EAU: Hmm.

EW: These new tools, surgery, microscope anatomy, chemistry, gave them the opportunity to pin down this disease. Okay. Focusing on two main questions. What is cancer? And why does it happen?

EAU: This is so interesting, Erin, because I don't think that I expected for there to be a kind of unified idea that cancer is cancer from that far back. Like, I thought that this was gonna be you being like, and then they thought that this was some weird disease and it turned out that was also cancer. Like,

EW: yes. Okay. That is kind of what it, I mean this is, things are still coalescing here. Yeah. So it's just like now we have, in the, starting in the 19th century, we have these tools. We have this idea of like, okay, now we're gonna throw out this black bile theory, which had been around for a really long time and kind of linger still. Um, and we're going to kind of see like what this individual one is. Okay. And so breast cancer was still viewed as a distinct thing.

EAU: Okay.

EW: And it, it is. I mean, and you can see why, right? 'Cause like there are commonalities between some and not between others.

EAU: Yeah, exactly.

EW: And so, but it's, it's what happens now, the story I'm about to tell you Okay. Is how we form the idea of cancer itself.

EAU: Okay. Okay.

EW: Like the mechanism, the recognition of it. Yeah. Okay.

EAU: Especially 'cause you're like blood cancers versus solid tumors. Like there's Right. They all can look so different.

EW: They all can look so different. So how do we come up with cancer?

EAU: Cancer,

EW: okay.

EAU: Okay.

EW: In 1845, okay. German physician, Rudolph ow, AKA, the father of modern pathology mm-hmm. Published a case report on a 50-year-old woman who had been admitted to the hospital with edema in her legs, a swollen spleen, diarrhea and nosebleeds.

EAU: Okay?

EW: She was treated according to the standard of the day, which was like leeches, bleeding, purgatives, et cetera. Uh, but she passed away. Three months

later, Virchow conducted an autopsy and found that some of her organs were teeming with white blood cells. With hardly a red blood cell to be found. Hmm. Yeah. And it was like, like he noted that it was like the normal ratio of white blood cells to red blood cells had just been reversed, completely

EAU: flipped.

EW: And it was like the white blood cells were so, they were so numerous that they were preventing the, the production of red blood cells. Mm-hmm. So to vi he was like, okay, I've seen, I've seen many white blood cells before in like, you know, infections, but this doesn't look like that. Mm-hmm. This is not like the thick, you know, pus, whatever yellowish that happens after a, an, an injury or a festering wound. Right. It's just too many white blood cells that looked slightly off. They looked mostly like normal white blood cells, but they were not a little off. A little bit off. And so he gave it a name leukemia.

EAU: Hmm. He named it,

EW: he named it, it's a Greek for white blood.

EAU: Yeah.

EW: Yeah. And this name is. Was was revelatory because it didn't imply a process or a cause. Hmm. It simply described what he saw.

EAU: Interesting

EW: white blood. And over the following years, Virchow continued to examine and describe cases of leukemia as well as solid tumors. And he found a common thread. Uncontrolled cell proliferation seemed to be at the root. Too many of whatever type of cell, whatever cell. It's, it's a little bit odd.

EAU: Okay.

EW: Yeah.

EAU: Okay.

EW: And so, um, since our bodies are, are made up entirely of cells, which was kind of a relatively new concept at the time, like cell theory had really just formalized in the early 18 hundreds. That's so interesting. Like 1830s. Yeah.

Then that meant that these malignant growths [00:45:00] could start anywhere within our bodies, neoplasia, which is what he called it also, and that cancerous cells could travel anywhere throughout our bodies. Virchow's framework of uncontrolled cell proliferation articulated in the mid 19th century became the leading concept of cancer.

EAU: Hmm.

EW: It displaced the plethora of vague non mechanistic hypotheses. Like it's a buildup of lymph, or it's poisons from the soil, or it's an excess of black bile.

EAU: Mm-hmm.

EW: And it still really provides the foundation for our current understanding of this disease. Yeah. It didn't explain why cancer happened, but it gave people an image to search for and a way to diagnose.

EAU: Mm-hmm.

EW: Just too many of one thing. And it's a little bit odd, A little

EAU: bit off.

EW: Yeah. Huh. With this, the field of cancer research had broken open three primary though overlapping avenues emerged mechanism.

EAU: Mm-hmm.

EW: What's causing this epidemiology? Who's getting it, who's getting it and treatment. Mm-hmm. What do we do about it? We do, and since at least the late 17 hundreds, scientists had identified patterns of cancer in populations, whether through, you know, environmental or occupational exposure like scrotal cancer in young chimney sweeps.

EAU: Huh?

EW: You don't know this story? No. Okay. Wait for the fourth episode. I cannot wait. Okay. It's great. Um, or familial clusters like Pierre Bro's. Research on hereditary breast cancer. Okay. But these prove to be exceptions, in the majority of cases, there was no family history or known or distinct environmental exposure. So the other big scientific and medical revolution at

the time, microbiology wasn't providing many answers either. Mm. While different fevers began to be divvied up among different bacterial pathogens or microbes, they didn't seem to be at the root of cancer. At least not obviously. So. It was our own cells causing the problem. Just as au observed right. In the late 18 hundreds and early 19 hundreds, improved microscopes and staining techniques began to shed light on what it was about our cells that was causing these issues. They look slightly off, but what is that offness?

EAU: Right? What is, what is off about them?

EW: Yeah.

EAU: Yeah.

EW: Our chromosomes. Mm-hmm. Was one thing that they observed. Basically something happens to the genetic markup of a cancer cell that causes it to replicate uncontrollably, and the resulting cells inherit that faulty genetic material continuing this pathological cycle of growth and metastasis

EAU: done.

EW: So this is when they started to also realize that not only are we all made up of cells, but that each cell then divides and creates more cells. And then what is, what are the instructions that are inherited

EAU: Right

EW: chromosomes. If it's inheriting faulty chromosomes, there you go. Then

EAU: it's gonna be a faulty cell.

EW: Yep.

EAU: Yeah.

EW: Yeah. This is how cancer grows,

EAU: right?

EW: Yeah.

EAU: What a time to

EW: be in research

EAU: time, my goodness.

EW: But like still, what was the initial trigger?

EAU: Right?

EW: What happened? What happens at the beginning to then lead to that? Abnormal chromosomes. There didn't seem to be a consistent answer. Mm-hmm. There was radiation in cancer, chimney, soot in cancer, cancer that ran in families, but these diverse explanations were unsatisfying. How was it possible that these disparate things were all resulting in the same disease process? How?

EAU: How?

EW: Then, A beacon of hope. In 1910, Peyton Rouse discovered that he could transmit cancer from one chicken to another.

EAU: Oh,

EW: yes. The discovery of the Rouse Sarcoma virus, which is the first cancer virus to be discovered. Okay. Kicked off a frenzy of research. Maybe there's a virus for every cancer if we just look hard enough to

EAU: just look and find it.

EW: Mm-hmm. And for some time that seemed like it might pan out, there was the chop papilloma virus mm-hmm. Was identified in 1933, which is a cancer causing viruses that causes tumors and rabbits. We talk about it all the time in our talks. Um, but it may have led to the Jackalope myth breath tumor, because it has these like corny growths Yeah.

EAU: Rabbits and

EW: things. Mm-hmm. There were mouse viruses that caused cancer cat viruses, and the first human cancer virus to Epstein-Barr virus associated with Burkitt's lymphoma. Mm-hmm. That was described in 1964.

EAU: Okay.

EW: And so over these decades, over this 50 years or so, a handful of people were still working on environmental and hereditary causes of cancer, but the majority of research funds for basic cancer biology, which was a smaller portion of the pie overall for cancer funding, was geared towards this viral hypothesis of cancer. How

EAU: interesting.

EW: Yeah.

EAU: That's really, really interesting to think about.

EW: Right? And given the huge strides made in the first half of the 20th century when it came to the control and prevention of infectious diseases, like especially when it came to vaccines, it makes sense that viruses were an appealing answer to the question of why does cancer happen, [00:50:00]

EAU: right?

EW: Because if you could just come up with a vaccine,

EAU: then, then that's it. Then we can be done with it.

EW: We can be done.

EAU: Yeah,

EW: well, yeah, there's still, you know, you

EAU: can get people to take the vaccine,

EW: public buy-in and all of that. Yes. Yeah. But after decades of research, it became increasingly clear that viruses held the answer in only a small proportion of cancers, about 10 to 20%. And by the mid 1970s, research took on a more balanced approach, also investigating environmental and hereditary causes of cancer. But that era of research where like the viral hypothesis ruled all Yeah. People were also head, other of people were like, I'm not sure. Of course. Yeah, I know. Sorry. Hedging, hedging, hedging, blah, blah, blah. Um, but it led to the discovery of oncogenes. And this is a really fascinating story,

which you should find out, but it's too long to include here. Um, but these oncogenes essentially in, in trying to find out what it was about this virus that, that led to cancer. Yeah.

EAU: What were they

EW: doing to our cells in the chicken cells? Yeah. Yeah. They were like, there's this different version of a gene that's causing, it's like a mutated version of a gene that we have, but it's causing the cell to proliferate with no off button just to keep growing. Just go, go, go, go, go. Yeah. Yeah. And, um. And so oncogenes and then later tumor suppressor genes. The, the finding of these, you know, mutated forms of normal genes that then either, you know, gas pedal to the floor right. Or the break is broken. Take no

EAU: break. Yeah.

EW: Yep. They help to unite the three main drivers thought to cause cancer, huh? Right. There's environmental, viral and genetic. And so an environmental exposure could cause a mutation in a normal gene turning it into an oncogene

EAU: right.

EW: Gas to the floor. Uh, a virus could insert its oncogene into the host cell's genome. Gas to the floor, gas to the floor. Someone could inherit a predisposition where oncogene development is more likely or they inherit faulty tumor suppressor genes. Yeah. Either gas to the floor or no break,

EAU: and we'll talk more about

EW: those next week. Let's talk more about those. Yeah. So this is how this unifying, okay. Cancer is this thing that can happen through many different roots,

EAU: all these different mechanisms. Same end result.

EW: Same end result.

EAU: Yeah.

EW: Yep. But so many questions remain. Mm-hmm. How do these mutations happen? What are the pathways? How predictable is this process? What are the

genes are involved? Can we harness any of this information to prevent or treat cancer? Up through the 1970s, research on cancer, biology and cancer treatment was happening almost entirely separately.

EAU: Really.

EW: Really?

EAU: Okay.

EW: So even at a cancer conference, you wouldn't really find like a cancer geneticist attending a clinical oncologist talk and vice versa.

EAU: Okay.

EW: Just wasn't really something that all very siloed happened. Mm-hmm. Very siloed. And after the initial promise that chemotherapy had shown more on that. In the third episode, clinical oncologists grew frustrated as they discovered that what worked for one type of cancer or even just one person's case Right. You know, didn't work for another. Yeah. This dream of a magic bullet for cancer was slipping out of reach. Mm-hmm. Cancer biologists validated this with their research as genetic sequencing revealed the complex and unique pathways that drove each individual cancer and how those pathways evolved over time. And so when Nixon. Announced the War on Cancer in 1971, Uhhuh. It was useful. It was really quite useful from a funding and awareness viewpoint. Mm-hmm. It was like, you know what? This is a thing. We're gonna fight this. This is a priority. This is a priority. Yes, we are going to, cancer is an under acknowledgement. We're gonna fund

EAU: it the way that we fund war.

EW: That is the idea. That was the idea, yeah. But it also had the effect of distilling this incredibly diverse process into one disease with one mechanism, one pathway, and thus one mythical cure.

EAU: Okay.

EW: And when that cure failed to materialize, the public grew disillusioned. There was this sense that if we could just form a task force, we could just task force our way through this. Just throw enough resources and expertise at this problem, then we could come up with a solution in no time. Mm-hmm. Because this is what the Manhattan Project had done during World War ii, right? Like,

why can't we just do this? Yeah. But reality didn't quite align with these high expectations. And in 1997, a controversial study came out in the New England Journal of Medicine with the jarring title, cancer Undefeated. So this was about, you know, 25, 26 years after Nixon's war on cancer. Okay. What was inside was even more shocking.

The report demonstrated that from 1970 to 1994, cancer deaths had either plateaued or increased for most cancers. In the few cases where cancer mortality had declined, it was mostly attributed to screening and prevention. Yeah, the paper was criticized reasonably so, because it seemed to call into question the decades of cancer research and the millions in cancer funding. The [00:55:00] trend it showed was real cancer remained deadly, but what it didn't articulate were two very important things about cancer. Number one, cancer is not one disease, but many a paper like that. Uh, falls into the same trap of coalescing, you know, this, this distilling into one thing,

EAU: right?

EW: It shaves off all of the nuance, any of the, the color around this thing. So lumping all cancers together does not allow us to see the nuance, like where substantial progress has absolutely been made or where we still have a ways to go. And number two, the other thing that it didn't really articulate about cancer was that cancer is a disease years in the making. Yeah. Both in terms of its pathology as well as our understanding. The cigarettes that you smoked in your youth might lead to cancer decades later,

EAU: right?

EW: Just as the cancer biology were uncovering now will give us insights into treatment that will take years to develop, test, approve, and become a standard of care. I

EAU: think that's one of the hardest things about how fast things feel like they're moving right now, is that they still aren't fast enough for people today.

EW: You

EAU: know? And

EW: that's reality. Yeah, it is. It is. Yeah. And you know these, like, it will take a while for these things, these headlines to actually become reality that people can access if, you know, there are other issues with access and, but for some

treatments it has already happened. Mm-hmm. Some cancers have been completely transformed. Yeah. Because of our understanding and treatment development over its history, cancer has been assigned so many meanings and definitions. It's been a disease of black bile, a cellular pathology, a monster, a genetic mutation, an enemy, a curse. In cancer's, metaphors, we see the fear and the blame that is so human of us. In our narratives of cancer history, we may emphasize scientific progress over failure, and in our personal stories of cancer, we may assign villains and heroes cause and effect. Mm-hmm. We want cancer to be one thing, but it isn't. It has many causes, many mechanisms, many pathways, many beginnings, and many endings. Each time we try to draw hard boundaries around it, cancer resists them. Mm-hmm. It demands that we look again and reconsider, and when we do, we find something. That, for me, has been perspective shifting. We find that the same cellular mechanisms that allow a cancer to proliferate and metastasize are those that underlie our ability to heal wounds or develop from infancy into adulthood.

EAU: Yep.

EW: We find ourselves, we find what it is to be a multicellular. Being cancer is not a failure of ourselves. It is a consequence of multicellular life. To understand why cancer arises in the first place and why it's so difficult to prevent and treat, we have to explore cancer in an evolutionary framework.

EAU: Yes, we do.

EW: Which is what we'll be doing next week. Yes. We'll, but before we get there, we still actually have to define like what cancer is, what

EAU: is it today?

EW: What is it today? So Erin, what is cancer?

EAU: I would love to tell you what I can.

Firsthand 5: Hi, my name is Kara Rings. I was diagnosed with stage four colon cancer in late 2024, right before my 33rd birthday. I had been experiencing blood in my stool for a few years, and around three to four doctors dismissed it as, uh, fissures or like hemorrhoids. I was very anemic at one point and was sent to an oncologist who was also a blood specialist, and he told me I was just anemic because I was a menstruating female. About a year and a half later, it seemed like there was more blood, so I told my primary care physician that I wanted a specialist. I had my colonoscopy and they found a four centimeter

tumor in my sigmoid colon. So I had my sigmoid colon resection pretty soon after, and while I was in recovery, they biopsied my liver and it turns out it had metastasized to my liver, meaning I was stage four. About a month later, I had my first round of chemo. Unfortunately, the pump they sent me home with, with the five FU, which is what my treatment plan was, uh, gave me a stress induced heart attack, which only happens about one to 2% of patients. So I started back up and switched chemo to a different schedule than what the traditional five FU regimen is. And a couple weeks later, I had a liver resection in early March of 2025, so now I'm in remission. Since then, I [01:00:00] have CT scans and blood work done every three months. I know that I'm in remission, but also. With the recurrence rate and everything, it still kind of feels like a death sentence for me.

Firsthand 6: Hi, my name is Rachel and today I would like to share my twin sister Leslie's story. We had a standard sibling relationship growing up, and she was my best friend. As we entered into early adulthood the summer we turned 21, she was diagnosed with Uveal melanoma, a rare tumor growing in her eye. She had almost none of the risk factors, was young, healthy, and active, but cancer doesn't care about those things. Initial treatment included radiation plaque therapy to kill the blood supply and shrink the tumor, and she had successful treatment. We were thankful to live in an area with access to excellent medical care, including her ophthalmologist. Dr. Oliver follow up included yearly scans that she went to diligently. Leslie went on to graduate with her Bachelor of Science in Kinesiology and Health Promotion, and she became a doctor of physical therapy. She got married and lived life to the fullest for the next 10 years. In her free time, she loved skiing and hiking, which are typical of a Colorado native for skiing. She gravitated towards the most technical runs like Christmas Tree Bowl, and Steamboat for hiking. She also gravitated towards technical routes and was able to summit over 40 of Colorado's fourteeners, including some of the most challenging Class four routes like Bear Peak. I haven't summited nearly that many, but she, my dad and her husband, slowly kept knocking peak after peak off the list.

Then shortly after our 31st birthday, she had her son, and in early summer the unimaginable happened and she was diagnosed with metastatic uveal melanoma in her liver. After having a clear scan the fall prior, while doctors were again able to act quickly, the cancer was growing too rapidly for successful treatment, and she passed away less than eight weeks after this diagnosis, I just celebrated my seventh birthday without her surrounded by family skiing in the mountains. Her husband has since remarried and I, I am thankful her son has a mother to her up with. I'm now a mom to three, including a set of twins. There's no roadmap to grief, and I've learned a lot about giving others grace and understanding because we don't know what they might be working through. I

also think of friends and family navigating their own journeys with cancer, and as a biomedical engineer, I use my sister's story as motivation to continue to engineer medical devices that allow surgeons to have better patient outcomes. I'm also choosing to live life to the fullest, just like Leslie, and I'm thankful to have supportive husband and family. Leslie didn't want to be defined by her diagnosis. She wanted to be defined by the things she did and the patient she interacted with. She was a wife, mother, sister, daughter, avid skier and hiker, and a doctor. Leslie. I love you and miss you.

EAU: So Erin, obviously you covered a lot of ground. In that history section. Thank you very much. You tried. I really enjoyed it. Um, but we do still have quite a bit to cover. Yeah. Um, in terms of what we mean when we talk about cancers today. And so that's what I'm gonna try and get into right now. And there are actually quite a number of different definitions depending on what organization you're looking at, but they do all boil down to this same general concept, which is abnormal growth. Right. Right. Cancer is an aberration of some kind. It is abnormal, it's atypical, it's out of control, it's uncontrollable growth.

EW: Mm-hmm.

EAU: In some way. So one technical definition that I will put forth, okay. Comes from the National Cancer Institute, which says, quote, cancer is a disease in which some of the body's cells grow uncontrollably.

EW: Mm-hmm.

EAU: And spread to other parts of the body. Now I just like side note here, um, because some of the definitions of cancer very explicitly say cancer is. A group of diseases which, and other definitions say, cancer is a disease. And I just think that that's a really interesting, like that, that is still something that I wouldn't say is like up for debate, but is just like a part of how we define cancer. Mm-hmm. Where some groups are gonna define it more as multiple different diseases. And some are gonna say like, we're lumping all of cancer as one thing.

EW: Right.

EAU: With many different pathways and many different like ways that it's going to turn out essentially. It's interesting.

EW: Well, and it's like there's a deliberate choice there. Yes.

EAU: So what, yes, exactly.

EW: What does that mean?

EAU: What does that mean? I also read it really interesting. I'm just. So off script right now, but I read a really interesting paper from 2023 that was like a, we are proposing a new definition for cancer. Okay. That was much, and it was an [01:05:00] entire paper that was an explanation for their one sentence definition, like word by word. This is why we chose of instead of by and stuff like that. I like that. You would love it.

EW: I would love that.

EAU: Um, but they really focused a lot on the evolution concept, which we're gonna talk more about next week. Ooh. Ooh. But it's a great paper. I'll link to it. Um, yes,

EW: please.

EAU: So the point is, the point

EW: is that

EAU: uncontrollable cell growth

EW: Yes.

EAU: That spreads to other parts of our bodies. Okay. Just pause and don't ask me any questions. Sure. Because I will tell you that a big question that arises when I hear that particular definition is like, how, how, why, how, how are cells growing uncontrollably? How are they spreading to other parts of our body? I'm not going to answer that question this week.

EW: Can I ask a question?

EAU: Yeah. But I just want you to know I'm, if it's that, I won't answer it.

EW: No, no, no. I, I kind of know some of that.

EAU: Yes, I know you do,

EW: but Spread

EAU: Spread

EW: is that, so that is obviously,

EAU: that is a big, I'll talk a lot about that this week.

EW: Okay.

EAU: Yes.

EW: Okay.

EAU: That is a big part of cancer and that I will talk about this week.

EW: Okay.

EAU: The spreads to other part is a really important

EW: part, is a necessary inclusion in that definition.

EAU: Yeah.

EW: Fascinating.

EAU: Yeah. We'll get there. We'll get there, but the question of how this happens is what I'm going to focus more on next week's episode. Um, but this week I'm gonna just kind of take for granted that we all understand the idea of a cancer because we've known someone who has had cancer, et cetera. And what I wanna dig a little bit deeper into is what I would call maybe the kind of clinical aspects of how we deal with cancers today. Right? How we define them, how we classify them, and then broad strokes on sort of how we're diagnosing and, you know, um, grouping different kinds of cancers. Okay? Yes. And then next week is more the biology of what's happening. Great. Cool. Great. Okay. So the first way that we. Have to classify cancers. And I think that we do this kind of almost intuitively when we talk about cancers, is what organ is your cancer coming from?

EW: Mm-hmm.

EAU: And that is actually the first way that medicine has to classify a cancer too. It's primary site of origin. Okay. So where did those cells initially come

from? Were they lung cells? Were they breast cells? Were they liver cells? Where in the body did this tumor first begin?

EW: Oh, I have so many questions already.

EAU: Okay. Okay. And we do this for a lot of different reasons, but it's in part to figure out where it first started.

EW: Yeah.

EAU: Uh, and also because pancreatic cancer acts very differently than breast cancer. And so we need to know what we're dealing with. Right. Which also act differently, by the way, than blood cancers like leukemias and lymphomas. These are all very distinct types of cancers. Once we have figured out the organ, like the tissue that it came from, that is not the end because not all breast cancers are the same. Not all lung cancers are the same. And so the next part that we have to do is figure out what. Tissue type. It came from within that organ.

Okay.

EW: Okay. What part of the lung?

EAU: What part? Yeah.

EW: Yeah.

EAU: So cancers that come from our epithelial cells, and we've talked a lot about epithelial cells on this podcast, but they're the cells that line all of our body surfaces.

EW: Yeah.

EAU: So they're like the inside of ducts in your breast. They are the, um, the insides of all of our blood vessels. They're the cells that are like lining and, and making up the inner parts of our body surfaces. These are called carcinomas. And so if you ever hear carcinoma, yeah. That means that it came from epithelial cells. This accounts for like over 90% of solid cancers. We'll get there. Okay. In humans. Okay. And you further can divide it from there because there are many different types of epithelial cells. So you might have a squamous cell carcinoma that came from these flat, like disc shaped cells. Yeah. Yep. Or you might have an adenocarcinoma. Mm-hmm. Which comes from these glandular

cells. And some cancers like breast cancer, for example. Mm-hmm. Most are all adenocarcinomas, but we don't necessarily call them that. We distinct them by did it come from the duct? Did it come from the lo? There's a lot of different types. We get really specific. Okay. I mean,

EW: it's wild. I

EAU: know.

EW: Mm-hmm. So how many different. Subcategories

EAU: and subtype. Small cell, non-small cells, squamous cell, adeno, like, there's so many different types of, of these, even just within the carcinoma category. Wow. Aside from that, cancers can also arise from non epithelial tissues, and these would be our connective tissue cancers.

EW: Okay.

EAU: So sarcomas, bone cancers, those kinds of things are called sarcomas, and those are actually a really wide range as well. So for example, a mesothelioma

EW: mm-hmm.

EAU: Which listen to our asbestos episode Yeah. For more detail, but a, a mesothelioma we think of as a lung cancer. It's not a lung cancer, it's a cancer of the lining of the lung, which is a connective tissue. So even though it gets a special name mesothelioma, it is technically a sarcoma. [01:10:00]

EW: Whoa.

EAU: I know I'm getting technical, but it's fun for me.

EW: I think it, well, I mean, I think it's, it's helpful to understand that it truly can arise anywhere.

EAU: Anywhere.

EW: And the, or the site of origin and the type of origin and blah, blah, blah, all influences the path that the cancer could take.

EAU: Exactly. Because it all means that these cells initially were acting in one particular way. Yeah. And so that's going to tell us something about how they might act as they become cancer cells. Then there's also, um, cancers that originate in our bones, like our, our blood-based cancers rather.

EW: Right,

EAU: right, right. So that like bone marrow. That's bone marrow. Yes. Thank you. Whoa, Erin. So that would be like leukemias, lymphomas, myelomas, which are all different types of blood cell cancers.

EW: Mm-hmm.

EAU: Okay. Then there's also more specific ones you can get, like retinoblastoma, which is in the retina of your eye, glioblastomas, which are in your brain, which I think technically might fall under sarcoma, but they're so specialized. Oh,

EW: okay.

EAU: That they're, I don't know that they actually technically count as a sarcoma because they, again, are just so specialized that it's your brain cells.

EW: Right. Right.

EAU: So there's a lot of different ways that we have to classify it at the beginning, but if we then go back, so knowing that if we go back to our definition of cancer, of these cells that are growing in an uncontrolled way that are then spreading to part of our body, part of this definition is that it's abnormal growth. So. What is it that makes these abnormal?

EW: It's a great question.

EAU: It's a really great question, and mechanistically, we'll get a little bit more into detail on that next week. But one thing to know is that cancers grow in these like disorganized masses. Mm-hmm. Especially when we're talking about solid tumors. Right. So everything but the blood cancers, and we call these tumors, like that's the name that we call these clumps of cells. But not all tumors are cancer.

EW: Right.

EAU: And in medicine we call non-cancerous tumors benign. Yeah. And it's not a great word.

EW: Yeah, it's not a great word. We talked about this in endometriosis.

EAU: We did, yeah.

EW: Yeah,

EAU: we did. Uh, because in medicine, benign does not mean good. Right? It does not mean chill. It doesn't mean, don't worry about it. It means that this tumor is not going to metastasize, and that is really the key that makes cancers. Cancers. It's not just that they're growing these disorganized clumps of cells. It's not just all these things. Mm-hmm. It's also that they are spreading and they spread in a lot of different ways. The thing that makes cancer so deadly is this ability to invade our bodies. Right. First, they're invading past what we would call tissue level barriers.

EW: Mm-hmm.

EAU: Which means that a cancer might start within the duct cells of your breast, but then it's going to invade through the lining of those ducts and into the surrounding tissue, and then it will break off pieces of itself and it will travel, whether through your lymph system, into your lymph nodes or through your bloodstream to distant organs and set up shop there. And that is what we call metastasis. Yeah. Those little bits of pieces that travel and make new tumors at distant sites.

EW: Question. So yeah. Uh, spread or potential to spread. And what is the quality or characteristic that allows for mobility?

EAU: That's a great question. I dunno.

EW: Okay.

EAU: Okay. I don't know if we fully understand that,

EW: but like, so if, if you're trying to say, is this a benign growth? Mm-hmm. A cancerous growth.

EAU: Yeah.

EW: Has what, what, how do you distinguish?

EAU: That's a great question. They're looking at the. We'll talk a lot more about all of the other like cell markers and things that we see on how these cells behave in cancer.

EW: Yeah.

EAU: If that makes sense. Yeah. Yeah. A little bit next week.

EW: Like the hallmarks.

EAU: Exactly. The hallmarks of like how cancer cells all behave. But, and so a lot of it is that it's looking at all of these things and I think it's also looking at the disorganization Okay. Of the structure where benign tumors are less likely to be super disorganized, though they might be a little bit disorganized.

EW: Okay.

EAU: Uh, compared to malignant tumors. So things that are going to be spreading. And I think too, it's uh, I think that most of these growths now we have well characterized. So we know if you look at this type of tumor, it is not likely to spread. Okay. Whereas if you look at this type of tumor, it is likely to spread. Spread and there are some that can sometimes, uh, hedge that line where they are not cancerous, but they might have the potential to become cancerous.

EW: Okay. Another question from the class. Endometriosis. Oh,

EAU: I knew you were gonna ask

EW: this, Erin. I have to. I know. I know. I have to. I mean, you can find

EAU: yes

EW: cells anywhere.

EAU: Yes.

EW: In the body. I know. And it can form [01:15:00] tissue. It could grow tissue anywhere. I,

EAU: yeah.

EW: So how is that not ca classified as a cancer? It's a, I know we talked about it

EAU: question,

EW: but

EAU: it's, no, it's a really good question, and I think, honestly, doing this research for this episode made me go back and ask that question myself. Yeah. Because I was like, it doesn't kind of make sense. This is one of the biggest hallmarks, and it's because the endometrial tissue that we find in endometriosis doesn't meet all of the other hallmarks of cancer. It's not necessarily disorganized, it's not replicating indefinitely. It's replicating in a way that is in sync with a menstrual cycle and things like that. Like it's not just going wild. I would say it's a valid question to think where is this line blurrier than we think?

EW: Right.

EAU: And I think maybe, but I'm just going with what I got.

EW: Pushing the boundaries again. Yeah, yeah,

EAU: yeah. Endometriosis is a wild beast.

EW: It is.

EAU: Um, especially in the context of this.

EW: Yeah.

EAU: 'cause yeah, they spread everywhere.

EW: Hmm.

EAU: But that's what cancers do. And because of this, um. Metastases are the, the reason why the next step in defining our cancers is figuring out how far it has already spread. And so we do this through a process called cancer staging. So once someone has a cancer and we know where it came from, we know what kinds of cells it came from, we need to figure out how far it has gone. And so

we do this through staging. It's often called like TNM Staging. Mm-hmm. Which stands? I'll tell you what it all stands for. And so first, the first way. Asterisk on this, but the first way that cancers tend to spread is locally. So from like the inner lining of your bladder through the muscle wall or something like that.

EW: Okay.

EAU: So how far a cancer has invaded within the tissue that it's from is the first component of that cancer. And that's the T in the TNM framework.

EW: Okay.

EAU: So for example,

EW: mm-hmm.

EAU: Uh, you could have something called ductal carcinoma. In situ.

EW: Yes,

EAU: these are cancer cells, but they have not yet left that duct.

EW: Right?

EAU: So that's like a stage zero cancer. Okay. Does that make sense? Yes. Same thing with bladder cancer. You might have, and this is true for any cancer, but bladder cancer, you might have it that's just within the lining of the bladder and hasn't yet invaded into the muscle. Or you might have what's considered muscle invasive bladder cancer. So now it's made it through the muscle

EW: okay. Of

EAU: the bladder wall.

EW: How, um. How much variation is there in terms of like the thickness of these different layers?

EAU: Oh, that's a great question. To huge amounts.

EW: Okay.

EAU: Yeah. You think of like the duct of a breast, like a breast duct is gonna be like a couple cells thick, whereas the lining of your bladder is quite thick.

EW: Right?

EAU: Yeah.

EW: And so how does, like, does that have any bearing on staging?

EAU: It is all, I mean, it's all part of the staging process. Yeah, yeah. But like does, what does it mean for prognosis and things? That's such a,

EW: I know.

EAU: I can't answer that question.

EW: I know, I know.

EAU: So then the next part of staging is n which stands for node, because one of the first ways that many cancer spread is via our lymphatic systems and our lymph system drains into lymph nodes mm-hmm. In specific patterns. And so we know like your breast tissue is going to drain towards a cluster of lymph nodes in your armpit and other, you know, your liver is gonna drain to specific lymph nodes, et cetera. And so by sampling the lymph nodes in the areas where that in original tumor is draining

EW: mm-hmm.

EAU: We can figure out how far the cancer has spread, what we consider regionally within the body.

EW: So you would expect to find cancer cells within that lymph node

EAU: potentially. That could be a, that could be a first place where they may spread.

EW: Is it, is there a possibility that it has spread but not. Not no evidence in the lymph nodes.

EAU: Absolutely. Because the next step is M for metastasis.

EW: Okay.

EAU: Because the other way that cancer spread is via the bloodstream. Mm-hmm. Which means they can go anywhere. Very commonly we see places like the liver or the bones where cancers tend to spread. And part of that is because we have good blood flow to those areas. And also maybe that those are just particularly conducive tissues to grow cancer cells. Why? Who knows? Um, but metastases can be literally anywhere.

EW: Mm-hmm.

EAU: And I said asterisk on the fact that cancers are gonna first spread locally. That's not always true. Some cancers. Have these, especially what we call micro metastases, that might spread very early in the course of disease and we might not even be able to pick those up if they're very small. Mm-hmm. Because the ways that we tend to look for metastatic growth is by doing imaging tests. So that might be CT scans or MRIs or what are called PET scans. And that is to look for evidence of cancer in distant sites far from that place where we first identified a tumor.

EW: Okay.

EAU: So by using all of this information, we then can stage a cancer, and that's where we think of like, was it stage one, stage two, stage three, stage [01:20:00] four. Like you, what stage was your cancer? They don't all mean the same thing. Um, and there's a lot of nuance to this. Mm-hmm. So I'm not gonna like, get detailed into how we stage these cancers because some get like two A, B, C, D and things like that.

EW: So many vari. Yeah. So many variations.

EAU: And especially for some cancers that we have now done a lot more research on and we understand much better. Breast cancer as one example, there might be a lot more to staging than just this. There might be testing for hormone receptors. There might be testing for particular, um, antigens that we see on the cancer that we happen to have treatment for. Mm-hmm. So we could then treat it with specific medications.

EW: Right.

EAU: Um, and so there's more to the staging process, but this is the like broad strokes picture of it that can give us a sense of, I won't say prognosis because

that's not quite true, like. It, it, how bad is this going to be? Is not quite the, the point of it, but it's part of it. Right. It's being able to group different types of cancers together, both for like clinical speak, to be able to talk to somebody about their cancer and have them understand this framework. And also to be able to do clinical trials

EW: mm-hmm.

EAU: So that people with similar types of cancers with similar distributions in terms of nodes and metastases and things are gonna be participating in trials for different medications. And it also, I think, creates this language that allows us to say, stage four means that your cancer is metastatic.

EW: Right.

EAU: Stage zero means it has not spread, localized. Mm-hmm. Outside at all. Okay. And everything in between is a lot more gray area.

EW: Sort of like, okay, how. Uh, how long has this been going on? Mm-hmm. How fast did we get here? And where might this go from here?

EAU: Kind of except that every cancer moves differently in terms of speed. So not so much on the how fast did we get here necessarily, but like, where are we now? Where are we starting from?

EW: Where are we starting from

EAU: and, and what does that mean for then, what the treatment options are and things like that.

EW: So, okay. So let's say that you are, you go in because you suspect you have a suspicious growth and you're like, I wanna get this checked out.

EAU: Yeah.

EW: What are the steps for staging? Yeah. Like what does that look like for someone?

EAU: I was hoping that, that you would ask me that question next time.

EW: Okay, good.

EAU: Because it's like, the question is like, how, how are we diagnosing cancer? Yeah. How, how are we doing this?

EW: Right.

EAU: And it can start with a really wide range of things, depending on if you come in saying, you know, I have a lump that I'm worried about.

EW: Mm-hmm.

EAU: Or if it's like, I've been losing weight and I am not, I'm nauseous. Or if it's, I'm fatigued. And so like the, how you get exactly to that initial diagnosis can really, really vary depending on the type of cancer that we're talking about. A cervical cancer, we might pick up on a pap smear, a breast cancer, we might pick up on a mammogram. Something like a blood cancer, you might have to have blood work done and it just be abnormal, right. For someone to be able to recognize that. Right. So there's a a huge range of how we get to that initial one. But then the next step is actually a tissue diagnosis. Which means getting a biopsy. Mm-hmm. To be able to do all those things. We said, where did this come from? What kind of cells are, are they, et cetera. And then the staging process is going to be a, usually a relatively long process of many, many appointments. Okay. It might include, in addition to that biopsy, it might include node biopsies. So, especially for something like breast cancer, you might get node biopsies at the same time that you get an initial biopsy.

EW: Hmm.

EAU: Because we know those nodes very well. We know which ones to sample for and what quadrants, et cetera. Mm-hmm. Um, for others it might not, there might not be a nodal biopsy until there's maybe an exploratory surgery or some kind of surgery to remove the cancer, and then you would sample lymph nodes at that same time.

EW: What is it? Tell me, walk me through a node biopsy.

EAU: Oh, I mean, I'm not a surgeon or an interventional radiologist, but

EW: you are a, an md so I'm just hoping for some broad stroke subscription.

EAU: So it's depends on, it depends on, uh, the, the type of cancer and things. Okay. For breast cancer, you could do it without necessarily needing to do like

an open surgery or anything. Okay. So you might be able to do a lymph node biopsy with just like an in, um. Interventional radiology type of procedure.

EW: Okay.

EAU: The same thing might be true for a lot of biopsies of things like maybe your liver or even lungs. You could do with like a bronchoscopy, you could do a lot of different biopsies in multiple different ways of both lymph nodes and the tumor itself.

EW: Okay.

EAU: Whereas for others, um, you might not like in your guts, it's very hard to sample some of those lymph nodes. And so you might not be able to do a lymph node biopsy until you're doing a surgery and then you might take the whole entire lymph node rather than just a sample.

EW: A sample. Mm-hmm.

EAU: Okay. And there's obviously pros and cons to doing both and Right, right,

EW: right.

EAU: But hopefully that was a good answer.

EW: It was. It was great. Thank you so much.

EAU: And then, and then after we have all of that, then you're also gonna get [01:25:00] imaging tests as well too. Right. And that's to look for distant metastases and, you know, depending on the types of cancer. There could be a lot.

EW: How well does imaging, what, what is the imaging? Yeah. And then like how, are there cancers that are missed by imaging or Yeah.

EAU: Yes. Yes. Definitely. Okay. Um, especially, I mean, I would say especially micro metastases, like we're not gonna be able to pick up a handful of cells somewhere.

EW: Right.

EAU: Um, which is why a lot of times chemotherapy is still recommended. Even if you think we had a surgery, we got good margins, we didn't see any metastases, there still might be a recommendation for chemotherapy because we just don't know if there's other cells hanging out. Yeah. Locally or more broadly. Um, but yeah, MRI is sometimes used. CT scans are sometimes used, and then PET scans, which are this like weird and fancy way to look at, uh. Metabolism basically.

EW: It's really cool.

EAU: It is really cool. There's still like a mystery for me, but you basically are looking at like glucose uptake in metabolism, right? Right. Yeah. So that you can see if cells are looking like they're growing more than they ought to.

EW: And you can

EAU: do fancy

EW: PET scans too.

EAU: You can do

EW: very, you can find specific targeted cell

EAU: cancer

EW: cells.

EAU: Exactly.

EW: But Okay. Okay. I just didn't know how well imaging captures.

EAU: Yeah. Like it all just depends. Like, it just depends on the size. Yeah. Um, and that's why most people with cancer are going to have many scans. It's not gonna be just the one, it's gonna be that first one for staging and then they're gonna have scans to look for evidence of recurrence or new metastases that we didn't know about. Um, 'cause things can change, you know, very rapidly.

EW: Right.

EAU: When it comes to how cancer is affecting our body's big picture, most cancer deaths are due to metastasis. Meaning because of the way that this cancer has spread through our bodies. And like, what is the exact mechanism of that? Who knows? Okay. Like, it can really, really depend. Um, like it could be that you have metastases to your liver and so now your liver is failing because it can't function anymore because it's full of cancer. It could be that you have brain metastases, so again, your brain or your kidney or whatever it is. Um, sometimes also we can see that like if tumors grow large or very numerous, they might start to. Lice themselves. Mm-hmm. Or sometimes that can happen as a result of treatment and that can be very, very dangerous. Mm-hmm. Because you're basically releasing a bunch of things that are supposed to be inside cells and that triggers a really strong immune response.

EW: Immune response. Yeah. Inflammation and, yeah,

EAU: exactly. There's also though, cancer requires a lot from our bodies mm-hmm. In terms of our metabolic load. And so it ends up just weakening our bodies until they really can't function anymore. And so this can result in something called cancer associated cachexia.

EW: Yeah.

EAU: Which is really, really awful. Um, and it's just this depletion of skeletal muscle masses, especially skeletal muscle mass that cannot be entirely reversed no matter how much nutritional support you give someone. It's like

EW: ever.

EAU: Yeah. It's, it's, I mean, it's not like no one can recover from this, but you, you unte until you get that cancer under control.

EW: Right, right, right. Okay.

EAU: Um, the cancer itself is doing this. Yeah. And so you can't, um, completely reverse it.

EW: It's just diverting all the resources.

EAU: Exactly. It, it's exactly that. Mm-hmm. Um, and it's a very multifactorial thing because a lot of times we do see like people having either food aversions or nausea, whether it's from the medications or from the cancer itself, or if you're talking about like a head and neck cancer or an upper GI cancer, you

might not be able to eat physically. And so then it's very difficult to get nutrients in. So it's, it come, there's a lot that goes into a cachexia associated with cancer, but that is a really big cause of death. One estimate that I saw was that cancer associated Cachexia accounts for nearly half of all the deaths associated with cancer worldwide. Which is, which is really huge. And then there's also the fact that cancer disregulates our immune system in a very profound way. Mm-hmm. Especially when it gets to be metastatic. Um. Mm-hmm. And so it can end up causing things like blood clots and thromboembolism or blood clots are a really big cause of death for people with cancer as well. So there's just a lot of ways that cancer, um, disregulates our body and then can end up leading to death, like in a lot of different ways.

EW: Why are, I know, I know that we're not gonna talk about specific cancers. Yeah. But why is there such very, you know, looking at different organ system or like point of origin Yeah. Organ of origin. Why is there such a difference? Tends to be such a difference in, you know, metastasis and, yeah. Fatal, you know, fatality, fatality and treatment. Receptibility, what is it? Being able to be treated right. I can't think of the word.

EAU: It's hard, Erin. 'cause it's so many different things. I think that play into that.

EW: Yeah.

EAU: Some of it is, um, our ability to screen for [01:30:00] things.

EW: Hmm.

EAU: And so we are able to catch some cancers a lot earlier than we can catch other cancers and therefore we can treat them more effectively with the same treatments that we would use for another cancer. Pancreatic cancer is a really good example of that. Like, and ovarian cancer is another one where a lot of times these are completely asymptomatic until, until it's really bad. It's

EW: really bad.

EAU: Yeah. Until it's already spread. At least regionally, if not widespread. Um, and so that's part of it. Whereas breast cancer, prostate cancer, like things that we can screen for, we can potentially catch earlier. And I, some of it is just cancer specific that I, I don't know the answer to. I'd have to dig on each specific cancer of like why pancreatic cancer is so, so, and some of it too is that we research cancers that are more common.

EW: Yes.

EAU: And there's more funding for cancers that are more common, which is logical, which means that cancers that are more rare are gonna have a lot less treatment options. They're gonna be harder for us to detect, harder for us to even think about checking for. Mm-hmm. And then harder for us to treat because we don't have as many treatment options available for those kinds of cancers. And that's a really huge issue.

EW: Right. And then if they're, if they're rarer, then it's harder to have clinical trials Exactly. That then, you know, show the performance of this treatment versus another. Exactly. Yeah.

EAU: So you're relying on a lot less data to guide your therapy to begin with.

EW: Mm-hmm.

EAU: Mm-hmm. So there's, there's so much that goes into it. So many

EW: factors.

EAU: Yeah. Yeah. But obviously cancer can and does end up affecting our entire body system.

EW: Mm-hmm.

EAU: But I haven't even told you at all, like, how does this actually arise?

EW: How does it happen?

EAU: How does a cell in our body just up and decide to go rogue? Is that really what happens? Why is tobacco smoke and genetics, like how do all these virus environment genetics play a role? That is where we'll pick up next week. Erin

EW: Cliffhanger,

EAU: cliffhangers. We love 'em.

EW: We do. We do. Gosh,

EAU: I know it was a lot.

EW: I feel like, I mean, yeah. We've, we've covered a lot of ground already also, and, and I have so many

EAU: more questions.

EW: I know. I feel like we've also barely scratched the surface.

EAU: Yeah, it's true.

EW: This is an iceberg, uh, of a topic.

EAU: And if you want more below the surface, boy do we have Nice, thank

EW: you. Very well done. It's like we plan that. We did not plan that. We have a lot of sources. Yeah. Um, I, I have so many. And then I just wrote a few here to shout out. Her

EAU: list is so long. Y'all like, please go to our website. This podcast will kill you.com. Click on the episodes tab, and it is such a long list.

EW: It's, it was really hard to stop.

EAU: Yeah. Good.

EW: And there were some really great sources. Okay. So, uh, for this episode, uh, a few of the sources that I found the most helpful are, uh, the Emperor of All Maladies. Mm-hmm. A biography of cancer. It's classic, it's Pulitzer Prize winning. It is. Yes. By Sid Arthur Mukerjee, uh, published in 2010. Then there's another book called Ologies, A Cultural Study of Cancer by Jackie Stacy, which I think ca this says 2013, but I think it came out earlier than that. Okay. I'm not sure. That was a really interesting. Perspective on like our perception of cancer today. Mm-hmm. And how that's shifted. Then, uh, there's a series by had you, uh, from 2011 going all the way through like 2016 or something like that, seven part series called A Note from History, landmarks in History of Cancer. Oh wow. One through Seven. Hugely informative.

EAU: Okay. Love

EW: that. Yep. And then also, um, more about sort of the historical perception of cancer is a dread disease Cancer in Modern American culture by James Patterson, 1988.

EAU: Not the same James Patterson that my dad reads.

EW: I don't believe so. I'd have to double check on that.

EAU: Um, I have a number of papers as well too. Uh, I also just wanna shout out the, um, national Cancer Institute has like a cancer classification. They have these like training modules that anyone can access.

EW: There's, so there's a wealth of information there.

EAU: Yeah. It's really great. So I have a link to that. Um, that paper that I mentioned that was like updating the definitions of cancer was by Brown et al from 20. 23 called updating the definition of cancer. I thought that was just an interesting read. Um, and then if you want more about the staging of cancer, there's a paper, it's kind of old from 2008 by Green and Soen called The Staging of Cancer, A Retrospective and Prospective Appraisal.

EW: It's like early 21st century. I don't know.

EAU: Um, and then there's so much more. Go to our website, check it out. You can see it all. I'm done.

EW: Uh, thank you again. I mean so deeply, so deeply to the providers of our Foran accounts. Yeah, it means the world.

EAU: Everyone, everyone who wrote in, everyone who Sent in Your story. Thank you. Yeah, thank you so much.

EW: Thank you to Blood Mobile for providing the music for this episode and all of our episodes.

EAU: Thank you to everyone here at the exact right studios.

EW: Yes, thank you. Thank you.

EAU: And Tom and Leanna and so many Pete. Pete, oh my gosh. I'm gonna forget everyone's name. Oh dear.

EW: Um, yes. Thank you. You make this happen. Also, I wanna shout out my husband, John, for listening to me [01:35:00] read all of these Yeah. And go

through all of these notes and talk incessantly about cancer. Yes. For weeks on end and really every other topic.

EAU: Yeah.

EW: Um, I

EAU: should also say thank you to Brett for listening to my, I made him, I was like, you can't do any fun things right now. I need to talk to you.

EW: I'm gonna talk to you for about, about two hours about cancer. Um, your guys

EAU: are good sports.

EW: Very good sports. Thank you. We appreciate your support. Um, we also appreciate the support of a few listeners. You listeners,

EAU: good transition.

EW: That's great, dear. Um, really you No thank you. Though you allow us to make this happen and to, your ideas are always appreciated. Yeah. Everything like you mean the world.

EAU: Thank you.

EW: Yeah.

EAU: Especially shout out to our patrons. Thank you for your support over on Patreon. We really, we really, it means a lot to us.

EW: Yes. Um, it's the end. It is

EAU: of episode one.

EW: Of episode one. Yeah.

EAU: We've got three more coming to you. So

EW: wash your hands. You

EAU: filthy animals.