

TPWKY

This is Exactly Right.

Erin Welsh

"In the afternoon of the 19th of August, 1790, John Lowe came to my house requesting me to go immediately to his wife who he said had fevered after delivery and was in great danger. I accordingly went and found her in a dangerous situation. She complained of an acute pain in the lower part of the abdomen attended with a very great degree of fever, the velocity of the pulse being at the rate of 140 strokes in a minute. I had no difficulty in ascertaining the patient's disorder having had previous opportunities of seeing it both in London and in the course of my practice in Aberdeen, for this was the 15th case I had attended since the epidemic began. And in every respect this answered the description of that known to practitioners by the appellation of the puerperal fever, a distemper which so frequently proves fatal to women in childbed, baffling the skill of the most eminent physicians.

On the 21st when I visited her in the morning I was happy to find that she had been pretty easy throughout the night and had enjoyed some hours sleep. She was in a profuse sweat which I hoped would prove critical but I was sorry to find that I was disappointed in my expectation, for when I returned in the afternoon I found that the sweat had disappeared, being succeeded by a diarrhea. The patient now complained of very great pain and the swelling of the abdomen seemed to increase. On the 22nd I was sorry to find that the disease was making rapid progress in spite of all the remedies employed and that the patient's health was sinking. All hopes of recovery were now totally abandoned. The patient's agony was now extremely great and she called loudly for relief. I therefore thought proper to administer opium to mitigate pain and if possible to procure rest.

I went early in the morning of the 23rd to visit my distressed patient and found that the storm was lulled into a calm. The friends received me with transports of joy, vainly thinking that her danger was over. The patient, supposing herself perfectly well, asked my permission to rise for she seemed to feel no pain and suffered me to touch and press the abdomen without showing any signs of uneasiness, a proof that the parts were in a state of gangrene. The friends, ignorant of this circumstance, were quite overjoyed to see the patient so composed after such excruciating pain. However it was evident from the ghastly appearance of the countenance, from the tumefaction of the abdomen with the absence of pain, from the sunk state of her pulse, and from the coldness of the extremities that death was not far off. Accordingly in a few hours the scene was closed."

TPWKY

(This Podcast Will Kill You intro theme)

Erin Allmann Updyke

Good god, Erin.

Erin Welsh

Yeah. That was from an account by Alexander Gordon whom I will talk about later in this episode. It's horrifying.

Erin Allmann Updyke

Yeah.

Erin Welsh

Hi, I'm Erin Welsh.

Erin Allmann Updyke

And I'm Erin Allmann Updyke.

Erin Welsh

And this is This Podcast Will Kill You.

Erin Allmann Updyke

It's really gonna be an upper of an episode.

Erin Welsh: Yeah, sorry guys. This week we are talking about childbed fever, puerperal fever.

Erin Allmann Updyke: Puerperal sepsis, maternal fever, WHO calls it maternal peripartum infection.

Erin Welsh: There we go.

Erin Allmann Updyke: There we go.

Erin Welsh: Lots of different pathogens under this umbrella.

Erin Allmann Updyke: Erin. (laughs) So it's funny because one of the things that you said to me before we started doing this episode is that you felt like it was in some ways more typical than the ones that we've done recently in that the biology and the history are very separate, there's not a lot of overlap. But for me this was not a typical episode. I was like could we structure this like a medical mystery except that it's not a mystery but it kind of is?

Erin Welsh: Oh. That could've been fun. Interesting.

Erin Allmann Updyke: It could've been fun, I know.

Erin Welsh: No I mean as I was researching it too I was like okay, well my story is very clear and part of the reason that we wanted to do this episode is because we had learned about puerperal fever in various classes.

Erin Allmann Updyke: Right.

Erin Welsh: And it's like such a good, interesting story and so crucial to the history of medicine but I don't think that I realized just how difficult a topic it would be to cover.

Erin Allmann Updyke: Yeah. But it's fine, it's gonna be fun, we'll learn a lot. I'm really excited to hear the whole story in terms of the history altogether because I've only heard bits and pieces, so.

Erin Welsh: Oh it's been one of my absolute I think favorite ones to research for sure.

Erin Allmann Updyke: Excellent. Well before we can get into the episode of course, it's quarantini time.

Erin Welsh: It's quarantini time. What are we drinking this week?

Erin Allmann Updyke: This week we're drinking The Filthy Animal.

Erin Welsh: (laughs) And as you will learn later in the episode, this is because at the end of all of our episodes if you've never stayed tuned to the final very end, which we can't blame you, we always sign off by saying 'Wash your hands, ya filthy animals.' And that's basically what Semmelweiss, who's a key player in this story, was saying to all of the doctors around him to try and stop puerperal fever from spreading.

Erin Allmann Updyke: Yeah, he was just walking around being like, 'Wash your hands, you're filthy animals!' And everyone was like (scoffs) and didn't listen.

Erin Welsh: Exactly. So what's in The Filthy Animal?

Erin Allmann Updyke Well it's gin, thyme simple syrup, and watermelon blended up. It's like a really beautiful drink.

Erin Welsh It's beautiful and really refreshing.

Erin Allmann Updyke Very summery.

Erin Welsh Yeah. I like it.

Erin Allmann Updyke We'll post the full recipe for that quarantini as well as our nonalcoholic placeborita on our website [thispodcastwillkillyou.com](http://thispodcastwillkillyou.com) and on all of our social media channels.

Erin Welsh Other business, basically go to our website. You'll find lots of stuff there. Transcripts, alcohol-free episodes, book lists of various sorts, just go there. It's great.

Erin Allmann Updyke It's great, it's really great. Yeah. Okay should we get into this episode?

Erin Welsh Let's do it.

Erin Allmann Updyke Okay, we'll take a quick break and then dive in.

TPWKY (transition theme)

Erin Allmann Updyke So like I said already, this isn't a very typical episode because puerperal fever isn't really one single disease and in fact it's not even really a term that we use anymore. We kind of already mentioned there are so many names for this illness which really does make it difficult to get a handle on in terms of the current status too but we're gonna do our best. Some of the names that you can find that we haven't already mentioned, puerperal sepsis, maternal sepsis, it's also called childbed fever, there's so many names. But the World Health Organization defined maternal peripartum infections which means they defined it as a bacterial infection of the genital tract during childbirth, like during labor even before birth but after rupture of the amniotic membrane but before delivery, or in the post-birth, the postpartum period up to 42 postpartum.

Erin Welsh Oh, okay.

Erin Allmann Updyke That is associated with childbirth. So bacterial infection of the genital tract associated with childbirth. And what's important about this definitely specifically is that it doesn't include some other infections that used to sometimes get lumped into postpartum sepsis or maternal sepsis like mastitis which is an infection of the ducts in the breast, or UTIs, even pneumonia. It also does not include infections in surgical sites so like a C-section incision, just an infection of the skin would not be included in this definitely.

Erin Welsh Okay so it's really both locational and time specific.

Erin Allmann Updyke Exactly. Right.

Erin Welsh Okay.

Erin Allmann Updyke

Yeah, right. So now that we have that out of the way I'm kind of just gonna run through this, it's not gonna be super detailed on all of the bacterial virulence factors and things cause that just too much. But what we will do is go through where in the body these infections happen because the genital tract is actually kind of a large area; we'll talk about why they're problematic, how we know that an infection is happening like what symptoms are we actually talking about, how do we define this, and then we'll talk about the risk factors for transmission, what pathogens we're actually dealing with, and finally who gets it or what the risk factors are for transmission.

Erin Welsh

Sounds good. Well sounds horrible but-

Erin Allmann Updyke

Yeah it does, it sounds horrible. It's pretty horrible. So puerperal sepsis, maternal - I'm just gonna call it MPI, can I do that?

Erin Welsh

Sure.

Erin Allmann Updyke

Okay. MPI can mean infection in a number of different organs but most often probably it could mean endometritis. Endometritis is an infection or inflammation of the endometrium, the lining of the uterus. And so this makes a lot of sense in the context of childbirth, this is not a disease that you can only get after childbirth but in the context of childbirth the inside of your uterus is exposed to the outside world in a way that it isn't normally.

Erin Welsh

Right.

Erin Allmann Updyke

Right, either because the cervix is dilated and then there's a vaginal delivery and bacteria can migrate upwards or if a C-section happens then the uterus is literally exposed on the abdomen and then put back in place. But on top of that, after delivery you have kind of a raw surface exposed inside the uterus because the placenta that had been attached has been removed. So there's not only routes of infection but there's also a surface that's more susceptible potentially.

Erin Welsh

Gotcha.

Erin Allmann Updyke

Okay. So that's one possible infection that can happen post-birth. Another is an infection that can actually start a little bit earlier in pregnancy. It could happen anytime in theory during pregnancy but that's called chorioamnionitis or intra-amniotic infection, IAI, and this is an infection of any part of the lining of the amniotic sac which is what holds all the fluid that cushions the fetus. It could be an infection of the placenta, just basically any part within there.

Erin Welsh

Okay.

Erin Allmann Updyke

And so that can happen during pregnancy but then result in a continued infection that can continue after delivery as well. But a maternal peripartum infection can have a number of other possibilities as well. Peritonitis is an infection of the abdominal wall itself which can happen as a complication like if the endometritis spreads outside of the uterus but it can also just happen in the setting for example of a C-section if the peritoneal cavity, the abdominal cavity becomes contaminated in some way.

Erin Welsh

Gotcha.

Erin Allmann Updyke	It can also mean a vaginal infection or a soft tissue infection especially if you have like a third or fourth degree tear that happens during delivery. It can also mean something that's a lot more rare but called septic pelvic thrombophlebitis.
Erin Welsh	Which sounds very bad.
Erin Allmann Updyke	It's as bad as it sounds. This is an infection that involves bacterial infection of the veins that surround the uterus that cause like hypercoagulability and it spreads.
Erin Welsh	Whoa.
Erin Allmann Updyke	Overall in general, not good infections but the biggest concern with any of these organ systems or any of these tissues that become infected is when that infection spreads beyond that single organ or that single tissue and enters the bloodstream.
Erin Welsh	Right.
Erin Allmann Updyke	That results in bacteremia, so bacteria in your blood, or septicemia, bacteria replicating and growing your bloodstream and potentially septic shock which can lead of course to death.
Erin Welsh	Okay.
Erin Allmann Updyke	So in the context of childbirth, the vagina, the uterus, the abdomen, these are just sites of entry for what can easily become an invasive, widespread infection.
Erin Welsh	Right. Also I did not know the difference between bacteremia and septicemia until this moment.
Erin Allmann Updyke	Why thank you, I also had to look it up. (laughs) Cause I kept seeing them both and I was like why is that different? So you can just have bacteria in your blood and technically that's bacteremia. But if they're replicating, growing, that would be when you have septicemia. So septicemia is like extreme scary.
Erin Welsh	Right, it's very bad.
Erin Allmann Updyke	Yeah. So that's like all the different types of infections that you can have and you'll notice those are all much more specific and that makes sense because now we can with medical technology that exists today, we can actually differentiate all of these.
Erin Welsh	So how does having this umbrella term sort of help?
Erin Allmann Updyke	Great question. I think it helps in a number of ways. Some of these conditions are quite rare, for example like septic pelvic thrombophlebitis, that's very rare. So if you were looking at stats of only that your numbers would be really low whereas if you lump it in with all of these other ones... But also some of these conditions, for example, chorioamnionitis can happen much earlier in pregnancy and result in pregnancy loss, like spontaneous pregnancy loss but if it happens around the time of delivery, it might cause different problems down the line. And same thing with endometritis, that's something that can happen outside the context of childbirth but if it happens within the context then you'd wanna know that that happened within that context.

Erin Welsh

Okay.

Erin Allmann Updyke

So I think by grouping them together you're looking at a broad picture of all these different types of bacterial infections that can happen specific to the context of childbirth. The other thing though, and it's a good question that you ask that Erin because the other thing about all these infections is that even though we can differentiate them all, in terms of symptoms they're all very similar.

Erin Welsh

Okay.

Erin Allmann Updyke

Okay? And so that's the other thing is that for a long time we probably weren't differentiating them all because does it matter exactly what tissue type is infected when you're looking at someone who just gave birth and all of a sudden they spike a fever, right, up to 102 Fahrenheit or 39 Celsius, and they're sweaty and they're pale, their heart rate is elevated, they're breathing hard. They're sick, right, and they're sick probably in the context of this traumatic delivery that just happened or even this nontraumatic delivery that just happened. And so I think that's another reason too why you lump it all together.

Erin Welsh

That makes sense.

Erin Allmann Updyke

In terms of some of the other symptoms aside from fever which of course is kind of the biggest sign which is why it got the name puerperal fever, other symptoms that tell you that you're dealing with an infection of the genital tract are things like abdominal pain or tenderness in the uterus and not just the tenderness that's normal after delivery but like a deeper tenderness and like a more... I don't know how to describe it, a more painful tenderness. And then also some vaginal discharge is fairly common especially with endometritis. You can have a very purulent, pus-filled drainage that can happen from the uterus. And then of course you have all these other general signs of infection, things like I already mentioned like you have an elevated heart rate, elevated breathing rate. If you were to take a white blood cell count, that would be elevated. And like I said already too the big concern here is if that infection spreads to the bloodstream because that can result in shock and potentially death.

Erin Welsh

Yeah.

Erin Allmann Updyke

So I've said already this is bacterial infection, what bacteria are we talking about?

Erin Welsh

It's a lot.

Erin Allmann Updyke

It's a lot. And so Erin I think, even though I tried really hard not to read about Semmelweis and not step on your toes at all, I think that largely in that timeframe it's thought that it was group A strep, aka *Streptococcus pyogenes*, that was the big contributor. Is that correct?

Erin Welsh

That's also what I read.

Erin Allmann Updyke

Okay.

Erin Welsh

But I think they didn't know. But it seemed like yeah, *Strep pyogenes* was the first causative agent to be isolated and characterized.

Erin Allmann Updyke

Got it.

Erin Welsh

From what I remember.

Erin Allmann Updyke

Okay, that makes a lot of sense. Cause it was so interesting cause I kind of knew that context but today when you read about NPIs in general, strep A, so group A strep or Strep pyogenes really doesn't even come up as a very big topic of conversation in most of the articles about it which is very interesting. Caveat that that you can find separate articles that are all about group A strep in the peripartum period.

Erin Welsh

Right.

Erin Allmann Updyke

But when you read about endometritis, when you read about chorioamnionitis, and when you read about just like general maternal sepsis and you use all these sort of buzzword terms, group A strep is like yeah it's on the list along with a whole bunch of other things.

Erin Welsh

Why?

Erin Allmann Updyke

I don't really know. Let's talk about it, okay?

Erin Welsh

Okay. (laughs) I have some guesses maybe, but...

Erin Allmann Updyke

I have several guesses, so we'll see if our guesses are the same guesses. So we'll start by talking about Strep pyogenes and what might make it a particularly interesting bug to talk about and then I'll go through what the other bacteria are too. But I'm not gonna get into a lot of detail on Strep pyogenes because it's also the causative agent of necrotizing fasciitis which spoiler, listeners, we're going to be covering shortly in this season.

Erin Welsh

Yes. Yeah.

Erin Allmann Updyke

So you'll learn all you want to know about the details of Strep pyogenes later. But in short, it's a gram-positive little ball, forms little chains like beads on a string when you look at it under a microscope, and it's a pretty common group of bacteria. Strep pyogenes can exist on our skin, it can exist in our throat, I think 25% of kids are colonized in their throat and like 5% of adults. It's what causes strep throat, right. So you've all probably heard of Strep pyogenes. It also like I said causes deeper infections like necrotizing fasciitis, if it's untreated Strep pyogenes is what leads to rheumatic fever, rheumatic heart disease, a number of different post-infectious type syndromes. But it's also of course a potential cause of MPIs. And one of the reasons likely is that during pregnancy and the postpartum period, people are 20x more likely to become infected with Strep pyogenes compared to non pregnant people.

Erin Welsh

Huh. Why?

Erin Allmann Updyke

So something about pregnancy makes you far more susceptible to Strep pyogenes. To answer your question of why, we don't know except that it might have to do with pregnancy in general is a state of immunosuppression so it might just be that that specific type of immunosuppression makes you more susceptible. There's some people that say because being around children is a risk factor for Strep pyogenes colonization in general since children are more likely to have it than adults without being sick, just hanging around.

Erin Welsh

Yeah.

Erin Allmann Updyke

So if someone is pregnant they might also be around kids or have other young kids so I don't know, that's kind of whatever. But in any case, 20x more likely to become infected during pregnancy and postpartum like that short, short postpartum period. Because the thing about people who get strep A postpartum is they often are already colonized and then it just becomes an infection postpartum when that bacteria swims into the bloodstream.

Erin Welsh

Right, right.

Erin Allmann Updyke

And while it's not the most common cause of peripartum infections today as far as I can tell because it's really hard to get numbers on what is causing all these different MPIs, if you look at all invasive group A strep infections, about 2-4% of them are somehow associated with pregnancy. So that's of everyone in the world who gets an invasive group A strep infection, 2-4% of those are associated with pregnancy. I don't know the proportion of all MPIs that are due to group A strep however when group A strep is the causative agent, it is extremely virulent.

Erin Welsh

Okay, yeah.

Erin Allmann Updyke

And when and if it progresses to something like toxic shock, mortality can be as high as 30-50% even today.

Erin Welsh

That's like with the use of antibiotics.

Erin Allmann Updyke

Yeah, if it progresses to shock. So that would probably mean that you didn't correctly identify it and treat it before it progressed that far.

Erin Welsh

Okay.

Erin Allmann Updyke

Yeah. So it's I think because of that, because it's so virulent it often has a very quick onset like within 24-48 hours after delivery and then people can just get really sick from it. So I think because of that it's like one of the really scary ones even though it maybe isn't one of the most common causes of infection.

Erin Welsh

Okay.

Erin Allmann Updyke

So that's group A strep. There's a whole other group of strep that we get to talk about and that is group B strep, aka *Streptococcus agalactiae*, I think I probably pronounced it wrong. And what I think is so interesting is that today you hear a lot more about group B strep interesting in the context of pregnancy than you hear about group A strep and that's because this is something that we actually test for in the U.S. at least during pregnancy because we know that group B strep is a very important cause of meningitis in newborns.

Erin Welsh

Yeah.

Erin Allmann Updyke

And so we know that my testing for group B strep, because this is another bacteria that just can often colonize the vagina and the rectum. So if you test pregnant people for group B strep and then treat them with antibiotics during labor, it drastically reduces the probability of that bacteria being transmitted to the baby during delivery and the reduces that baby's risk of meningitis significantly.

Erin Welsh

And so is the same treatment used for group B that's also used for group A?

Erin Allmann Updyke

The same, yeah, you'd use like a penicillin type.

Erin Welsh: Right. Okay.

Erin Allmann Updyke: So that would treat both, yeah.

Erin Welsh: Okay, okay. And so is that part of the reason why we see so few nowadays?

Erin Allmann Updyke: It's a good question. I mean we don't test for group A strep so...

Erin Welsh: Okay.

Erin Allmann Updyke: Yeah. But it's a good question. But group B strep, even though we know that it definitely can cause illness in newborns, it also has the potential to cause a perinatal infection, a peripartum infection as well in the pregnant person. Other bacterial species E. Coli, super common cause in some studies but also things like anaerobic species like bacteroides and what's really common, overwhelmingly, is that you can have polymicrobial infections. So we're not even looking at a single bacterial species. If you think just about the process of childbirth and that there's so much exposure happening from so many different potential sources, a lot of these are bacteria that can be found on a lot of different kind of surfaces and skin and things like that. And so it kind of makes sense that you might be able to have polymicrobial, multiple bacterial species infections.

Erin Welsh: Right. Just a bunch of opportunists.

Erin Allmann Updyke: Exactly, yeah. But really in general we don't often know what the causative agent is. So most studies, even the ones that kind of looked at it where they tried to figure out like what was the cause of these particular infections, even when we're looking we often only identify like 30-40% of cases with a laboratory-confirmed organism.

Erin Welsh: Is that just because like you know toss some antibiotics and the person gets better and-

Erin Allmann Updyke: Exactly.

Erin Welsh: Right, right.

Erin Allmann Updyke: Yeah. For any kind of postpartum fever or fever during delivery and after delivery, anything like that, there's kind of like a standard regimen of antibiotics and if those don't work within 24 hours then you add a penicillin in case it's a strep and then that's it.

Erin Welsh: Interesting.

Erin Allmann Updyke: It's a pretty... Yeah. Cause you give antibiotics that are going to cover that whole range because you don't know, it's could be any of those.

Erin Welsh: Right. Time is of the essence.

Erin Allmann Updyke: Exactly, exactly.

Erin Welsh: Yeah. And so is there a risk... This might be jumping the gun, but is there a risk of antibiotic resistance?

Erin Allmann Updyke: Okay. Good question. Of course it's always a potential risk.

Erin Welsh: Right, right.

Erin Allmann Updyke: The answer's always yes. (laughs) But I don't have stats on what the rates of resistance of MPIs are to the kind of mainstay antibiotics at this point are.

Erin Welsh: Okay.

Erin Allmann Updyke: One of the big problems is that at least one of the big antibiotics that we often use can be quite expensive so in other parts of the world I don't think they use that, they use different antibiotics that are less expensive.

Erin Welsh: Gotcha.

Erin Allmann Updyke: So there's also always the cost to take into consideration. Yeah. So that's kind of the overall picture of infections and what causes it. And Erin you're gonna talk a lot, I think, in the history about kind of the transmission, how we figured this out, right?

Erin Welsh: Yeah.

Erin Allmann Updyke: But like I said a lot of these bacteria are just vac that exist around us, whether on providers' unclean hands or unclean instruments that are used or even just on our skin, just already here or in our vaginal canal or even in our throat or other mucus membranes. So when you add on top that pregnancy is a state of immunocompromise and all of the potential routes of entry that could be opened up during childbirth and then all of these bacterial species floating around, that's kind of how you get to transmission if that makes sense. There are some things that would increase the risk of maternal peripartum infection and the biggest one worldwide today of course is a C-section which is not really surprising considering that that's a much more invasive way to deliver a baby. However in general antibiotics are used prophylactically during C-sections just like with any other surgery because we know that surgery is such a big risk for infection overall.

Erin Welsh: Right, right.

Erin Allmann Updyke: And so with antibiotics prophylactically, that drastically reduces the risk of infection associated with C-section.

Erin Welsh: And so I guess since this umbrella term, well is an umbrella term, it covers a lot of different things, asking what is the case fatality rate is not very easy to answer.

Erin Allmann Updyke: It's very, very difficult. We'll talk in the current events section about what the stats are today and I think that'll give us a little bit more. But yeah, just like looking at overall, it's almost impossible to get that.

Erin Welsh: I mean yeah.

Erin Allmann Updyke: Yeah, yeah.

Erin Welsh: I'm sorry Erin, I'm making you do this one. This is very difficult.

Erin Allmann Updyke: I do feel like we put this one off for a while and it's because I was like oh no, how am I gonna even do this?

Erin Welsh

(laughs) Well I think it's been great so far.

Erin Allmann Updyke

Oh good cause I'm pretty much done. I do just wanna say cause I think it's a very interesting fact, if we go back to group A strep for a second, it's far more common following a vaginal delivery than a C-section delivery unlike some other infections like from other bacterial species. Isn't that interesting?

Erin Welsh

Interesting.

Erin Allmann Updyke

So yeah that is maternal peripartum infections. Erin, you wanna walk us through this?

Erin Welsh

Oh I can't wait, but let's take a quick break first.

TPWKY

(transition theme)

Erin Welsh

You may think that this story begins more or less with Ignaz Semmelweiss.

Erin Allmann Updyke

Yeah.

Erin Welsh

And that's reasonable to think because if you had heard of puerperal fever before this episode, there was a good chance it was in connection with his name and his story. And I love that story and I will definitely get to it but it turns out there's actually so much more to the story of puerperal fever, not surprising considering that it's like a ton of different bacterial species and you can get it a ton of different ways and so on.

Erin Allmann Updyke

And also it's this podcast so I would expect nothing less. (laughs)

Erin Welsh

(laughs) So let's begin at the beginning which also is easier said than done for all the things you have already talked about. I also wanted to say we will also be at some point, whether it's this season or not, probably not, we will be doing scarlet fever. So another group A strep situation. But in the interest of time, I'm just gonna start with the beginnings of the concept of puerperal fever.

Erin Allmann Updyke

Okay.

Erin Welsh

Which as you may guess goes way back. Giving birth is not a risk-free activity. It never has been, it never will be. And since at least some of the bacteria that cause infections after childbirth are carried naturally with us, as you said, these infections have been around since, you know, as long as humans have been giving birth, so forever. Before humans were humans. And so it's probably not surprising that people had long recognized that fever, severe pains, and a swollen abdomen in the days after giving birth often led to death. Hippocrates for example wrote about it and there are also descriptions in Hindu texts dating back to 1500 BCE. Several English queens died of infection after childbirth including Elizabeth of York, Queen Consort of Henry VII, and Henry VIII has two wives that died in the same way including Jane Seymour whose death inspired an old ballad that's included in a song on Inside Llewyn Davis.

Erin Allmann Updyke

(laughs)

Erin Welsh

(laughs) I really like the song, it's beautiful. But it was only in 1716 that the term puerperal fever was introduced. From 'puer' the Latin for child, and 'parere' meaning to bring forth. Why'd it take so long for there to be a term for what was ob known about and probably not that uncommon? In short, hospitals. The 1600s saw the establishment of many so-called 'lying-in' hospitals where women would go to give birth. And the growth of these hospitals was an advance in some ways, like through the use of forceps and difficult deliveries and through the beginnings of formalization of medical education and the growth of obstetrics and gynecology as a separate field. But in so many other ways, they were a perfect setting for the spread of infection disease. Wards were overcrowded, instruments were filthy.

Erin Allmann Updyke

God.

Erin Welsh

Germ theory was still over 200 years away, as was the importance of cleanliness in limiting infection. So no one was washing their hands or the bedsheets or their clothes or their instruments. It was believed that the stiffer the doctor's coat with blood and fluids and pus, the more respected they were because it showed that they had experience.

Erin Allmann Updyke

Stop. That really makes me nauseous.

Erin Welsh

I know.

Erin Allmann Updyke

Ugh, I can picture that far too well.

Erin Welsh

I know, I know. Yeah. And these hospitals were often used as training grounds for future physicians which meant that a pregnant person would often be subjected to repeated vaginal exams as student after student came to practice on them.

Erin Allmann Updyke

By the way, Erin, speaking of that cause that's a thing that still sometimes happens, I should've probably mentioned that that's one of the biggest risk factors for transmission or bacterial infections is the number of cervical exams that take place as well as how long you're in labor, like the longer the duration of labor especially after the membranes are ruptured. But oh, ugh.

Erin Welsh

Yep, yep. That makes complete sense.

Erin Allmann Updyke

Yeah, it does. Yep.

Erin Welsh

And so knowing what we know now about the transmission of puerperal fever, it's not surprising that it was at one of these lying-in hospitals that the first described epidemic of puerperal fever happened in Paris in either 1646 or 1746, different papers say different things and I couldn't get to the bottom of it. My guess is 1746 but honestly if someone can pinpoint the very original text, that would be amazing.

Erin Allmann Updyke

That's so fascinating.

Erin Welsh

Yeah. Up until the development of these hospitals, outbreaks of puerperal fever tended to be more isolated with single cases or maybe a few here or there. But this marked the beginning of an era in which puerperal fever seems like inescapable, essentially. From that first epidemic, puerperal fever never really left and outbreaks of the disease were not unique to France where the first epidemic happened or even Europe. And nor was the threat restricted just to hospitals. Physicians or midwives may have moved inbetween hospitals or inbetween house to house, leaving a string of deaths behind them.

Erin Allmann Updyke

Oh my god.

Erin Welsh

Let's put some numbers to the absolute nightmare that hospitals were though. Jumping ahead to the 1800s.

Erin Allmann Updyke

Oh god.

Erin Welsh

In London between 1831 and 1843, 10 mothers per 10,000 died of puerperal fever at home while 600 per 10,000 died when they gave birth in the hospital.

Erin Allmann Updyke

What?

Erin Welsh

Uh huh. These numbers were also not unique to Britain and in some places or during some times were even higher elsewhere such as in Paris where the peak reached 880 per 10,000 which was 17x higher than at home births.

Erin Allmann Updyke

Oh my gracious.

Erin Welsh

So many infants lost their mothers to childbed fever that many of these hospitals had like home attached or a home nearby specifically for the care of these and other infants.

Erin Allmann Updyke

Oh my.

Erin Welsh

Yeah. And so it's hard to believe that physicians or the general public would fail to notice this massive uptick in childbed fever. But what did they think caused it? This was still pre-germ theory so you can imagine the array of possible causes. One of the most predominant ones was that it was caused by the lochia, so the fluid that flows from the uterus after a vaginal delivery, it was caused by the lochia being prevented from freely flowing and the stagnating in the body. Another was that it was pregnancy itself, like over the course of 9 months impurities accumulated in the blood and as the fetus grew it pressed down on the intestines and so fecal material was slowly released into that area and then caused puerperal fever. I know.

Erin Allmann Updyke

Gosh that'd feel terrible.

Erin Welsh

Yeah it'd be terrible. And why was this either fecally-contaminated fluid or lochia suppressed? Well that could be due to the blood being too thick or cold air inadvertently received into the uterus was one example or drinking cold water or fear, terror, grief, any shock to the system.

Erin Allmann Updyke

Wow.

Erin Welsh

And if you weren't a fan of the suppressed lochia cause, you could blame rerouted breast milk. For way too long it was believed that breast milk was actually menstrual fluid, or it originated from the blood going from the uterus to the nipple via a duct. Despite countless autopsies failing to find any such duct. And so when doctors examined the abdomens of people who had died from childbed fever and found white pockets of pus that kind of resembled breast milk, they thought that it was caused by the failure of milk to route to the nipple.

Erin Allmann Updyke

Oh my goodness gracious.

Erin Welsh

And then there was always miasma to blame or poorly ventilated rooms. But before we feel too smug about how dumb people in the 1600s and 1700s were, that you know we would've seen the connection right away, let's remind ourselves how little we know about autoimmune diseases or even just how our own immune system works or what dreaming is or all these things.

Erin Allmann Updyke

100%.

Erin Welsh

But yeah so back in the 1600s, 1700s, even 1800s, doctors lacked training in statistics and they were working under the assumption that the cause of childbed fever was already known. You know, just pick whatever cause you wanna believe in. And so it's kind of understandable that many doctors would focus their efforts on developing treatments for childbed fever rather than trying to control what seemed inevitable. I mean we do the same thing today in science and medicine, like we are all trained on a foundation of knowledge that we are almost taught not to question, that these facts have been established and we should focus our efforts elsewhere to expand this body of knowledge, which we often do for very good reason because that's how most progress is made and that's also the path that is the most rewarded. And so it makes it all the more remarkable when someone doesn't just question the established knowledge, because that's easy enough to do, but they collect and present solid evidence in defense of their questions despite the resistance that they are often met with.

Erin Allmann Updyke

Ooh, it's gonna get good!

Erin Welsh

(laughs) Semmelweiss was one of these questioners in the story of puerperal fever but he wasn't the first. The person who wrote the account that I read at the beginning of this, a Scottish obstetrician named Alexander Gordon, he recognized the contagious nature of puerperal fever in the 1790s about 50 years before Semmelweiss.

Erin Allmann Updyke

Oh wow.

Erin Welsh

And before germ theory. So contagion as a concept, as we've talked about, is pretty old and it had some pretty strong consensus in at least some areas long before germ theory. But this concept of contagion, where a disease could be transmitted from person to person through skin or contaminated clothing was disease-specific. You touch someone with smallpox, you get smallpox. Same with measles. Puerperal fever didn't follow this pattern so miasma or lochia suppression seemed more likely. But Alexander Gordon rejected those. He noticed that what linked the affected individuals in a puerperal fever outbreak was not some characteristic of the mothers or the weather but rather that they had all been treated by the same person, nurse, midwife, physician. And the cases appeared in succession. And he became convinced that it was a contagious disease, one that the medical caretaker played a direct role in which really shook him to his core.

Quote: "It is a disagreeable declaration for me to mention that I, myself was the means of carrying the infection to a great number of women." He traced an outbreak of the disease to several midwives employed in his practice and he published his findings in 1795. And in this treatise he recommended airing out the room, burning contaminated clothing, and scrubbing hands and the arms of people who delivered the babies as a way of preventing the spread. And he didn't stop there. He went on to say that he could predict who might be at risk of developing the disease based on who their practitioner or midwife was. And then he kind of published this list of the names of 17 midwives who had exposure to the disease and so basically he became an unwanted person in the town.

Erin Allmann Updyke

Yeah.

Erin Welsh: And he left obstetrics and joined the navy.

Erin Allmann Updyke: Oh goodness.

Erin Welsh: Yeah. And yeah, then he died at 47 of tuberculosis.

Erin Allmann Updyke: Oh gosh. Burned a few bridges on his way out.

Erin Welsh: Yeah. And for the most part his contributions would not be recognized until way later. So into the early 19th century many physicians, especially British and American, had started to maybe consider that puerperal fever might be a contagious disease but the exact nature of this wasn't clear. Like how was it contagious? What was being transported here and there? Oliver Wendell Holmes Sr, an American physician but probably better known as a poet set out to compile all of the evidence for the contagiousness of puerperal fever in such a way that it could not be denied. He didn't speculate on the exact mode of transmission whether it was through the air, carried by a physician, or through the instruments that they used.

But he did firmly state that, quote: "The disease known as puerperal fever is so far contagious as to be frequently carried from patient to patient by physicians and nurses." He also recommended that physicians should not perform autopsies prior to delivery and that if they had to do so they should change their clothes and wait 24 hours before treating a patient. If a case of puerperal fever develops, that doctor should consider their next patients at risk and shut down their clinic if necessary.

He didn't necessarily suggest any form of washing or sanitation specifically but his conviction of the contagiousness was so strong that he said in one talk, quote: "Whatever indulgence may be granted to those who have heretofore been the ignorant causes of so much misery, the time has come when the existence of a private pestilence in the sphere of a single physician should be looked upon not as a misfortune but a crime. And in the knowledge of such occurrences the duties of the practitioner to his profession should give way to his paramount obligations to society."

Erin Allmann Updyke: I mean that's pretty bold.

Erin Welsh: Very bold. Bold words and bold, strong evidence. But guess what?

Erin Allmann Updyke: Not really listened to at that point?

Erin Welsh: No. Yeah. Completely dismissed. Completely. A lot of physicians took great offense to his claims that they were responsible for the sickness since as was commonly believed and as one of his main opponents said, "A doctor is a gentleman and a gentleman's hands are never dirty."

Erin Allmann Updyke: Oh no.

Erin Welsh: Yeah. So we seeing a pattern yet?

Erin Allmann Updyke: Yeah.

Erin Welsh: If two is not quite a pattern, here comes the third.

Erin Allmann Updyke: Here comes the third.

Erin Welsh

Semmelweiss. Ignaz Semmelweiss was born in Budapest, Hungary then controlled by Austria, on July 1st, 1818. After finishing school in Budapest he enrolled as a law student in Vienna but changed to medicine after attending an anatomy lecture. After graduation Semmelweiss found himself in obstetrics after his first two choices had fallen through.

Erin Allmann Updyke

Gosh.

Erin Welsh

And so on March 20th, 1847 Semmelweiss began a two year appointment as an assistant in obstetrics, basically like a residency, in the Vienna General Hospital First Division. He came into the medical profession at a very unique time and in a unique place. And these circumstances in a way set him up almost perfectly to make the observations that he did. So let's do a little bit of context.

Erin Allmann Updyke

Yes.

Erin Welsh

In the early 19th century, the field of pathological anatomy had really taken off and autopsies were seen as essential instruction for medicine with each cadaver holding an incredible wealth of knowledge. And there was no better place to do autopsies than at the hospital in Vienna where one of the field's leaders, Karl von Rokitansky had been appointed Director of Pathological Anatomy in 1844. And if you were an obstetrics student under Johann Klein at the Vienna General Hospital, you were expected to practice on cadavers every chance that you could, especially in the mornings before rounds began. Just make sure to wipe your cadaver juicy hands on your coat before walking upstairs.

Erin Allmann Updyke

Please don't ever say 'cadaver juicy hands' again.

Erin Welsh

I'm sorry. (laughs) And this was a big change from the previous director in the obstetrics ward at this Vienna General Hospital who felt that autopsies should only be performed if absolutely necessary and he never allowed an autopsy on a woman who had died after or while giving birth. And so I think it's interesting knowing what we know about the transmission of puerperal fever to look at some numbers about how these two different approaches might have affected the rates of puerperal fever.

Erin Allmann Updyke

Okay.

Erin Welsh

Okay. So under Bower who was the earlier guy who was not a fan of autopsies, the mortality rate of childbed fever in the First Division lying-in ward hovered around 1%, mostly lower.

Erin Allmann Updyke

Wow. That's pretty good.

Erin Welsh

In autopsy superfan Klein's first year as director, first year, that number shot up to 8% which was probably the lowest it ever was during the entire time he was director.

Erin Allmann Updyke

Oh my god.

Erin Welsh

And so this is the guy, Klein is the guy that Semmelweiss started his assistantship under in 1847.

Erin Allmann Updyke

Okay.

Erin Welsh	And he entered this hospital then, he started his assistantship during a time when 1 out of every 6 women that gave birth in that First Division died of childbed fever.
Erin Allmann Updyke	1 in 6?
Erin Welsh	That's what was a very common rate and it was nearly standard all over the world.
Erin Allmann Updyke	Oh my.
Erin Welsh	Yeah. Yeah. Every day, almost every hour it seemed that you could hear the ringing of the priest's bell as he walked down the rows of beds in the First Division giving absolution to those how were dying of puerperal fever became like a haunted noise for everyone who was there and also for Semmelweiss. And I also wanna throw in one more piece of information about this hospital and about this obstetrics ward. So as I mentioned Semmelweiss was appointed an assistant in the First Division, so there was a Second Division and a Third Division but I won't talk about that. But the First Division and the Second Division were very different. They were both lying-in wards where pregnant people would go to give birth. First Division was composed of male medical students and that's where they received training.
Erin Allmann Updyke	Okay.
Erin Welsh	And then the Second Division is where the midwives received training.
Erin Allmann Updyke	Okay.
Erin Welsh	Training which importantly did not include autopsies. The death rate in the First Division was always at least 3x higher than that of the Second Division. And this super high death rate earned it urban legend status. So if a woman came to the hospital, was about to give birth, she would beg and beg not to be admitted to the First Division.
Erin Allmann Updyke	Oh my god.
Erin Welsh	Yeah. And Semmelweiss was not blind to this horror. He couldn't bear it. He vowed to do something about it. First he was like, 'Alright, I have to get a handle on what exactly puerperal fever was.' Because despite having many texts and articles written about it, a precise definitely was just not there. And so to do this Semmelweiss would start off each day by dissecting cadavers.
Erin Allmann Updyke	Oh gosh.
Erin Welsh	I know. And there was never any shortage. Some months as many as 30% of postpartum mothers died of the disease. Semmelweiss became convinced that the high incidence had to do with the way that the hospital managed its patients, so he began to make small changes. Things like the way that medicine was administered, increasing ventilation, having the women deliver on their sides as he had seen the midwives do, but nothing seemed to help. So he began to look for patterns in the hospital records and he made six key observations. Number one, even though the First Division, so med students, and the Second Division, midwives, had the same number of deliveries per year, so 3000-3500, in the First Division 600-800 women died of childbed fever on average whereas only 60 died in the Second Division.
Erin Allmann Updyke	Oh my.

Erin Welsh

Yeah. Number two, the epidemic of childbed fever was localized to the hospital. There was no similar rate of childbed fever cases seen outside the hospital walls. And he actually found that you had a better chance of surviving if you gave birth in the street on your way to the hospital. Number three, the incidence of puerperal fever was definitely not related to the weather.

Erin Allmann Updyke

Okay.

Erin Welsh

Pretty easy to conclude. Number four, the more trauma experienced during delivery, the more likely it was that the person would develop childbed fever.

Erin Allmann Updyke

Okay.

Erin Welsh

Number five, closing down the ward always stopped the epidemic. And number six, infants delivered by mothers who developed childbed fever also often died of a similar disease. And these observations seemed to Semmelweiss very strong evidence that practices at the hospital and specifically the First Division were contributing to or even causing the puerperal fever epidemic and that the disease was transmitted through direct contact. But where did it come from? And as he prepared to deliver this information to his director at the hospital, he was given tragic news that would lead to a eureka moment. He learned that his friend Professor Jakob Kolletschka had died after being stuck in the finger by a med student wielding a scalpel during an autopsy. Death by cadaveric poisoning as it was called. Semmelweiss, who was horribly sad about the death of his friend, went to consult his autopsy report which described fever, pain, swelling, and organs and tissues inflamed and filled with pus. And this sounded awfully familiar to him.

Quote: "Totally shattered, I brooded over the case with intense emotion until suddenly a thought crossed my mind. At once it became clear to me that childbed fever, the fatal sickness of the newborn and the disease of Professor Kolletschka, were one and the same because they all consist pathologically of the same anatomic changes. If, therefore, in the case of Professor Kolletschka general sepsis arose from the inoculation of cadaver particles, then puerperal fever must originate from the same source. Now it was only necessarily to decide from where and by what means the putrid cadaver particles were introduced into the delivery cases. The fact of the matter is that the transmitting source of these cadaver particles was to be found in the hands of the students and attending physicians."

This was an incredible lightbulb moment.

Erin Allmann Updyke

Right.

Erin Welsh

Linking not just the fact that cadaveric poisoning and puerperal fever were the same thing but that cadaveric material introduced into the body of someone who had just given birth, that was what led to puerperal fever.

Erin Allmann Updyke

Right. Yeah and that was on the hands of the students and the residents and the physicians. Yeah.

Erin Welsh

Yeah. And as he later learned and talked about, it wasn't just particles from cadavers, it was also like he noticed if someone came in with an infection on their knee or on their hand or something like that. That could also be a way to introduce an outbreak of puerperal fever.

Erin Allmann Updyke

Okay, yeah. That makes sense.

Erin Welsh

So this moment where he was able to link this material to puerperal fever, like the bits of cadavers to puerperal fever, it also led him to come up with a very simple solution for preventing the disease. Because if you rid the hands, the contaminated hands or instruments of the cadaveric material, you would prevent blood poisoning.

Erin Allmann Updyke

Yeah, wash your hands.

Erin Welsh

Wash your hands. And I can't emphasize enough how it was really in the mornings whenever you had a spare chance, you cut away, you do autopsies, you-

Erin Allmann Updyke

Right, you're down in the cadaver lab and then you go straight up-

Erin Welsh

And then you just wipe your hands on your coat and you bring the instruments that you were using upstairs. Not cleaned, nothing. And you could see, like Semmelweiss observed that during holidays for instance or during the summer, the rates of puerperal fever would decline because students weren't there or it was really nice outside and they were spending more time not in the autopsy lab but hanging out. Yeah. But like this is still pre-germ theory so how do you... What's like the concept of contamination?

Erin Allmann Updyke

Right.

Erin Welsh

And I think it's really fascinating because of course it should come as no surprise that cadavers don't smell that great.

Erin Allmann Updyke

Uh huh.

Erin Welsh

And so measures had been taken before to control the smell so that physicians and students could work without the horrible odor. And chloride solutions were commonly used for this and so Semmelweiss figured that hey, if this stuff, this chloride stuff gets rid of the bad smell, maybe it gets rid of the bad stuff itself? And so he placed a bowl of diluted chloride solution outside of the First Division and made every person who would be treating someone wash their hands in it and also do regular hand washing. And then later he was forced to switch to chloride of lime because Klein, the head of obstetrics, was really annoyed at how much money he was spending, Semmelweiss was spending.

Erin Allmann Updyke

(laughs) Okay.

Erin Welsh

And within a few weeks of Semmelweiss implementing this hand washing solution, the effect was like immediate. The mortality rate dropped from where it was around 7-8%, but also there seems to be like Klein might have doctored his records quite a bit, to 3%. And that was close to that of the Second Division where just the midwives were. And after a month of the practice it dropped down to 1.2% with the Second Division clocking in at 1.3% where hand washing had also been instituted.

Erin Allmann Updyke

Wow.

Erin Welsh

The only other change that had been made besides the hand washing during this time was a new ventilation system, so guess what Klein, the head of the unit, felt was responsible for the drop in deaths?

Erin Allmann Updyke

Obviously the new ventilation!

Erin Welsh

Yep. Klein was a member of the old guard at the hospital who believed that new ideas were dangerous. Like he tried to get a professor kicked out for using a stethoscope which were new at the time. And that you shouldn't ask why things were the way they were, they just were. You just had to accept that. And on top of this, Semmelweiss was foreign, he was from Hungary and so his Hungarian-tinged accent made him a target for the xenophobic and superior Klein. And then came the Revolutions of 1848 which made Semmelweiss and even further scary free-thinking liberal because he participated in the Revolutions of 1848. But all of this resistance that he faced within his own department, Semmelweiss just kept at it, he was evangelical about his hand washing doctrine.

Yeah. And the incidence and mortality rates of puerperal fever continued to fall and he became like on fire with this knowledge that this practice had the potential to change the world for the better. And he as a result of this, maybe his personality seems to have changed a bit from being light hearted and friendly and popular as a young student to sarcastic, suspicious, contemptuous, how later accounts describe him. If a case of childbed fever popped up for instance, he played detective to pinpoint who had lapsed and then he would chew them out publicly. His identity began to be wrapped up in this so-called Semmelweiss doctrine and a rejection of the doctrine meant a rejection of him. At the end of his two year assistantship he applied for renewal which was really a formality cause they were always granted but Klein denied. He denied him renewal.

Erin Allmann Updyke

Wow.

Erin Welsh

And so suddenly Semmelweiss found himself not only without a job but also without any ability to institute his life saving doctrine and he was devastated.

Erin Allmann Updyke

Yeah.

Erin Welsh

His professor friends who were part of the new school at the hospital urged him to present his findings. But then Semmelweiss met with a little more difficulty because Klein had barred access to the division's records and he wouldn't let Semmelweiss have them. But fortunately Semmelweiss had kept some of his own and he finally agreed to speak publicly about his work in 1850, which is three years after first developing this hand washing doctrine. His lectures were largely met with success although there was some debate, especially from doctors who refused to believe that they could be the cause of such widespread disease and death. But Semmelweiss knew that feeling. He felt horribly guilty for the role that he had once played.

I'll read another quote from him: "Because of my convictions I must here confess that God only knows the number of patients who have gone to their graves prematurely by my fault. I handled cadavers extensively. As painful and depressing indeed as such an acknowledgement is, still the remedy does not lie in concealment and this misfortune should not persist forever, for the truth must be known to all concerned."

And it just seemed like so many of the doctors couldn't even consider that possibility cause it is horrifying to think about.

Erin Allmann Updyke

Right cause then it's you. You have done this.

Erin Welsh

Right. Yeah.

Erin Allmann Updyke

To countless humans.

Erin Welsh

Yeah.

Erin Allmann Updyke: And their families. And their babies. And yeah.

Erin Welsh: Right. But it seems even more difficult to imagine not trying this out. Like what's the harm?

Erin Allmann Updyke: Right. It's a lot. It's also just so interesting because you know hindsight 20/20 whatever, like it's so painfully obvious.

Erin Welsh: Yeah, it is.

Erin Allmann Updyke: When you look back on it.

Erin Welsh: Oh yeah.

Erin Allmann Updyke: So it's almost difficult to put yourself in that mindset of... How could you not?

Erin Welsh: Which is why I had thought a lot during this research about how it's so easy to fall into the trap of 'we know everything' and yeah there are a few things left to be uncovered, but like nuh-uh. There are going to be incredibly huge paradigm shifts or whatever in the future.

Erin Allmann Updyke: Right. Things that we look back on and we're like, how?

Erin Welsh: How did we not see it?

Erin Allmann Updyke: Right.

Erin Welsh: Or just things that you can't even... Like how do you even predict what the next paradigm shift might be in medicine or ecology? Like we just don't know because that's not the way that we're trained to investigate problems. It's just interesting. But anyway, besides the forced denial of these doctors and the guilt that they may have felt, another thing that kept the Semmelweis doctrine from gaining more traction broadly was the fact that he wouldn't publish. He hated writing. Hated it.

Erin Allmann Updyke: Oh goodness.

Erin Welsh: And so a few of his professor friends and some former students tried to write it up but they lacked all the data and they couldn't capture Semmelweis' thought process that led him to his conclusions. So it was more just like, 'hey, here are the results that we found, that's it.' And so he continued applying for jobs where he could put it into practice. And when the job that he had finally been given, which he was actually first denied and it was a teaching position in midwifery, it was changed at the last minute and he took it to be a personal affront.

And basically he was like my colleagues refuse to see my great accomplishments, I'm surrounded by enemies, I'm being told to publish despite the evidence being so clear. Like you shouldn't need a thorough paper, it should be obviously, how do you not see it? And then now the disrespect he felt from this job thing was the final straw. So he left Vienna, he packed up and left to return to Budapest without so much as a goodbye to any of the friends who had supported him and championed his cause for so long.

Erin Allmann Updyke: Wow.

Erin Welsh

Back in Budapest, Semmelweiss seemed to be at least a little bit reinvigorated when he learned of an outbreak of puerperal fever at the hospital nearby and so he visited the hospital and found that the obstetric ward was under the management of the Chief of Surgery who was also responsible for doing all forensic autopsies.

Erin Allmann Updyke

Uh huh.

Erin Welsh

Uh huh. And so Semmelweiss was like okay, I will be the unsalaried director of this lying-in ward at the hospital.

Erin Allmann Updyke

Wow.

Erin Welsh

And that came through, he was given that position and he immediately implemented the same hand washing practices and saw a similar immediate drop in puerperal fever cases and deaths. But his constant watchfulness and tendency to play detective when someone died of puerperal fever didn't exactly make him popular among his employees and students, many of which went to great lengths to avoid washing their hands just to spite him.

Erin Allmann Updyke

Oh my.

Erin Welsh

I know it's so difficult, the story is so wrenching cause you're just like... And then he made enemies with the hospital administration, like the sheets weren't being washed frequently enough in his eyes so he gathered up a bunch of dirty sheets and dropped them into the office of the hospital administrator.

Erin Allmann Updyke

Oh my god.

Erin Welsh

And so the hospital administrator then started immediately looking for ways to fire him. His personality didn't really endear him to people around him and he seemed to leave enemies a lot of places.

Erin Allmann Updyke

Yeah. That's the real bummer.

Erin Welsh

He made enemies more easily than he made friends, for sure. But eventually he did reach a sort of point where he was like, you know what? This is too many years of being met with ridicule and scorn and he finally decided to sit down and write.

Erin Allmann Updyke

Finally!

Erin Welsh

Finally. And so in 1861, just 14 years after he first developed the hand washing technique, he published his book 'Etiology, Concept and Prophylaxis of Childbed Fever'. Unfortunately it turned out to be densely written, difficult to follow, and he included many personal attacks on doctors who had rejected his findings in the past.

Erin Allmann Updyke

He's killing me.

Erin Welsh

I know, I know!

Erin Allmann Updyke

This is absolutely killing me.

Erin Welsh: He's his own worst enemy. So his book did little to increase acceptance of his doctrine although I will say it had picked up a couple of supporters in some places who wrote grateful, joyous letters to Semmelweiss. But maybe the saddest part of this story is that Semmelweiss himself wouldn't live to see his doctrine vindicated. In the early 1860s it became clear to those around him that his mental health had begun to decline. His moods were becoming increasingly erratic and he had trouble taking care of himself or performing his job. There are retrospective diagnoses ranging from tertiary syphilis to Alzheimer's presenile dementia. But in any case by the summer of 1865 his wife realized she could not take care of him by herself so she took him to a state-run insane asylum as they were called then. Two weeks after he walked through the doors, he was dead. The cause of death was determined to be a septic infection.

Erin Allmann Updyke: Oh.

Erin Welsh: I know. Much like the ones that caused puerperal fever.

Erin Allmann Updyke: Oh my gracious.

Erin Welsh: However it was not from a wound during a gynecological surgery as the facilities officials told his wife, but rather from an infection following violent beatings by the asylum staff while trying to restrain him.

Erin Allmann Updyke: Oh my god.

Erin Welsh: I know, it is-

Erin Allmann Updyke: Horrific.

Erin Welsh: It is. Yeah. The year that Semmelweiss died a guy by the name of Joseph Lister came across a series of papers by Louis Pasteur and began to study under the microscope the pus from amputation wounds. He realized that the microbes he was observing may be causing the systemic disease that he was seeing and that praying them with carbolic acid could prevent it. After he did this, mortality dropped by almost 2/3 and he published a description of his new technique which he called antiseptis. With this recognition of the germ theory of contaminated wounds came the realization among the medical community that Semmelweiss was right. And starting in the late 1800s his story as a martyr to medicine was being rewritten.

Erin Allmann Updyke: Wow.

Erin Welsh: What prevented the Semmelweiss doctrine which seems so clear in retrospect? What prevented it from being readily adopted? I mean, could be personality stuff, could be that he didn't write about it. But I think it's kind of the same thing that it always is. This might be one of the most heart-wrenching stories but it's not the first time we've seen similar things.

Erin Allmann Updyke: No.

Erin Welsh: It always takes, what, 20 years to get a new idea into textbooks and then when it's outdated, 20 years for it to be removed.

Erin Allmann Updyke: Right, yeah.

Erin Welsh  
And so in the 1860s and the 1970s, about 20 years after Semmelweiss first proposed his doctrine, the causative agents of puerperal fever began to be characterized. And the next big milestone came in 1935 with the development of the sulfonamide prontosil which greatly reduced mortality due to puerperal fever. The link between scarlet fever, erysipelas, and puerperal fever was recognized and steady increases in hygiene continued to drive down the rates of the disease. But Erin, this is not a disease of the past by any means. Can you bring us up to speed on what's going on with puerperal fever today?

Erin Allmann Updyke  
I'd love to. Let's take a quick break first.

TPWKY  
(transition theme)

Erin Allmann Updyke  
Worldwide, this by the way it's kind of just a depressing story so I'm just gonna leave it out there-

Erin Welsh  
Great.

Erin Allmann Updyke  
Maybe we'll find a way to find some light in this tunnel but... Worldwide, bacterial infections during labor and the immediate postpartum period, so MPIs, account for an estimated 10% of the global burden of maternal deaths.

Erin Welsh  
Oh my god.

Erin Allmann Updyke  
So of all maternal deaths, about 10% are associated with bacterial infections. The World Health Organization, the most recent data that they have on their site is from 2015, they estimate that there are about 75,000 deaths every year due to these infections specifically.

Erin Welsh  
Wow. That's a lot.

Erin Allmann Updyke  
Yeah. It is and the thing is that that's not the whole story. It's not just death. These infections also carry with them the potential for long term disability including chronic pelvic pain, secondary infertility due to infection, and on top of that like you kind of mentioned Erin, maternal infections can have a big impact on newborn mortality as well. So that same World Health Organization report from 2015 estimates that over 1 million newborn deaths are associated with maternal infections.

Erin Welsh  
What? Every year?

Erin Allmann Updyke  
Yeah. That's what it said in 2015. I am still shocked by that number.

Erin Welsh  
Oh my gosh.

Erin Allmann Updyke  
Yeah. While today overall rates of maternal infections are still even though these numbers are shocking, they're drastically, drastically lower than in the past.

Erin Welsh  
I mean 881 per 10,000?

Erin Allmann Updyke  
Yeah and that's just deaths, right?

Erin Welsh  
That's just deaths, that's not incidence, yeah.

Erin Allmann Updyke

But however even though we've come a really long way, there's still some huge disproportionate impacts.

Erin Welsh

Yeah.

Erin Allmann Updyke

Not only between countries, so high income countries have drastically lower infection and maternal death rates compared to lower income countries, but even within higher income countries like the U.S. there's a huge disparity in terms of race. So in the U.S. in general we're not great when it comes to maternal outcomes. We can look not only at deaths but severe morbidity, so like serious complications as well as mortality rates are very high in the U.S. compared to a lot of other high income countries. But the racial and ethnic disparities in the U.S. are also atrocious. So in this country, black women are 3-4x more likely to die from pregnancy-related causes than white women. 3-4x.

Erin Welsh

Wow.

Erin Allmann Updyke

So I kind of just wanna read you the overall numbers of pregnancy-related mortality in the U.S. and this is averaged from 2014 to 2017. In the U.S. 41 deaths per 100,000 live births, which is the standard metric of measure, 41 per 100,000 for non-Hispanic black women. 28.3 deaths per 100,000 live births for non-Hispanic Native American and Alaskan Native women. 13.8 deaths per 100,000 births for Asian or Pacific Islander women. 13.4 deaths for non-Hispanic white women. And 11.6 deaths per 100,000 live births for Hispanic or Latino women.

Erin Welsh

Those are very different numbers.

Erin Allmann Updyke

They're very different, I mean I would say all of them are too high.

Erin Welsh

Yes.

Erin Allmann Updyke

But they're very, very different. So we'll just sit with that for a minute.

Erin Welsh

Yeah.

Erin Allmann Updyke

Because like I said it's not just death, that's the worst possible outcome. It's estimated that in the U.S. for every maternal death there are 100 other severe events, whether that means infection or severe hemorrhage or emergency surgery that takes place. So that means that over 60,000 people every year in the U.S. are having these severe, likely very traumatizing complications that in so many cases are preventable. And it's not just the U.S. In the U.K. if you look specifically, even just specifically at maternal sepsis deaths, for every 1 maternal sepsis death there are 50 other pregnant people that have life-threatening infections.

Erin Welsh

Wow.

Erin Allmann Updyke

If we wanna look at disparities across the globe-

Erin Welsh

We do.

Erin Allmann Updyke

Of course we do. The World Health Organization estimates that 810 people - so this is looking more broadly than just maternal infections, but 810 people die every day from preventable causes related to childbirth and pregnancy.

Erin Welsh: 810 every day.

Erin Allmann Updyke: 810 every day, that's 295,000 lives lost every year. In low income countries that maternal mortality ratio, the number of maternal deaths per 100,000 live births, you said Erin sometimes it was like 800 in the 1700s? Today in low income countries it's 462.

Erin Welsh: 462 deaths per 10,000?

Erin Allmann Updyke: Per 100,000.

Erin Welsh: Oh per 100,000.

Erin Allmann Updyke: Yeah.

Erin Welsh: Wow.

Erin Allmann Updyke: Yeah.

Erin Welsh: Semmelweiss would be appalled.

Erin Allmann Updyke: Yep. In high income countries it's 11 on average though in the U.S. as of 2017 on average 17.3 and we know that those averages don't tell the whole story.

Erin Welsh: Right. So what's going on? I mean...

Erin Allmann Updyke: It's such a good question Erin because the other thing is it's not getting better, it's getting worse at least here in the U.S. Worldwide from 2000-2017 the maternal mortality ratio has actually decreased by like 38%. So worldwide the trend is going down.

Erin Welsh: Okay.

Erin Allmann Updyke: But in the U.S. specifically our maternal mortality ratio has been increasing year after year.

Erin Welsh: What's happening?

Erin Allmann Updyke: Yeah I don't... It's a great question. I don't have an answer for you.

Erin Welsh: I mean I guess it's really difficult because there are so many different causes, prevention is not a one size fits all type of thing. It's a lot of different things you have to do.

Erin Allmann Updyke: Absolutely. And it's definitely not, I wanna just be clear this is not all infection-related. In fact infection is a 10% or less contributor at least when we look at deaths overall. But that doesn't change the fact that things like hemorrhage, preeclampsia, cardiac issues, worldwide unsafe abortion practice is another major contributor to pregnancy and childbirth-related deaths. So we have a lot of work that needs to be done still and I think like Semmelweiss we need to start by figuring out what the root cause of a lot of these problems are so that we can actually fix them.

Erin Welsh: Right. Yeah.

Erin Allmann Updyke: But you know racism is a big part of it here.

Erin Welsh: For sure.

Erin Allmann Updyke: There's a lot of...yep.

Erin Welsh: Yeah it's a multifactorial problem.

Erin Allmann Updyke: Sure is. Gosh I wish I had something more uplifting to end it on. Sources? (laughs)

Erin Welsh: (laughs) Yeah I can't really think of anything. Sources! Yeah so I relied on primarily, I have some articles, but primarily I relied on two books both of which I highly enjoyed. One is called 'The Doctors Plague' by Sherwin Nuland and that is a nonfiction book mostly about Semmelweis but also more broadly about puerperal fever. And another is a fiction book which was really fun, I get to read fiction not that often for the podcast and it's called 'The Cry and the Covenant' by Morton Thompson and it's out of print actually.

Erin Allmann Updyke: Oh wow.

Erin Welsh: Yeah.

Erin Allmann Updyke: How'd you get it?

Erin Welsh: Library.

Erin Allmann Updyke: Oh okay.

Erin Welsh: Woo-hoo libraries!

Erin Allmann Updyke: I of course because this episode was kind of a mess of a biology there's a lot of different papers that you could read, some specific to group A strep, some just looking at maternal peripartum infection overall. I will say to add a slightly happy ending the CDC has a number of new campaigns specifically to try and address a lot of this and a lot of it is just paying attention to the person who is pregnant and actually listening to the symptoms that they're having. One of their big campaigns is called Hear Her. Yep. Cause that's a big part of it, right, is not paying attention to the person who's experiencing what they say they're experiencing.

Erin Welsh: Yeah.

Erin Allmann Updyke: And we've seen that time and again.

Erin Welsh: It's a little bit frustrating that it needs to be a public health campaign.

Erin Allmann Updyke: A whole public health campaign.

Erin Welsh: Like this is not something that is inherently taught or learned, but...

Erin Allmann Updyke: Yep.

Erin Welsh: Yeah. So we will post all of our sources on our website [thispodcastwillkillyou.com](http://thispodcastwillkillyou.com).

Erin Allmann Updyke

Yep. Thank you to Bloodmobile for providing the music for this ep and every one of our episodes.

Erin Welsh

And thank you to the Exactly Right network of whom we are a proud member.

Erin Allmann Updyke

And thank you to you listeners. This was a very interesting journey, very depressing ending, but thanks for sticking with us!

Erin Welsh

Yeah. Thank you. And I guess we've been just stealing this line from Semmelweiss all along.

Erin Allmann Updyke

We really have.

Erin Welsh

But I feel very excited to sign off this episode with a wash your hands.

Erin Allmann Updyke

You filthy animals!