Erin Updyke (00:00) [Firsthand account]
“In 1967, I was treated with hypothermia by immersion in ice cold water as part of a local study and then developed subcutaneous fat necrosis. Both myself and one other case were reported by the neonatal team who looked after me to have had otherwise favorable short-term outcomes, but on the basis of this complication, these early studies of hypothermia were stopped. I was born weighing 3,970 grams at full term after an uncomplicated pregnancy, labor, and delivery. As reported, at one minute after birth, I became apnic and did not respond to resuscitation. After five minutes, I was placed in an ice water bath. My breathing was reported to recover after 28 minutes of hypothermia. At 45 minutes of life, my capillary pH was 6.9, but recovered steadily, and I was discharged at day three. Subcutaneous fat necrosis developed between two and four weeks of age. The calcium deposits were largely cleared by six months. My serum calcium remained normal and my weight gain and development were considered appropriate at that age, but no further follow-up was reported. 53 years after these events, I have had a very normal life.

Although my mother teased me about my skin in childhood, I never had any apparent skin problems as a child or later. I was a keen sportsman at school. My handwriting was never a strength and so I taught myself to touch type, which turned out to be an advantage in the computer age. Academically, I did very well throughout school and university. I was awarded my PhD in 1998 and have served at my current institution as department chair and faculty senate president.

In retrospect, I strongly believe that the benefits of treatment clearly outweighed the costs and that the abrupt cessation of these early studies of therapeutic hypothermia represented a missed opportunity. the opinion of my parents had been sought at the time or subsequently my opinion, we would have favored continued trialing of this promising treatment.”

Erin Welsh (01:54)
Fascinating.

Erin Updyke (01:55)
It's really an interesting, I don't know that I've ever read a report of someone who had been a recipient of Therapeutic Hypothermia, especially from so long ago. It's a really interesting, yeah, it's really good find, Erin

Erin Welsh (02:10)
Yes.

‚Åì Thank you. I don't remember how I found it, but I do.

Erin Updyke (02:18)
Well, I can tell you where it's from.

That

was by Robert Carlson in Pediatric Research from 2021, an article titled, 53 years of follow-up of an infant with neonatal encephalopathy treated with therapeutic hypothermia.

Erin Welsh (02:34)
It's fascinating and I feel like that, yeah, the first hand account much, much later, because it's not like he remembers this happening, but he's like.

Erin Updyke (02:43)
Right, it's like he's clearly

reading some of the medical records of his birth and treatment thereafter and then talking about his life since. It's so interesting.

Erin Welsh (02:46)
Right.

Mm-hmm.

Yeah, and I'm so curious to know how this episode shakes out with like what you find. like the point I feel like I feel like the thing that stuck out to me when it comes to that is that maybe it was a little bit of missed opportunity. Maybe it was a little bit of, you know, understandable hesitation to pursue trials. But ultimately, it's like, how do you how do you make scientific discoveries that do not harm?

people or have the potential to harm people. And that's, you know, we've come a long way in the 20th century because of that. So anyway, hi, I'm Erin Welsh. And this is This Podcast Will Kill You.

Erin Updyke (03:26)
Yeah.

Yeah.

And I'm Erin Allmann Updyke

and we're coming back with our second part on hypothermia as promised.

Erin Welsh (03:41)
Yeah,

as promised, this is hypothermia can be good. Cold can be good. Yeah, yeah, however you want to say it. ‚Åì Yes, it's the history of therapeutic hypothermia. ‚Åì It's really so much to learn.

Erin Updyke (03:47)
Cold is not always bad.

I am thrilled. I know literally nothing about the history prior to 2002. Yep.

Erin Welsh (04:09)
‚Åì

okie doke. Well, I'll teach you some things that I have discovered. But we've got a few a few things. This is off to a great start, Erin. We've got a few things to tackle before we can get into like the meat of the episode. It's quarantine-y time.

Erin Updyke (04:16)
Great.

Mm-hmm.

It's quarantine time. We're still- we changed it.

Erin Welsh (04:32)
‚Åì drinking,

yeah. ‚Åì uncommon cold, the uncommon cold. Yeah, that's what we're drinking. It's... Nah. This is gold, Erin. This is gold. It's a... It's a habanero...

Erin Updyke (04:37)
That's what we're drinking. Yep. We should probably do that again though, right? Okay.

the uncommon cold.

Erin Welsh (04:56)
margarita, spicy margarita, because it's blended, it's cold, there's ice in it, but also there's like a little bit of warmth, you know, even though, yeah, and also alcohol is not a treatment for hypothermia, as we covered last episode as a reminder. It's on our website. This podcast will kill you.com. It's on our social media channels.

Erin Updyke (04:59)
Blend it.

Listen.

It's on our website.

Don't, don't, yep.

Today, this is going really well.

Erin Welsh (05:21)
really

well. ,Åì Our website has lots of good things. It's got transcripts. It's got ,Åì sources for all of our episodes, links to merch, links to Patreon, bookshop.org, affiliate account, Goodreads list, music by Bloodmobile. If I haven't already said that contact us form firsthand account form. Reach out, reach out. We love to hear from you.

Erin Updyke (05:36)
You didn't.

We also love to hear when you have a great rating or review to write about us. So if you could leave us one of those, we'd really appreciate it. If you haven't done that already, thank you. If you have and subscribe on YouTube exactly right channel, can we get into the episode?

Erin Welsh (05:53)
Well done, well done.

Certainly. Let's take a break.

Erin Updyke (06:07)
Okay.

Erin Welsh (06:10)
I left off last week with the story of the amazing recovery of Anna Baggenholm whose body temperature dropped to 13.7 degrees Celsius or 56.6 degrees Fahrenheit. What? I still can't get over it. Just it bears repeating. Yeah.

Erin Updyke (06:27)
I know,

is that in the Guinness Book of World Records? Is that the record or do we know? Especially not after, no, definitely not anymore. Exactly, mm-mm. Yeah, hugely lost faith. Wow.

Erin Welsh (06:34)

I don't trust the Guinness Book of World Records anymore. I don't think I ever did, but like, yeah, not after a gallstone mishap. Mm-hmm. Mm-hmm. But yeah, she might be in there. ,Åì

But in that episode, Erin, last week, you also took us through all the ways that the cold can hurt or even kill us and how we can reverse or halt some of that damage. But it would be unfair to the cold for us to end the story there.

just showing its villainous side. Because while the cold has claimed many lives and fingers and toes and noses, it has also saved many as harnessed by modern medicine. And so this week, I want to tell the story of how humans have attempted to use cold successfully or unsuccessfully to save or prolong lives. We have

Erin Updyke (07:03)
Mm-hmm.

Erin Welsh (07:26)
long used cold as a topical treatment for various aches and pains, swollen joints, battle trauma and fever. Ancient Egyptian, Greek and Roman physicians all called for cold to be used in various ailments. know, the oldest medical writing hailing the benefits of cold comes from the Edwin Smith Scroll dating to 1600 BCE. It details a recipe to cool blisters. So it's more about like a cooling sensation in the cold itself, but still like

Erin Updyke (07:54)
,Åì okay, still,

yeah, cold can feel good.

Erin Welsh (07:56)
Yeah,

cold can feel good. And Hippocrates, of course, was a big believer in cold, especially for those of a warmer temperament. And he also wrote that this is, yeah, infants left out in winter, like left out infants, survived longer than babies left out in the summer months. So like.

Erin Updyke (08:12)
huh, yep.

Sorry. Like, first of all, what? Also, second of all, I missed this a little bit, but you just said of a warmer temperament?

Erin Welsh (08:21)
I don't, yeah.

Oh yeah, know, like tempers or not tempers, humors. Oh my God. I was like, we just did a whole episode. Honestly, this sweater is making me overheat. Next week, hyperthermia, just kidding. But no, so I have no idea. Was this an experiment? Was this just like lore? know, I don't know.

Erin Updyke (08:34)
like humors? Humor? We just did a whole episode on it. OK, so if you're... Well, maybe you have a warm temperament and you need some cold...

Ha ha ha.

Okay, I love it. Okay.

Yeah.

mean, so like babies can definitely overheat in warmer temperatures in many cases more quickly than they will. But like we said last week, because of their body surface area to volume ratio, they're also, you know, going to get be more susceptible to hypothermia too. So it's it is both. And how about that?

Erin Welsh (09:01)
Yes.

both and I mean really anything is possible with Hippocrates like this is like, yeah, I don't know. ,Åì But beginning in the 1600s or so there was a shift in thinking like if a little localized cold was helpful to relieve joint pain and whatnot that a full body cold soak would be even better, right?

Erin Updyke (09:42)
Mm.

Erin Welsh (09:42)
Cold

baths became all the rage and advocates claimed that they cured every ailment under the sun, especially fevers, which honestly, maybe they did, I don't know. But by the way, this made me think, I did a little digging in this episode because I was like, oh yeah, fevers, that sometimes can be adaptive. That sometimes can help us to fight off infections. Can hypothermia ever be adaptive in that way? Is there any reason that it would be protective?

Erin Updyke (10:01)
Mm-hmm. Mm-hmm.

Mm, mm, mm.

Erin Welsh (10:09)
So I did some digging and yes, I did find that a few people suggested that maybe a hypothermic response, like sometimes people get hypothermic in sepsis for instance, could be a last ditch effort to conserve energy and protect against damage from inflammation. But I also see your face right now, which is very questioning and that's how I feel too. Because how do you disentangle that from the body just not having the energy to maintain a fever or even just like normal body temperature?

Erin Updyke (10:35)
Yep.

Right. And I will say, like, what is the driver of it? I don't know. But what is the outcome of it? We do know that hypothermia in case, like, unintentional hypothermia. We're going to talk later today about intentionally reducing someone's body temperature. But if someone is so sick with an infection and they end up hypothermic, it's usually quite a bad sign that things are not going well. And it's usually poor outcomes. Yeah. Yeah.

Erin Welsh (10:53)
Yes. Yeah.

It's very bad. Yeah, yeah. So it's,

yeah, it's not like, it seems to me that we have no evidence to suggest or very little, none that I found that it's an adaptive response and it's more just the body shutting down. Yeah.

Erin Updyke (11:14)
Yeah,

it's not like a fever where our hypothalamus is like, hey, let's raise the body temperature. Our hypothalamus doesn't go, hey, let's lower the body temperature. I didn't find any data that that happens in humans. In other animals like you talked about, they do it all the time.

Erin Welsh (11:19)
Yeah. Hang on. Nope. No.

They're doing it for other reasons too. It's like not, it's not a switch that they flip. Yeah, yeah, yeah. Okay, anyway, one of, one of, I'm glad, don't we love to just like some easy swing and just bat down ideas? Yeah, hypotheses. my God. Okay, so.

Erin Updyke (11:29)
Yeah, torpor, hibernation. Exactly. Yeah.

I love this. Already.

Yes! No! Push!

Erin Welsh (11:50)
One of the biggest cheerleaders for cold baths was this guy named James Curry. And I mentioned him in our fever episode last year as the mastermind behind many enthusiastic cold water treatments where he continually doused people with freezing water, even past the point where they were like, no, please, no, no more. Yeah, do you remember that? Sound familiar? OK. Well, I don't know. I don't remember if I got into this in the episode.

Erin Updyke (11:58)
Okay.

Mmm.

Uh-huh, uh-huh, I feel like I remember this. Yep, yep, yep, yep, I do.

Erin Welsh (12:15)
But one of the reasons that he became so evangelical about cold water treatment is because in the early 1770s, he observed a shipwreck in the freezing waters of the North Channel. When rescue finally came, the survivors tended to be those who stayed in the water, while those who waited on top of the ship more often perished. And that made me think of Titanic and Jack and Rose, you know?

Erin Updyke (12:39)
Hmm.

Mm-hmm.

Erin Welsh (12:42)
Because by this logic, shouldn't Jack have survived? Spoilers. He doesn't. Sorry, spoilers. No, it got spoiled for me by a neighborhood friend when it came out, and it was trauma. That has made me hate spoilers so much. You know how I feel about spoilers. I mean, who likes spoilers? But yeah.

Erin Updyke (12:45)
But like, he doesn't.

Sorry if that's a spoiler for anyone.

yeah, that would be, I do, I do. ,Åì

It also, I just wanna say that that does not make any sense because of what we talked about last week with how water is a much better conductor of heat than air and so immersion in even, mean the water in Titanic was like below freezing, very cold, but even immersion in like water that's like 60 or 70 degrees can cause hypothermia in a number of hours where it would take a very, very long

Erin Welsh (13:08)
Okay.

Very,

Erin Updyke (13:29)
prolonged exposure with no close at all to be hypothermic in those temperatures in air.

Erin Welsh (13:34)
Yeah, mean, you know, if only we had Curry himself here to question and be like, bro.

Erin Updyke (13:39)
If only. only. Yeah,

what was your sample size and did you actually

Erin Welsh (13:44)
I think he was just watching

from a distance and how he could even know were the people who were on the shipwreck like or on the the remains of the boat were they also soaked in water did they fall off occasionally you know like

Erin Updyke (13:54)
Right,

was it that they were soaking wet and then there was wind chill or something like that maybe? Was the air temperature colder and the water temperature was not that cold and then there was wind chill? I don't know, there's too many.

Erin Welsh (13:59)
could be.

Maybe. mean,

the bottom line is that he was like convinced cold water is where it is at.

Erin Updyke (14:08)

Okay.

Well, we know you can't change their minds.

Erin Welsh (14:13)
Um, you can't, yeah. And, oh, by the way, speaking of Titanic, so of the nearly 1,500 deaths from the Titanic, from that Titanic, I mean, do I need to say any more, were classified as drowning when in fact they were probably hypothermia. Yeah. Just an interesting, I think that kind of, but it shows to me, it demonstrates sort of the public's understanding of hypothermia and what was happening in that situation.

Erin Updyke (14:27)
No.

Hypothermia. Makes sense.

Erin Welsh (14:42)
Okay, so the other reason that Curry was psyched about cold baths was reading about the experience of this guy, Dr. William Wright, who used cold water to treat a fever that he had, which was likely typhoid fever. right, quote, September 9th, having given the necessary directions, about three o'clock in the afternoon, I stripped off all my clothes and threw a sea cloak loosely about me till I got upon deck when the cloak was also laid aside. Three buckets.

full of cold salt water were then thrown at once on me. The shock was great, but I felt immediate relief. The headache and other pains instantly abated and a fine glow and diaphoresis Towards evening, however, the febrile symptoms threatened return and I had recourse again to the same method as before with the same good effect. I now took food with an appetite and for the first time had a sound night's rest.

Erin Updyke (15:38)
I love that image. What is a sea cloak? Can I have one?

Erin Welsh (15:44)
I'm assuming towel, no?

Erin Updyke (15:47)
I'm picturing.

I'm picturing something quite much more majestic than a towel.

Erin Welsh (15:54)
Okay,

I'm calling my towel C-cloak from this point forward. Can you help me fold the C-cloaks, please?

Erin Updyke (16:03)
Do know that never in a million years would I have assumed that it's a towel?

Erin Welsh (16:08)
I have no idea. Somebody, we need to look this up. No, it might not be. It's just a branding opportunity.

Erin Updyke (16:15)
It's a towel, but I never would have thought that.

It really is someone make a sea cloak.

Okay, but also like that's a whole so that is the account that made this guy curry be like cold baths cold baths for everyone cold baths for everything

Erin Welsh (16:35)
cold bath.

Yeah. I mean, it's not that much different than like watching a TikTok video today and being like cold baths, ice bath. You absolutely can. Yes. Yeah. And so, but this like really took many different places by storm. Spas sprung up where you could alternate between hot and cold waters, which is quite delightful. And

Erin Updyke (16:41)
you

You can find a lot of those videos on TikTok right now. People are really into cold baths. Yep.

Mm.

Erin Welsh (17:00)
The benefits of cold water plunges were widely hailed even before the TikTok bros, you know, came on the scene. But cold treatments weren't always used with consent. In the 1600s, cold water dunking was occasionally employed as a cure for mental illness, where it proved not only ineffective, but also cruel, torturous, and even deadly in some cases. There were dunking stations built on the grounds of some asylums.

Erin Updyke (17:06)
Uh-huh.

my gosh,

that's awful.

Erin Welsh (17:31)
The logic behind this was that, okay, well, if mental illness is caused by a fevered brain, you need to cool it by any means necessary. So as an example, in 1725, a woman who was accused of neglecting her husband was forced while restrained to stand under a torrent 15 tons of freezing water for 90 minutes until she promised she would become a loving and obedient wife.

That's like, I mean, what else do you call it that's literally torture? Yeah, yeah. Uh-huh. And not to mention ineffective on medical grounds. But even if it were effective, it's not like that would justify its use.

Erin Updyke (18:02)
That's just actual torture. What? ‚Åì

Yeah.

Also, it's a mental disorder to not be nice to your husband.

Erin Welsh (18:20)
I know I told my husband this and he was like what is neglectful me like what what does that mean right right and I know

Erin Updyke (18:26)
What does that mean? Yeah, I so many questions.

Like, her sandwich wasn't made crispy enough or like it was too crispy and it, you know, when it scratches the top of your mouth. Yeah.

Erin Welsh (18:35)
Yeah, the Captain Crunch syndrome, yeah.

Just shreds the roof of your mouth, Mm-hmm, mean, yeah. Still don't think it deserves 15 tons of freezing water, but you know, that's just my opinion. Just our opinion. But yeah, and so as much as I would like to tell you that this type of thing fell out of favor and was never used again by anyone in medicine, unfortunately, I cannot.

Erin Updyke (18:40)
That's what it is. She made his sandwich like that. Well, okay.

just our opinion. Okay.

Yeah.

Erin Welsh (19:03)
In fact, it was the torturous use of cold on non-consenting individuals that led to cold therapy being dismissed as an illegitimate and groundless therapy, even when one doctor showed evidence to the contrary.

Erin Updyke (19:17)
Hmm.

Erin Welsh (19:19)
While in medical school in the early 20th century, Temple Fay was stumped by a question on a quiz. Why does metastatic cancer rarely appear in the limbs?

He had no idea. He was like, I don't know what to put here. So he asked his professor, like, hey, what's the answer to this? And his professor was like, I don't know either, actually. I don't know. don't know. Yep. But ‚Åì the puzzle stuck with him. And so in the 1930s, Fay decided that he wanted to try to solve it. His primary hypothesis had to do with temperature.

Erin Updyke (19:46)
Why did they put it on the quiz?

Okay.

Okay.

Erin Welsh (20:03)
So he figured that parts of the body with higher temperatures were more likely to promote cancer growth, while cooler parts, the extremities, discouraged growth. growth, you could arrest cancer development. So operating under this logic, Fay devised a few local refrigeration experiments, first in chicken embryos, then tissue culture, and then

in humans. His first patient was a woman who was experiencing extreme pain from a cervical carcinoma. He inserted a device of his own making into the mass, like a hollow metal capsule through which water flowed in a closed system, and he set it to cooling. 48 hours later, the patient was pain free. And within five days, the tumor had actually shrunk a fair bit around the edges.

Erin Updyke (20:53)
Wow.

Erin Welsh (20:55)

The results encouraged Fay to invent more cooling instruments and setups, rubber bags, tubing, ice baths, and he tested out his hypothesis on other cancer patients. His results suggested he was onto something. 95 % of his patients reported an alleviation in pain and 20 to 25 % reported that their tumors shrank or grew more slowly. I mean, this was the 1930s, so keep in mind that like other treatment options for cancer were really limited.

Erin Updyke (21:23)
weren't available. Yeah.

Erin Welsh (21:25)
Yeah.

And when he presented his results, the broader medical community was stunned. They had dismissed his ideas initially as just quackery. Like, what do you mean you're just going to refrigerate that body part and suddenly you're all healed? And now they're like, hey, actually, maybe there is something to therapeutic cooling. What other applications can we find for this? And Fay himself would have likely gone on to develop his cold therapy further.

Erin Updyke (21:47)
Mm-hmm.

Erin Welsh (21:54)
if a couple of things had not happened. The first was a series of cold therapy programs that began in the 1940s at a few hospitals in the US, notably McLean Hospital in Belmont, Massachusetts. Doctors would administer barbiturates to the patients of theirs who were the most seriously debilitated by mental illness and then place them in cold water for periods ranging from 10 to 38 hours. Yeah.

Erin Updyke (22:15)
No.

,Åì jeez.

Erin Welsh (22:22)
And yes, there were warming blankets on hand and the patients were being monitored, but still.

Erin Updyke (22:29)
This is patients with mental illness. These are not consented. This is not an institutional review board which doesn't exist approved study. Yeah, okay.

Erin Welsh (22:32)
Yes.

Correct, correct.

No. Right, right. Yeah.

Body temperature would drop into the 70s Fahrenheit, 20s Celsius. Outcomes were allegedly positive, but it's not clear who's making the assessment, right? Like, is it the doctor who's like biased to think, I want this therapy to work? You know, is it the person self-reporting? Right.

Erin Updyke (23:01)
Mm-hmm.

Right, what are the metrics? Yeah.

Erin Welsh (23:08)
And it's also not clear how long any positive effects, if they did exist, how long they lasted. But they were encouraging enough for Scientific American to rave about them. Quote, for the first time, this new therapy, popularly known as human hibernation and technically as hypothermia, has apparently found a definite valuable application in treating insanity, particularly schizophrenia or dementia precox. Results in the case of studies have been remarkable.

so that more extensive investigation of the possibilities and limitations of this treatment will surely be forthcoming at the war's end, if not before." quote. Yeah. A little bit of unchecked enthusiasm there. That went a bit too far, as it often does. And as more hospitals started cold therapy programs to treat mental illness, there was several of them that got started, illnesses

Erin Updyke (23:49)
Okay.

Erin Welsh (24:07)
Injuries and deaths, even deaths occurred. So for example, at the University of Cincinnati in 1943, 16 people were put into refrigerators for 48 hours, two died and others suffered permanent brain damage. Yeah.

Erin Updyke (24:26)
cheese.

Erin Welsh (24:27)
This had the understandable effect of halting interest in therapeutic hypothermia for any reason or for any condition, but it wasn't the only thing to do so. It wasn't the only thing to kind of pump the brakes. So I mentioned that it was a couple of things that prevented

therapeutic hypothermia from being like more investigated. The first being these US based programs and the second was Nazis. So yeah. Yeah.

Erin Updyke (24:36)
Mm-hmm.

Yeah.

Yeah, this one I knew about.

Erin Welsh (24:55)
In 1939, Temple Fay submitted a manuscript to a publisher in Belgium, and somehow the Nazis, who had captured Belgium in 1940, came across it. They were already interested in hypothermia because their pilots often died in frigid waters after being shot down, and they wanted to better understand how long someone could survive, at what temperatures, which revival methods worked best, and when the point of no return was...

there, like what that point looked like, what it was. And they took inspiration from Fay's paper to set up cold water immersion tanks at Dachau concentration camp, where they held people in the tanks at varying temperatures ranging from 36.5 degrees Fahrenheit, which is two and a half degrees Celsius, to 54 degrees Fahrenheit or 12 degrees Celsius. Sometimes

Erin Updyke (25:27)
Yeah, right.

Erin Welsh (25:50)
They gave people pilot suits or flotation devices. Other times they strip them and held them there naked for up to 14 hours. And over the course of the war, 360 to 400 experimental sessions were carried out involving 300 individuals. ‚Åì It's, yeah, there are many, many more horrifying details of this torture that emerged after the war during the Nuremberg trials. And

Erin Updyke (26:07)
Peace.

Mm-hmm.

Yeah.

Erin Welsh (26:19)
The news of these trials really poisoned any remaining interest in therapeutic hypothermia for almost two decades. No one wanted to be seen doing what had become characterized

as Nazi science. Eventually though, that characterization faded as people realized that cold therapy may still hold some promise.

Erin Updyke (26:26)
Mm.

Mm-hmm.

Right.

Erin Welsh (26:40)
And

as World War II became more distant, some researchers grew more comfortable with using the data generated by these torture sessions, believing that it could, quote, advance contemporary research on hypothermia and save lives, end quote. And it became and really still is quite a controversial topic. Some people advocate for free, unrestricted use of this type of data and others saying that a ban is actually more appropriate. No one, no one should be able to use this.

Erin Updyke (26:55)
,Åì yeah.

Yeah.

Erin Welsh (27:10)
,Åì data.

Erin Updyke (27:10)
Right.

mean, you're essentially benefiting from torture in one way or another.

Erin Welsh (27:14)
torture.

By 1984, though, over 45 publications had cited the hypothermia experiments at Dachau, implicitly or explicitly endorsing the use of such data. And I found a paper published in the New England Journal of Medicine in 1990 that discusses these hypothermia experiments specifically and the controversy surrounding them.

And the author concludes with this, quote, on analysis, the Dachau Hypothermia study has all the ingredients of a scientific fraud and rejection of the data on purely scientific grounds

is inevitable. If the shortcomings of the Dachau Hypothermia study had been fully appreciated, the ethical dialogue probably would never have begun. Continuing it.

runs the risk of implying that these grotesque Nazi medical exercises yielded results worthy of consideration and possibly of benefit to humanity. The present analysis clearly shows that nothing could be further from the truth." quote. Basically, like the author, I feel like, saying that if it's a question of using the data, first of all, the data is worthless scientifically. even if it was, even if the experiments were done in a way,

Erin Updyke (28:27)
Right, yeah.

Erin Welsh (28:34)
quote unquote experiments were done in a way that was controlled and all the variables, it doesn't mean that it's okay to use. So.

Erin Updyke (28:41)
Yeah, but and

also and also on top of that it's trash data. Yeah.

Erin Welsh (28:45)
It's trashed. Yeah, it's just,

yeah. yeah, there's, it is a really interesting paper. Yeah.

So therapeutic hypothermia,

joins the ranks of so many other scientific advancements that have been built on the backs of those who did not have the power to say no or have their no heard. And hopefully it's somewhat of a consolation that overall very few papers exploring the use of therapeutic hypothermia make reference to Dachau, at least like directly from data. They may mention this is where things, you know, this is what was done, but they don't say, and this is how we know. Yeah.

Erin Updyke (29:06)
Mm-hmm.

That's good.

Right. Yep. Yeah. This is where we got

our data.

Erin Welsh (29:25)
Right, right. And the therapy came crawling back slowly with a few papers here and there in the mid to late 1950s. First, the discovery by Hubert Rossimoff and Duncan Holliday that when a person is hypothermic, their brain consumes less oxygen. That was a major breakthrough. It opened the door for new avenues to protect the brain during times where oxygen might be restricted, like stroke, heart attack, aneurysm, certain surgeries, by just reducing the

brain's oxygen demands with hypothermia, you're protecting the brain from long-term injury. And shortly after, a few physicians started playing around with using hypothermia after cardiac arrest, others during cardiac surgery, although the routine use of therapeutic hypothermia wouldn't happen for a long time, especially as physicians grew aware and wary of certain complications with the practice.

In the 1950s and 1960s, again, the therapy was used in a few small studies for infants that had trouble breathing shortly after birth, like Apgar scores of one. This is our firsthand account. Animal studies had shown promise in this regard, so doctors tried it out on humans. And also it has a deeper history, like there are some reports from the 1600s using cold water immersion for infants. Mm-hmm. It seems successful.

Erin Updyke (30:42)
Interesting for infants. Hmm.

Erin Welsh (30:48)
So in one of the studies, nine out of 10 of the infants survived and none showed any developmental delay. And I couldn't find any indication that the baby that did not survive died because of hypothermia. yeah, I don't think that that was the case. ,Åì But these studies were really small and they weren't well controlled. so combine that with the potential for complications and you've got another decades long delay in this becoming a standard of care. Yeah.

Erin Updyke (31:15)
Interesting.

Erin Welsh (31:16)
And ultimately in 2005, I believe it did become a routine and has since saved lives and prevented injuries. But what about prolonging lives? So someday, Erin, we should do an entire episode on cryonics. as a teaser for now, let's just say that while researchers were trying to figure out how to use the cold to protect the body from injury,

Erin Updyke (31:35)
We should.

Erin Welsh (31:46)

Other folks were wondering whether we could use hypothermia to put the body in a suspended state. The space race had begun after all, so like who was going to be the first to traverse light years worth of distances? So a bunch of cryonics companies sprung up in the 1960s with the first volunteer dying on January 12th, 1967, and which was a little bit

Erin Updyke (32:00)
Exactly.

Erin Welsh (32:14)
earlier than the company that he had, the Life Extension Society, it was called, thought that they were, he was going to die, yeah, they were not ready at all. Like his doctor was like, he's on ice, you gotta get him now. And they didn't have anything set up, they were still in building the pods or whatever. And so they stored this person in one of the Life Extension Society guys' garages in his station wagon.

Erin Updyke (32:21)
that they were ready for? Yeah. huh.

Erin Welsh (32:44)
And then was like, don't tell my wife. And then his wife went into the garage and was like, what? Get this out of here. So we found a couple of friends who would store the body for a few days. ,Åì But yeah, cry on. Cry. Yeah.

Erin Updyke (32:44)
Also.

Sorry, all I can do is blink.

Sorry, this is a, just so I understand. This was a person who died of some other cause, some cause, cancer.

Erin Welsh (33:12)
Yes.

cancer. Yes, I believe. ,Åì

Erin Updyke (33:20)
And then they made him cold and stored him in a hatchback.

Erin Welsh (33:27)
There was some perfusion of various substances. forget what. Yeah. It might have been DMSO. Sounds familiar? Yeah. In 1967, yeah. But they didn't have the pods ready for like long term storage. So the station wagon was the thing. ,Åì Yep. But this

Erin Updyke (33:36)
In the ssss... Okay, in the 60s. Cool. Okay.

No. Yeah, the pod.

The first pod. Mm-hmm. Okay.

Erin Welsh (33:55)
came out, like the news of this came out and Cryonix never quite recovered from this first mishap. And really just like over the years, it seems like a way to extort money from grieving people who don't know how to accept that their loved one died or that they themselves are mortal. Yeah.

Erin Updyke (34:17)
going to die.

Erin Welsh (34:21)
So there you have it, Erin, the history of cold, the good, the bad, and the weird. So can you tell me how therapeutic hypothermia works? Does it work?

Erin Updyke (34:35)
I

love that that's what you're leaving me with. ,Åì I also have to tell you, I am not going to talk about cryonics at all. literally as you were, like as you were even starting, was like, gosh, I wonder if I should have looked into like, I didn't. So if that's what you're expecting from this episode listeners, you're about to be disappointed. I'm gonna talk about real life and not science fiction.

Erin Welsh (34:37)
Yeah.

I didn't think so, that's okay.

You know, real life. Yeah.

Erin Updyke (35:03)
And maybe it will be science reality someday. Right now it's science fiction. Okay. If we could wake up in the morning anyways.

Erin Welsh (35:07)
I mean, wouldn't it be nice?

said a song. ,Åì

Erin Updyke (35:14)
Beach Boys. Wouldn't

it be nice? Okay.

,Åì What I am going to actually focus on today, ,Åì not cryonics, is how we use therapeutic hypothermia. I'm putting it in air quotes because we don't call it that anymore. There's been ,Åì multiple evolutions of this term for a while, and it kind of depends on what scenario you're looking at. So sometimes it still is induced hypothermia or therapeutic hypothermia.

Erin Welsh (35:34)
,Åì what do we call it?

Okay. Okay.

Erin Updyke (35:50)
,Åì But more commonly, ,Åì targeted temperature management is used. ,Åì

Erin Welsh (35:56)
God,

this might explain why I could find so few papers on the history of therapeutic hypothermia.

Erin Updyke (36:00)
Yes,

yes. It's why it took me so long to find the papers that I finally found about how we do it. It's because targeted temperature management and now newly just temperature control. Why the change in rhetoric, Erin? Let me tell you. I'm going to tell you, but it's going to take me a while to get there because I'm verbose. I'm going to focus mostly on the broad strokes of

Erin Welsh (36:15)
,Åì

Erin Updyke (36:26)
Like what are the contexts in which we use therapeutic hypothermia? How do we do it? And things like that. The point of it, really big picture, is what you mentioned, Erin. It is to reduce the risk of ischemic injury, meaning reduce the risk that a lack of oxygen to our tissues causes actual and irreversible damage.

Erin Welsh (36:44)
Mm-hmm.

Erin Updyke (36:55)
Because of the theoretical fact, which is like, it's not just theoretical, it is true, but because of the fact that as our body temperature cools, our metabolic rate decreases, our need for oxygen in our tissues decreases. That is the theory by which therapeutic hypothermia works.

Erin Welsh (37:14)
Mm-hmm.

Erin Updyke (37:22)
But how does it end up working in practice? Like what is it really doing to protect our tissues? We think that in the brain, this decrease in our metabolic rate decreases blood flow to the brain, which can also decrease intracranial pressure, which is something that often goes up during damage.

Erin Welsh (37:48)
Mm-hmm.

Mm-hmm.

Erin Updyke (37:51)
In our heart, because of changes to the heart muscle and the heart tissues itself, as well as the changes that we see in our blood vessels with cold, right? We're vasoconstricting a lot of our blood vessels. We see a decrease in our heart rate, but you can maintain blood pressure to a certain degree.

Erin Welsh (38:06)
Yep.

Okay.

Erin Updyke (38:17)
And these are two of our organs, our heart and our brain, that we are wanting to protect the most with therapeutic hypothermia. Because our heart and our brain are two organs that A, are gonna be impacted first due to ischemic damage, right? Lack of oxygen is gonna end up damaging those tissues irrevocably. And...

Erin Welsh (38:41)
Mm-hmm.

Erin Updyke (38:43)
If we can protect those, then we could potentially recover from any other insult to other organs or other tissues.

Erin Welsh (38:51)
So we're still in the hypothetical, this is how things should work phase.

Erin Updyke (38:53)
Yeah, this is like the thought of how this should

go and why we think that that cooling a body, a core temperature is going to be beneficial, right?

Erin Welsh (39:04)
Okay, got

it.

Erin Updyke (39:06)
so to understand the specific situations where we might use therapeutic hypothermia or targeted temperature management or whatever, we also have to think about the ways in which this lack of oxygen ends up causing damage.

Because what that tells us is there's different time periods at which you could potentially use hypothermia to try and reverse or prevent this damage.

Erin Welsh (39:37)
Right, yeah, elaborate.

Erin Updyke (39:41)
Okay,

well, let me elaborate Look and we can use if we want we can use an example. Let's say your heart stops Okay, this is one possible situation If your heart stops beating you're not pumping blood So your tissues are not going to get oxygen that it's all of your tissues your brain your heart all of your tissues are going to not get oxygen There's three phases

Erin Welsh (39:51)
Okay.

Erin Updyke (40:06)
to the damage that that is going to cause. The first is when that heart stops, you're gonna have the lack of oxygen, right? Because our cells require oxygen for metabolism, without oxygen, your cells start to become damaged, okay? Step one. But then, if we are in medicine and we're like trying to bring somebody back and you can restart their heart after a cardiac arrest,

you're going to all of a sudden re-perfuse that area. Okay? Which means you're gonna have a flow of oxygen to the area. You're doing CPR, you're using a defibrillator, whatever it is, you're now re-perfusing. That process actually causes its own sort of damage. Because as our cells start working again, they end up creating reactive oxygen species.

The way that I think of it is like, know, if you turn your water off in your house for a while, and then when you turn it back on, it's like grody, sputtery and like brown water at first before it runs clear. Thank you. That's my analogy. ,Åì That's like the immediate reperfusion injury that you can get. Okay. And then after that, there's a final stage that you can also get like a delayed reperfusion injury. Think of it like,

Erin Welsh (41:03)
Yeah.

Mm-hmm.

Okay. Okay.

Erin Updyke (41:31)
a few hours after you start to get blood flow back, there's inflammation, there's our body reacting to this insult that it just received, so you can get additional damage to that time as well. I don't have a sync analogy.

Erin Welsh (41:43)
I was gonna say,

how does the, what about pipes in the house, water? Okay.

Erin Updyke (41:46)
It doesn't, yeah it doesn't.

I don't have a equivalent there, sorry. Okay, sorry. Okay, so that's the example with cardiac arrest, but it's true in any scenario where you have lack of blood flow, right? If you think of a stroke, all of those same scenarios are gonna happen. You have blocking blood flow to a part of the brain that causes tissue damage in the brain.

Erin Welsh (42:10)
Mm-hmm.

Erin Updyke (42:11)
then if

you're able to re-perfuse that area by say breaking up that clot or something like that, you're going to get re-perfusion injury and then you'll have delayed re-perfusion injury as well. So it

is, that's the like ways that damage are caused. So you could potentially in theory use hypothermia at any of those stages to decrease the risk of injury depending on when you can initiate it.

how long you initiate it for. Because in addition to decreasing our overall metabolism, this hypothermia also just attenuates all of our cellular responses. It's gonna reduce the inflammatory response. You'll have vasoconstriction, so you're not gonna have as much edema or fluid collection outside of our vascular system. And there is a lot of animal data to support the use of therapeutic

hypothermia in a really wide variety of situations.

Erin Welsh (43:13)
Okay, real quick though. ,Åì if someone has their heart stops, then there already will be damage because of the reperfusion and then the second reperfusion situation, whatever. then when is hypothermia, when do you target the use of hypothermia? And also how realistic is that from like a hospital situation?

Erin Updyke (43:18)
Mm-hmm.

Exactly. Yeah. Yeah.

So that is why this gets so complicated, right? Because that's the exact right question. But if you think about the survival story that you told last episode, Erin, where her heart stopped, right? But she was already cold at that point. She was cold and her heart stopped because of that cold.

Erin Welsh (43:44)
Okay.

because her heart had just stopped. Yeah.

Yes.

Right.

Erin Updyke (44:06)
So

there was already a decrease. you potentially in that case, because she recovered so well, you already had protection against anoxic injury. You had protection against lack of oxygen because the tissues were already cold before that initial insult, right? In most realistic scenarios, that's not going to happen, right?

Erin Welsh (44:29)
Yeah.

Erin Updyke (44:29)
So

the cases that we are going to potentially be able to use therapeutic hypothermia, we're probably not gonna be able to do it before that initial injury, before the onset of the lack of oxygen, okay? So it's the second two scenarios that we're thinking about targeting. Can we use it to reduce the risk of that initial reperfusion injury? Well, to do that, you would have to cool the body before you reperfuse it, right?

Erin Welsh (44:41)
Mm-hmm, mm-hmm.

Okay.

Erin Updyke (44:58)
So before you restart the heart, that's not a thing that people do because if someone's heart stops, your first thought is to restart it, right? So the way that therapeutic hypothermia or the way that targeted temperature management often ends up being used is in that third phase to try and reduce the risk of that delayed reperfusion injury after the heart or whatever it is gets restarted or things like that.

Erin Welsh (45:05)
Restart it, yeah, yeah.

Okay.

Erin Updyke (45:26)
Can we reduce the risk of that further damage by cooling the body, slowing down the metabolism, slowing down the need for oxygen?

Does that make sense?

Erin Welsh (45:38)
It does, and so like, because I feel like there are two main, well, I mean, obviously you're gonna tell me more, but like in an emergency situation, there's, it's like the use of therapeutic hypothermia or whatever, temperature control, yeah, the thermostat in an emergency situation and like we need to decide right now, what do we do versus a.

Erin Updyke (45:47)
Uh-huh.

Yeah, whatever.

Erin Welsh (46:06)
we're going into surgery type of situation. Like is that, you know, like a more planned use?

Erin Updyke (46:10)
Right,

so when do we actually use it, right? What are the situations that we actually use it today and do we have data that it's actually helpful? Because that was all like the theory of like, this is how it should work, we should be able to use it in these scenarios. Can we actually use it in these scenarios? Surgeries, so in a surgical situation, you could, because you're in total control there, you could cool the body before any kind of ischemic insult, right?

Erin Welsh (46:15)
Yeah, yeah.

Mm-hmm.

Erin Updyke (46:41)
You can do that. And if we are talking about a heart surgery, you might need to actually stop the heart in order to do a surgery on the heart, right? In those situations, a person is put on cardiopulmonary bypass. So their blood is still being pumped. It's being oxygenated outside of the body. But could we, by reducing their body temperature, also...

decrease the risk that if we're not oxygenating it quite well enough or just, you know, that the heart itself, which has stopped, it's not going to be as injured. That is something that is sometimes used, but there is much more mixed data on whether or not it's truly protective, both for like neuro protection, as well as just like generally protective against ischemia. And so right now the guidelines for, you know,

Erin Welsh (47:19)
Okay.

Erin Updyke (47:33)
if someone is doing a heart surgery and is going to be on cardiopulmonary bypass, do you do intentional hypothermia or do you not? ,Åì It depends on the situation.

Erin Welsh (47:43)
In what and like in what way?

Erin Updyke (47:46)

It might depend on that particular person. How high of risk are they for ischemia to begin with? It might depend on the capabilities of where you're doing the surgery. Do you have the ability to cool somebody or not? ‚Åì But the data is not like a clear cut, like you need to do it in order to improve outcomes. And it's okay if you don't do it essentially. In most other surgeries,

Erin Welsh (47:51)
Okay.

Erin Updyke (48:11)
the data is more clear that hypothermia should actually be avoided because your body is going to be under more stress trying to warm itself up and surgery is already a very stressful situation. So it's really only like heart surgeries. There also was like, there's been trials on using it for, ‚Åì

Erin Welsh (48:18)
Okay.

Yeah.

Erin Updyke (48:35)
brain surgeries, especially like aneurysm clips and things like that, there's not really data that hypothermia is beneficial necessarily in those scenarios.

Erin Welsh (48:37)
Mm-hmm.

It's so interesting because I feel like, I mean, and maybe this just speaks to the papers that I found that were out of date, but how it is talked about in terms of like, this is a really promising thing, it's case by case, but like it does really work. I think also just the fact it's the human body.

Erin Updyke (48:59)
Right.

The

human body,

Erin Welsh (49:08)
We have these controls,

our homeostasis or whatever. We're trying to maintain temperature for our benefit, even if that does end up hurting us. so I see, yeah, causing more stress by trying to override those controls. That makes sense.

Erin Updyke (49:22)
Exactly. Yeah.

Yeah. so that's really, from what I could find at least, that's the only scenario where if you could do therapeutic hypothermia, you would be trying to prevent that initial injury. Everything else that we use it for is kind of post injury. Can we prevent, you know, worse sequelae when it comes to neurologic stuff? Cause there's a lot of interest in like protecting our brain using hypothermia.

Erin Welsh (49:41)
Mm-hmm.

Yeah. Okay.

Erin Updyke (49:50)
The data is much more mixed and not as strong as I kind of expected. So after stroke, after traumatic brain injury, after hemorrhagic aneurysm or aneurysm rupture, ‚Åì any of these things, the data is unclear and guidelines right now do not support universal therapeutic hypothermia. They do support avoiding fever.

Erin Welsh (50:12)
Okay.

Erin Updyke (50:17)
And that is part of why, and I'll get into it even more, but that is part of why the kind of naming of this has changed more to let's not think as much about intentionally cooling the body, but to like a degree lower than a typical body temperature of 37, but let us do make sure that we don't go above 37.5 because then we do see that there's more damage. Yeah.

Erin Welsh (50:42)
Yeah, that makes sense.

What about ‚Åì babies?

Erin Updyke (50:48)
Okay, I was gonna talk about cardiac arrest next, but we can talk about babies next. Okay. No, I love it. Those are the two, those are the two big areas. So that's all the things that like we maybe sometimes kind of use it for. There's two areas that at least for a while, oh, spoilers, this therapeutic hypothermia actually cooling the body to around 32, 33, 34 degrees. So mild hypothermia was considered standard of care for

Erin Welsh (50:51)
yeah, you can do that, sorry. ,Åì

Erin Updyke (51:17)
almost 20 years for out of hospital cardiac arrest. So if somebody heart stops outside of the hospital and you're doing CPR or you have access to a defibrillator and they have a shockable rhythm so you can defibrillate them, there was a big paper that came out in 2002 that showed big benefit to once you get circulation back, once you have

Erin Welsh (51:22)
Okay.

Erin Updyke (51:46)
which is return of spontaneous circulation. Once you bring that person back to life, if you cool them for at least 24 hours, I think it was 12 to 24 hours at first, you have improved outcomes, better survival.

Erin Welsh (52:00)
Okay, survival as the outcome, got it?

Erin Updyke (52:02)
Survival

is the outcome because that's, And so that became standard of care. And then there was other papers that came out later that showed even if the person initially did not have a shockable rhythm, meaning if their heart stopped, but it was because of other things. It could be because of ,Åì substance use. It could be because of a pulmonary issue. It could be like just so many different things, but their initial rhythm wasn't one that you could defibrillate like they do on ER.

Erin Welsh (52:26)
Mm-hmm.

huh. Yep. They've moved past the clink, clink, clink of the paddles. Yeah. Yeah.

Erin Updyke (52:33)
Mm-hmm.

Oh, that's good. That's good.

But so there were other papers that came out in like the early 2000s that showed even in those situations, there was some benefit to therapeutic hypothermia. So that was the

standard of care. However, since very recently, like a paper came out in 2021 that looked at a pretty big swath of people.

Erin Welsh (52:48)
Okay.

Erin Updyke (53:02)
regardless of their initial rhythm, out of hospital cardiac arrest, and did not find that therapeutic hypothermia was beneficial compared to just ensuring that they don't have a fever. So targeting 37.5 and not allowing it to go higher than that, but not necessarily lowering it wasn't any more beneficial.

There were a couple of other papers that came out since then that were similar that kind of just showed maybe this because there were papers that looked at, okay, well if lowering the body temperature is beneficial, what's the ideal temperature? Is it 32? Is it 33? Could it be 36? How low do we need to go? And those papers found that like 36 and 33, eh, no big difference. And so that led to more and more of these papers looking at how cold do we need to get people to have a benefit to try and

Erin Welsh (53:40)
Right.

Erin Updyke (53:55)
keep them alive with minimal neurologic damage once we bring them back after their heart stops.

Erin Welsh (54:01)
Okay, so this is once you bring them back after their heart stops, administer therapeutic hypothermia, but you don't anymore. It's just to make sure they don't have a fever.

Erin Updyke (54:10)
So right now, as of 2023, the guidelines is to pick a temperature somewhere between 32 and 37.5 and keep them there. So temperature control, but not necessarily therapeutic hypothermia.

Erin Welsh (54:20)
Okay. Yeah.

I have a question. How do we do that?

Erin Updyke (54:26)
Uh-huh.

,Åì such a good question. There's a lot of different ways. ,Åì It all does have to be very tightly monitored, ,Åì especially during the induction and maintenance phase. So as you're cooling that body down, and then once you get to that temperature that you're targeting, one of the things you have to do is avoid shivering, right? Because that's an automatic response that's going to rewarm the body and increase metabolic demand. ,Åì

Erin Welsh (54:39)
Mm-hmm.

It's gonna make you warm.

Erin Updyke (54:57)
You also have to keep very close eye on like their blood counts, making sure that all of the things that can go wrong during hypothermia, getting increased blood clotting, electrolyte abnormalities, diuresis, acid-base disorders from things shifting in and out of cells. You have to monitor all of those things. But how do you actually do it? ,Åì

You can do it almost the opposite of how we can warm your body. So you can externally cool with water baths or these fancy gel pads that circulate temperature controlled water. ,Åì You can do internal cooling, like the opposite of what we would do to warm it up. You can infuse cold IV fluids or cold like peritoneal or lavage. You can also, I know, you can also do, have you ever donated plasma?

Erin Welsh (55:31)
Mm-hmm.

Ooh, that must feel weird.

Mm-mm, only blood.

Erin Updyke (55:47)
If you ever donate plasma, take out, yeah, and so when it goes back into you, it's not cooled, but it is just colder than your body temperature usually, and it makes you feel cold. But you can also do that. You can do extracorporeal blood cooling. So you can take someone's blood out, cool it down, and then infuse it back in. So there's a number of different ways. And like I mentioned, it's usually a very mild hypothermia that is targeted. So like 32 to 34 degrees Celsius. Yeah.

Erin Welsh (55:50)
They recirculate, yeah.

more.

Right, okay.

Erin Updyke (56:18)
okay, I know. And then there is babies, you asked Erin. And this is the area that I think therapeutic hypothermia is truly still the correct term because it is the area that is still used. Whole body cooling or sometimes just head cooling, so just cooling of the head, is used and is considered standard of care.

Erin Welsh (56:19)
Fascinating.

babies.

Okay.

Mm.

Erin Updyke (56:48)
for full term newborns that are born and suspected of having hypoxic ischemic encephalopathy or HIE. And this is suspected brain damage that's due to lack of oxygen to the brain in a newborn. And that can happen, I'm not gonna go into a lot of deep detail on this, because I think it deserves its whole own episode, but this can happen in like a variety of different contexts.

Erin Welsh (56:57)
J. ,Åì

Okay.

Erin Updyke (57:16)
either just before delivery or kind of during delivery or shortly after delivery, right? There's a lot of situations, whether it's placental abruption, when like the placenta comes off of the uterus before the baby is delivered, that is going to disrupt oxygen flow to the fetus. Other cord issues, like the cord getting compressed or prolapsing, ,Åì uterine rupture, the heart rate of the fetus just dropping and then not recovering,

Erin Welsh (57:22)
Okay, yeah.

Hmm.

Erin Updyke (57:44)
or even during or after delivery, anything that causes the baby to stop breathing or not have access to oxygen is going to lead to potentially hypoxic ischemic encephalopathy. And we use that Apgar score that you mentioned, which is a composite score of like how well

they're breathing, their skin color, turgor, reflexes, all of these things to give a sense of how a baby is doing. And it's usually at that 10 minute mark if a baby's heart rate is still really low or

Erin Welsh (57:57)
Okay.

Erin Updyke (58:12)
if it's not there at all, ,Åì and if they're not breathing or they're requiring continued ventilation support. There is good data that cooling these babies can help prevent severe disability or death.

Erin Welsh (58:20)
Mm-hmm.

Okay.

Erin Updyke (58:29)
And I specifically mentioned full term infants because a relatively recent study from, I think it was actually published this year in 2025, ,Åì was actually one of the first ones that looked at preterm infants and did not find any statistically significant improvement in outcomes for preterm infants

Erin Welsh (58:31)
huh. Yes.

Mm.

Why do you think that is?

Erin Updyke (58:57)
I mean, babies, newborn babies are so different in their physiology. so like ,Åì a premature newborn has different physiology than a non-premature, like a full term newborn. And so we don't know. mean, the short answer is we just don't know. ,Åì But that's why it was so important that this study was actually done because there certainly were all of the studies previously had only used full term infants and

Erin Welsh (59:13)
Yeah.

Okay.

Erin Updyke (59:25)

Yet, therapeutic hypothermia, I think, was often maybe used in some situations infants, just based on the data of full-term infants, right? But because we know they're so different, it was important that this data actually came out, and it doesn't show ,Åì improvement in outcome. So.

Erin Welsh (59:43)
Okay, and what is like the effect size, I guess, or like what, you know?

Erin Updyke (59:50)
It's a good question. A meta analysis from 2021 found for full-term infants, a pooled reduction in risk of mortality of about 26 % in infants who are cooled compared to ones who weren't. And this was similar, whether it was whole body cooling or just head cooling that was used. Yeah. So it's not nothing.

Erin Welsh (1:00:08)
Okay, okay.

It's not nothing and it is pretty amazing that, yeah, that there is, I don't know, there are uses for this because it does seem like fairly, I know it's not straightforward, that there are many different approaches that you can use to do this and administer this and monitor this and that it's about the degree and all this stuff, but it's like.

Erin Updyke (1:00:14)
Yeah.

No.

Erin Welsh (1:00:34)
It's just, I don't know, it's fascinating to me that it's like we use temperature in this way.

Erin Updyke (1:00:37)
It is.

Also, what you had mentioned, Erin, about the use in cancer is so interesting because I didn't find anything about it's you. mean, I know people do sometimes like ice ,Åì on the head to try and reduce hair loss during chemotherapy or things like that. The mechanism, that's going to be very different than what you had mentioned, but someone using it to try and reduce cancer growth. I think probably because we have better options today is why there's not.

Erin Welsh (1:00:44)
Yeah.

Mm.

Erin Updyke (1:01:04)
really a lot of data that I could find at least on modern uses of that. We do use a different kind of cryotherapy like liquid nitrogen to kill small skin cancers or other growths all the time. Yeah, I thought about that after the fact. I also did find a paper on cold plunges and that kind of cryotherapy for muscle recovery after workout. By the way, there's not really good data to support it, but I can give you a paper if you want to read about it.

Erin Welsh (1:01:06)
Yeah.

Yep. I love that you mentioned that. That's funny. I forgot.

Well, and you know, I'm not against cold plunges. If you enjoy jumping into an icy lake or a tub or whatever, do it, do it safely. Have a buddy, whatever, you know.

Erin Updyke (1:01:39)
Good do it.

Yeah, no,

but there's not like for like the muscle recovery stuff like you There's not a lot of data that it's really beneficial, but you can read about it if you want to know more We have so many sources for you

Erin Welsh (1:01:56)
We do. OK. Again, I'm going to shout out that book by Phil Jekyll called Out Cold, Chilling Descent into the Macabre Controversial Life-Saving History of Hypothermia and then a paper about Dr. Temple Faye called Breaking the Thermal Barrier, Dr. Temple Faye by Al Zaga et al from 2006 and then by Gunn from 2017 Therapeutic Hypothermia Translates from Ancient History into Practice.

Erin Updyke (1:02:26)
it. I had a couple of older papers, one from 2014, that old, but called Clinical Applications of Targeted Temperature Management by Perman et al. and another one from 2008 that was just called Therapeutic Hypothermia by Varen and Acosta. And then the two papers, two biggest papers that I had on hypothermia in infants

Erin Welsh (1:02:26)
and more papers.

Erin Updyke (1:02:53)
‚Åì One of them is whole body hypothermia for neonatal encephalopathy and pre-derm infants 33 to 35 weeks in JAMA pediatrics. And the other one was from PLOS ONE and it

was that 2021 paper that was the systematic review and meta-analysis. But then what's fun is I have guidelines, so many of the guidelines, like the 2002 paper that led to the guidelines initially of being yes, do therapeutic hypothermia for out of hospital cardiac arrest. And then all the subsequent papers that were like,

Yes, it's beneficial. No wait, maybe it isn't. Maybe it's not as good to be thought. Now here are the new guidelines. So many guideline papers. You can find them all on our website. Thispodcastwillkillyou.com.

Erin Welsh (1:03:23)
Maybe Ray Ray.

You can thank YouTube Blood Mobile for providing the music for this episode and all of our episodes.

Erin Updyke (1:03:37)
And thank you to Liana and Tom and Brent and Pete and Jessica and Mike and everyone else at Exactly Right Network for all that you do.

Erin Welsh (1:03:44)
Thank you, thank you. And thank you to you listeners and watchers and anyone who enjoys this podcast in any way. It means the world to us and as does the support of our patrons. Thank you, thank you. Well, until next time, wash your hands.

Erin Updyke (1:03:56)
Yes, thank you, thank you, thank you.

You filthy animals.