Podcasting for Medical Education:

A how to guide

Welcome + Purpose

Welcome to the Podcasting for Medical Education How to Guide. I created this handbook to give health care professionals the basic tools and skills they need to create educational and compelling audio stories. Why? Because podcasts take case-based, interactive teaching methods to the next level. An audio recording lets patients and physicians tell the story of a condition, diagnosis and treatment in their own voices. Also, medical professionals live busy lives. An educational podcast makes it possible for physicians to learn about a specific population or a new technique while they're running on a treadmill or commuting to work.

User-friendly, entertaining podcasts are the perfect format for clinicians hoping to address an "uncomfortable" knowledge gap. Physicians with the skills to create these audio stories can disseminate important experience, information and interdisciplinary approaches to anyone with access to the internet or a smart phone. For all these reasons and many more, podcasts are a great tool for sharing medical knowledge and physicians are in an ideal position to tell these stories. Let's get started.

Table of Contents

My story

The day I taught a 4th grade classroom about neurology

My name is Dr. Julie Roth and I'm a neurologist at Rhode Island Hospital. Although I frequently encounter pregnant patients with migraine, epilepsy and other neurological problems, I've found that these topics are not adequately covered in most neurology or obstetrics and gynecology training. What's worse, neurology and obstetrics/gynecology house officers learn little about one another's fields, largely due to the high demands of their own disciplines during residency and fellowship training.

To bridge the gap between neurology and obstetrics/gynecology among physicians in training, I developed a series of case-based podcasts illustrating neurologic issues in pregnancy. When I compared these podcasts to traditional written case reports, I found that residents and fellows experienced the same mastery of the material in the short and long term, but were more satisfied with the experience of listening to the podcasts.

I believe this audio only, entertaining approach can be useful for any medical discipline where physicians and physicians in training need to learn about an "uncomfortable" area or fill a knowledge gap. That's why I created this how to guide, to help other medical professionals develop similar podcasts in their fields.

What's different about a medical podcast?

When I embarked on this journey, I surrounded myself with radio experts. I listened carefully to all of my favorite podcasts and even took a three-day crash course on audio editing and storytelling. I gathered some great skills and tips (which I'll include in this how to guide) but it took me a while to realize that some of the approaches I learned didn't quite make sense for a medical podcast.

Rule 1: Know your audience. You see, one of the first rules of good storytelling is to know your audience. In my case, my audience was made up of other doctors, but because I was working with radio people with no medical background, I kept putting a lot of effort into making my pieces more accessible and more enjoyable for a general audience. This was slowing me down, and it took months for me to realize that I didn't need to define every medical term I used. I could use slightly more technical language to save time and keep the story moving. So, my message is, do push yourself to tell user friendly, entertaining stories, but remember who you're talking to and don't drive yourself crazy trying to explain concepts or terms most physicians learned about in medical school.

What's different about a medical podcast?

Rule 2: Pay attention to attention span. Do doctors have longer attention spans than regular podcast listeners? Maybe not. But when they think they will be using that information later on, they are less likely to tune out – or change the radio station, so to speak. In podcasting, your competition is: other podcasts. In medical education, your competition is: textbooks, journals, grand rounds and noon conferences – not *Serial*. Still, sounding more like *Serial* will help your audience stay focused.

Rule 3: Know your learning objectives. Most radio people start with the story. The sound bites and narration are there to take the listener on a journey that explores that story. In medical education, you are explaining a *topic* through the lens of a *story*. Not only do you need a good story, but you have to think about your learning objectives. What do you want your audience, or medical learners, to get out of the podcast? What are the take-home points? And importantly, *how do all of these elements fit into your story?*

Rule 4: Get permission. When I decided I wanted to record patient stories, I knew there would be ethical and legal implications. Like the internet, podcasts are forever. This means you have to be extra careful not to reveal any little inkling of protected health information *or* identifying information of *any* kind! My institution has a permission form for patients to sign, which covers video recording for educational and collaborative purposes; I tailored this form for audio… and even with permission, I still changed the names of my patients to protect their identities. Like research, I made it clear that the purposes of the educational podcast were completely separate from their medical care, and their willingness to participate (or not) would in no way influence that care. If you have specific questions about these rules, contact your institution's legal and/or media department – because they deal with these issues the most.

Getting started: what to buy

My recording kit

So, you've decided to make a podcast! Now what? In my case, I met with some people from the radio world to get advice about what I should buy. On the next few pages, I'll tell you about the tools that turned out to be the most useful/necessary. Try not to get too hung up on finding the perfect equipment. Just get the essentials so you can start experimenting with sound; you can always upgrade later. On the other hand, if your department wants to invest in a podcasting studio, take advantage of the opportunity and get some great tools. To account for either scenario, I've listed a few options depending on your price range.
If you want more advice about what kind of gear to buy, or just love geeking out about equipment, check out Jeff Towne's "Tools" articles on Transom.org. He writes incredibly detailed reviews of the latest audio technology.

What to buy:

Field recorder

- High end: Marantz PMD661($599), Zoom H5 ($659)
- Middle: Tascam DR-100MKII ($329)
- Cheapest option: Zoom H1 ($99)

If you plan to conduct interviews away from your computer, you'll need a field recorder. A good recorder can make a big difference in the quality of your sound, but the end product isn't the only thing to consider. You'll also want to make sure your equipment is easy to use. If you can, play around with a few options and see which recorders are most intuitive to you. Is it easy to start and stop your recording? Is there a clear way to adjust your recording levels? How easy is it to transfer sound to your computer? Battery life and storage of sound also matter.

I used the Marantz PMD661 and read the entire manual before getting started. It is important to get used to your recorder – where the buttons are and sound volume – because I found it was easier than I expected to create bad sound by having volume settings too low, or something plugged in incorrectly. Hint: if something is buzzing, then you're doing something wrong.

Microphone

- Recommend: Shure SM58 ($109.99)

There are three main types of microphones – a "**shotgun**" mic, which records directly in front of it (the tip is shaped like a cylinder), an "**omnidirectional**" mic, which records the ambient noise all around it (round shape), and a "**cardioid**" mic, which is sort of a hybrid of the two. For recording a single person, a shotgun mic is ideal. For recording a concert or crowd noise, the omnidirectional mic is ideal.

If you're going to record a range of sounds, get a cardioid. That is what I did. I used the **Shure SM58** cardioid dynamic mic, which was easy to use and I was happy with the sound. Jeff Towne calls the Shure SM58 "the most popular all-purpose vocal mic in the world."[1] So, it's the ideal microphone if you're just getting started.

What to buy:

Microphone Accessories

- Wind screen ($3-$5)
- XLR Cable ($10-50)

In addition to the microphone, you will need a **wind screen**- the foam tip that typically covers the head of the microphone and keeps random breezes (or your own breath) from making a rough, rumbling sound.

You'll also need an **XLR cable**, which is how the microphone plugs into the recorder. Generally, the longer the cable, the more "buzz" you can get in your recording because of electrical leakage. But the shorter the cable, the less range you have from your field recorder. I would recommend purchasing more than one cable, in case one sounds buzzy.

Headphones

- Recommend: Sony MDR7506 Professional Large Diaphragm headphone ($79.99)

Headphones will make you *look* like a real podcaster. But seriously, they are a necessary part of your recording kit. You might be tempted to use earbuds, but it's worth investing in a good pair that wrap comfortably around your ears. Quality headphones help you hear background noises- like a car door slamming, a siren, or two people having an argument outside your office. These sounds will distract from whatever interview or narration you're trying to record, and they can't be removed later. You might tune out these sounds every day, but when podcasting, these little sounds matter – so you have to get used to hearing them again.

What to buy:

Editing software

- High end: Pro-tools ($299.99 annual subscription)
- Middle: Hindenburg Journalist ($95)
- Cheapest option: Audacity, Garage Band (Free)

Editing software also boils down to personal preference and ease of use. Back in the day, Pro-tools was considered the industry standard for editing audio, but there are now plenty of cheaper and less complicated options. I bought the Hindenburg software because that is what I used in my crash course on audio production, and because it comes with a number of helpful video tutorials. The "Journalist" version usually costs $95 – but it went on sale for $1.90 in honor of World Radio Day (which is February 13).

You can also use basic options such as Audacity, which you can download for free, and Garage Band, which comes as a standard application on Apple computers.

Computer

If you already have a fairly modern computer with a little bit of memory, you'll have no problem editing sound with the computer you already have. If you're lugging around a 10-year-old laptop, or your work won't let you add new software to your desktop, you might need to invest in a new computer.

I found the MacBook Pro (laptop) portable and easy to use. My editing software ran smoothly on a Mac, but it can also be used on a PC. If your computer does not have a USB port or a SSD card reader, be sure to buy adaptors so you can transfer your sound from your recorder to your computer.

What to buy:

Extras

- **Cloud storage:** Free to $9.99 a month

  You can never truly redo an interview or recreate a magical recording. That's why you'll want to back up your files with some kind of cloud storage. I use Dropbox, but any service will do.

- **Microphone stand:** $29.99

  I purchased one of these for my desk, but then I never used it. I found it much more comfortable to hold the mic. But if you have a quiet, well-insulated room to record in and want to convert it into a media lab, the mic stand can be helpful.

- **Batteries:** Depends on type and quantity

  If you're using your recorder away from your office, you'll need plenty of batteries to keep it running. Always be sure to have a spare set when you're out conducting interviews.

- **Podcast hosting:** Free to $5 a month

  Many podcast hosting services offer free hosting including Archive.org, Soundcloud, Podomatic and Podbean. For a little more bandwidth, and a lot of reliability, Lybsynth offers a "classic" hosting service for $5 a month.

- **Music:** Free to $$?

  For my podcast, I was looking for something very particular- a theme song that incorporated the sound of a fetal heartbeat. So, I invested in hiring a local musician, who used the sound of his own baby in utero to compose the piece. I was incredibly happy with the final product and it's given my episodes an extra polish. However, you can also find free music and sound clips on Freemusicarchive.com. It can be difficult to sort through (organization is based on genre), but it might add that little "something" to your podcast. Just remember to credit the musician(s) at the end of your piece.

Podcasting on the cheap

If you are really low on cash or not ready to invest in audio equipment, you can get started with some very basic equipment:

Field recorder: Smart phone or Zoom H1

If you have a smart phone, you can record sound using the "voice memo" app. The internal microphone on your phone will work pretty well, or you could spend around $100 to buy a mic that plugs into the bottom of your phone. Zoom H1 is a $100 recorder that comes with decent microphones.

Microphone: Blue Yeti USB Microphone

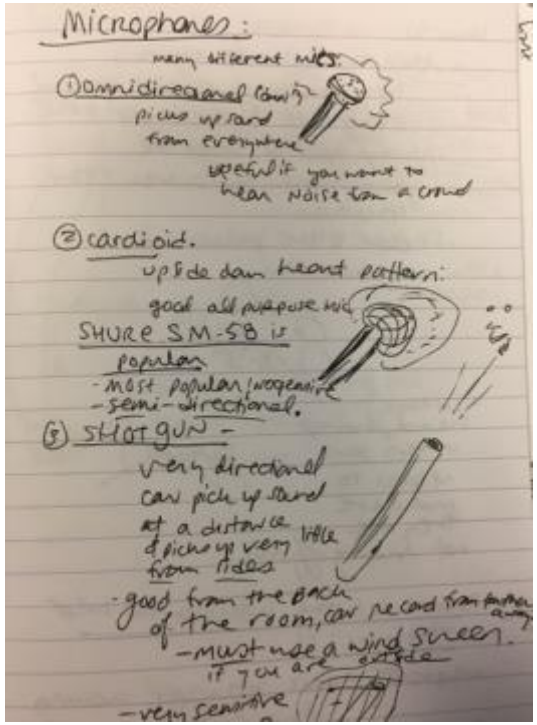
If you're planning to create a simpler podcast where you just conduct interviews in your office, you can try a USB microphone that plugs directly into your computer. The Blue Yeti USB microphone is about $130. If you plan on conducting field recordings, go with the smart phone or the Zoom H1.

Editing software: Audacity or garage band

I already mentioned these free options under my section on editing software. You can download Audacity for free and Garage Band is a free application on Apple computers.

That's really all you need to get started. Just remember, making your podcast on the cheap will help you gain experience, but it will also cut down on the quality of your podcast and make it less appealing to your listeners.

Getting started: using technology



My notes on microphones

You've got your equipment and now you're ready to go! Well, almost. Before you start recording your first important piece of sound, you'll want to **play with your equipment. A lot.** Get used to pushing the buttons, turning the volume nob – because when you record your interviews, you will have to do all this while you're listening to your interviewee and thinking about the next question. On the next few pages are a few more tips for getting the most out of your technology.

Using technology:

Get used to hearing your own voice

Yes, you sound weird. Get over it. Quickly. The more comfortable you become with your own voice, the more natural you will end up sounding in your recording. I found it helped to go around "pretend interviewing" people with the recorder on standby mode. Once I did this long enough, my "radio" voice started to sound like my "real" voice – and I started to relax.

Pick your file format

Most recorders let you pick the file format for your sound. Should you record Wav or mp3 files? If you're short on memory, mp3 files will take up less space, but the files are compressed. Wav files are uncompressed, but take up more space. Why does compression matter? The average listener can't tell the difference between a compressed and uncompressed file, but listeners will notice if a compressed file has been copied again and again. That's because compressed sound loses information, or deteriorates, every time it's copied. I decided to record uncompressed Wav files to preserve the quality of the original sound. Later, when I produced the podcasts, I converted my episodes to mp3s so they could take up less space.

Hold your microphone correctly (and don't share!)

When you speak, hold the mic at a 45-degree angle and at least a few inches away from your face. Speak OVER the mic – if you speak directly into it, listeners will hear every P and every T, and it will sound like you are spitting your words at them. If you are interviewing people, always hold the mic yourself – so you can control the sound! *Let me repeat: never let them hold the mic.*

Wear your headphones

While you are recording, you should ALWAYS have your headphones on. Use them to listen carefully and make sure the person you are interviewing is not moving off mic. Make sure to mic yourself asking the question, and make eye contact with the person you're talking with. Eventually, if you do a good job, they might forget you are recording them and act more naturally. This is the goal.

Using technology:

Learn to adjust your levels

Check your levels while you record. If your recording levels are too high, your sound will distort (test this by yelling into your recorder and listening back). If your levels are too low, you can always increase the volume, but doing this pumps up the sound of everything else in the room, making something as subtle as the quiet hum of an air conditioner sound like a giant wind.

A good rule of thumb is to keep your sound in the -12 to -6 dB range on your recorder. You should be able to adjust your levels manually. On my machine, I use a physical knob that turns the levels up and down. You can also quickly adjust the sound you're capturing by adjusting your mic placement. Move in a little closer if your interviewee starts talking softly and back up if she starts laughing loudly.

Ask about breakfast

Some people talk softer and some talk louder, so you'll need to reset your levels for every interview. To do this without sacrificing any important sound, ask your interviewees a throw away question they can answer easily in their normal voice. A common mic check question is, "What did you have for breakfast this morning?" A bonus to asking this kind of innocuous question: it makes some easy chit chat and might help your interviewee relax.

Eliminate unnecessary noises

This means: turn off electronic devices like your phone, a computer, a loud air conditioner, etc. If there is a buzz, try troubleshooting – and re-reading the manual. When I recorded my patients and expert interviews I started out using the same principals. But traveling to other people's work spaces usually meant external noise I couldn't control, though I did my best. Later, I realized that some of my best sound came from noisy environments – a noisy ER or café – because the background noise created a new setting for my piece, and the change of setting could be a tool to grab my distracted listener's attention – similar to a change of volume, pace, or emotions like laughter.

Using technology:

Eliminate unnecessary noises, continued…

I started to think of putting together the podcast like I was putting together a musical piece – some parts were loud, some soft, some slow, some fast, some chaotic, and some organized.

Always remember to record some room tone

Particularly if you record in a noisy or crowded space – recording a minute of "room tone" in the location can help you mix your sound later on and prevent dramatic cuts between your narration your interviews.

Now you're ready! You just need to find someone to interview.

Conducting interviews

Interviewing a colleague in my office (I should have closed my door).

Doctors talk with patients all day long, so we must make great interviewers, right? We have the body language, the eye contact, the empathy, the intimacy. We ask open ended questions – skills we all learned in medical school. We can get to the heart of the disease and its psychosocial burden sometimes within a matter of minutes; our patients often tell us their stories with little prompting. Still, there's an important difference between medical interviewing and audio interviewing – doctors seek information to make a diagnosis and formulate a treatment plan; audio interviewing involves finding the story. Using your doctor skills – your bedside manner, in other words – will come in handy, but there are a lot of other skills you need to learn to become a good audio interviewer.

I didn't learn this myself. Megan Hall, a former public radio health care reporter, coached me extensively on how to do this, and gave me this advice: a good interview relies on both preparation and intuition. Before the interview, you want to invest some

Conducting interviews

time to think through your goals- what role is this person serving in your story? Are there particular quotes you're hoping to get? Do you want this interviewee to respond to something another person has already said? Once you've clarified the major purpose of the interview, write down your questions and organize them so they follow a logical flow. It's a good idea to start with some easy questions that will help your interviewee relax, then work your way to topics that require a little more reflection. Half memorize these questions, so you can ask them without reading off a piece of paper.

When you're in the interview, be prepared to pivot from your plans. Your interviewee might say something surprising that's worth exploring. You can always refer back to your list of questions at the end of the interview to make sure you didn't miss anything.

The rest of Megan's tips, which I'll call "Tips from professionals," occupy the next few pages of this guide. These tips will help you conduct a great interview.

Conducting interviews: tips from the professionals

Megan Hall documenting the "Sea Pageant" with her daughter Claire

Hi, I'm Megan Hall. I worked in the world of radio for more than a decade, first as a freelance producer and then as the health care reporter for Rhode Island Public Radio. After years of interviewing medical professionals and policy experts, I started to get jealous. These folks were making real, concrete change in people's lives! I was only talking about their ideas on the radio.

So, in 2012, I left journalism and joined the team in charge of implementing the Affordable Care Act in Rhode Island. I also went back to school and got a master's degree in public health. Now, I use my journalism skills to help policy makers, academics and doctors explain complex concepts to everyday people. I helped Dr. Roth develop this podcast.

Here is some of the advice I gave to her:

Conducting interviews: tips from the professionals

Before every interview:

1. Put on your headphones and listen for any distracting noise
   - Turn off computer monitors and silence phones
   - Close windows and doors
   - Remove ticking clocks
   - Turn off fans

2. Explain the basics of the interview: how long it will take and how it will be used. For patients, you'll probably need them to sign a form granting you permission to use their story.

3. Ask interviewees to introduce themselves.

Experts: Name and what they do for a living in simple language
Patients: Name they want to use (to protect personal health information) + how long they've had their medical issue

Examples:

"My name is Dr. Maria Fosbender and I treat patients with migraines and severe headaches"
"Hi, my name is Sara and I've had migraines since I was 7 years old

After every interview:

1. Record a minute of silence
2. Ask your interviewee if there's anything you should have asked/if there's anything else she wants to say
3. Keep recording, even after the "formal interview" is over. This is often when you get the best sound. Or, be prepared to turn your recorder back on and ask your interviewee to revisit something she said off tape.

Conducting interviews: tips from the professionals

Many of the tips in this section are taken from Transom.org and "Interviewing Performance Artists…And Others: A Practical Guide." Both resources are full of interviewing advice from public radio professionals. You'll notice that sometimes the advice is contradictory, but once you start conducting interviews, you'll see why that makes sense. Every person is different, so each interview requires a different set of tools to help your subject relax and give you the fascinating sound bites you seek. Read through these techniques and be ready to pick the ones that make the most sense depending on the situation.

Put them at ease

Try laughing and smiling a lot. Making jokes. Think about how the recorder makes people nervous. Sometime you acting clumsy or human or putting the recorder in unobtrusive place is good.[2]

But don't delay too much

"Don't pussyfoot. Take control. If they're sitting across a desk, make them sit next to you. If their phone is ringing, see if they can turn it off. Never ever, ever, ever, ever let them hold the microphone. It does NOT make them feel more comfortable. And it just insures that you'll get mic noise. The more certain you are in your behavior, the more comfortable and relaxed they'll be in the interview."[3] --- Alex Blumberg

The value of silence

Alex Chadwick has a habit of just sitting after a response and waiting. It can feel like a whole minute goes by before he asks another question. It can be terrifying, but it often works. People have this impulse to fill the silence. Often what they say in that silence is your best tape.[4]

Conducting interviews: tips from the professionals

Admit you're dumb

"One of the cards she [Terry Gross from Fresh Air] plays all the time is to furrow her brow and ask some version of the question, 'Huh?' Or 'I don't get it." Or 'What do you mean?'... Terry never plays the expert. She just asks other people who know their stuff for their take on it"[5] - Jonathan Menjivar

Be my narrator

Make it active. This is especially great for when you're in the field watching something happen. Ask your interviewee to answer questions like: What are we doing now? Why are you doing it?

You can also ask your interviewees to transport you back to the moment an important event happened. Have them describe what they remember, drawing on sound, taste, smell and touch. A good question for getting your interviewee in that space is, "Tell me about the moment when…" you realized you wanted to become a doctor, you found out you had epilepsy, you realized you were pregnant, etc.

Talk to me like I'm a….

Ask your interviewee to explain an idea or answer your question the way they would for a third grader a drunk or someone who doesn't know anything. Sometimes I ask, "how would you explain this to a friend or someone you met at a party?"

Conducting interviews: tips from the professionals

Just keep asking the same question
If you don't like the response you got, try rewording your question and ask again.

Repeat back the exact words of another person
If you want your interviewee to react to something someone else said, read (or play a recording) of that person's exact words. Later on in your script, you can put these two pieces of sound right next to each other without any narration, so it sounds like the two people are having an actual conversation. Radio producers call this a "butt cut."

Use your spidey sense
Prepare, but be prepared to go off script. Sometimes something will just occur to you. A question might even seem silly, but that can be good, in that it can throw them off their standard or boring way of talking about a subject.

I'll show you mine if you show me yours
Sometimes telling a personal story of your own will encourage your interviewee to relax. You can always edit your sound out later.

The door knob effect
You often get the best sound when the actual interview is over. Don't turn off the machine, but signal that the formal part is over, perhaps by taking a deep breath and putting down your headphones. Or… do turn your recorder off, but be ready to turn it back on if the person starts to say something good.

Conducting interviews: tips from the professionals

Take me there

Conduct your interview in a place where something happened, so your interviewee has something to react to. This helps you gather tape where the person is showing, not just telling, what happened. Ira Glass gives an example of this in his comic book: Radio: An Illustrated Guide, where he gets a woman to show him the place where a bullet hit her house.

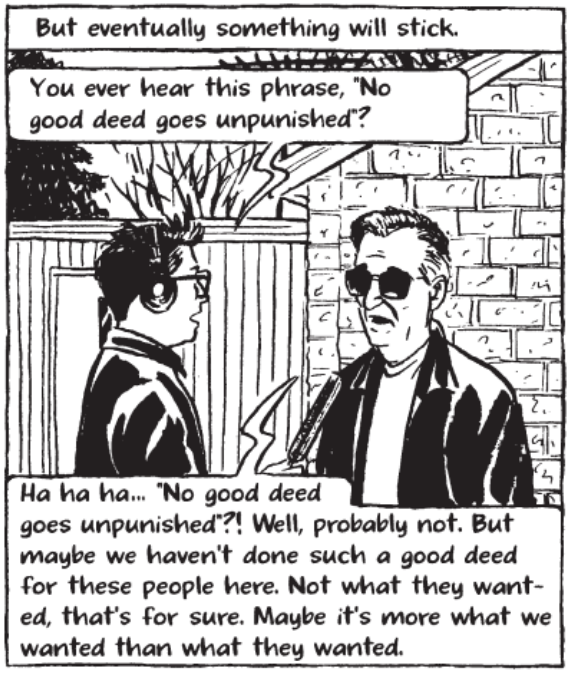
Taken from Radio: An Illustrated Guide[6]

Notice how when Ira Glass takes his interviewee to the actual spot, he gets a very visual description of the bullet hole- big enough to put your finger (or a small thumb) into it. This is the kind of tape you're looking for.

Conducting interviews: tips from the professionals

Turn it into a cliché

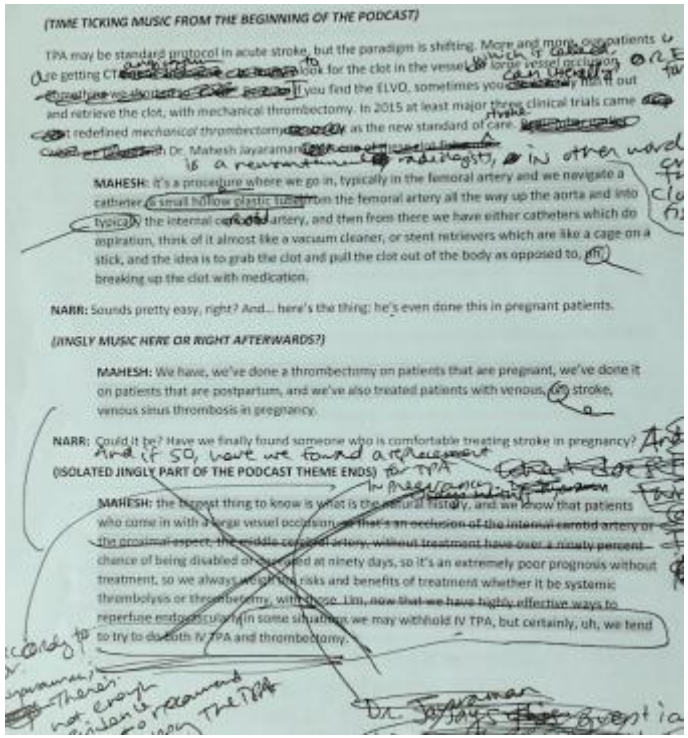
This is another technique Ira Glass uses- keep trying to sum up your interviewees story by fitting it into a big theme or a cliché. If the cliché is incorrect, it still gives your interviewee something to react to. Her or she might respond with a more nuanced or interesting summary. This gives you a nice bit of reflection on "what it all means."



Taken from Radio: An Illustrated Guide[6]

After you've collected all of your interviews, it's time to write a script.

Writing your script



(TIME TICKING MUSIC FROM THE BEGINNING OF THE PODCAST)

TPA may be standard protocol in acute stroke, but the paradigm is shifting. More and more patients are getting CT ... look for the clot in the vessel ... large vessel occlusion ... If you find the ELVO, sometimes you ... and retrieve the clot, with mechanical thrombectomy. In 2015 at least major three clinical trials came ... redefined *mechanical thrombectomy* ... as the new standard of care. ... Dr. Mahesh Jayaraman ... is a neurointerventional radiologist, ... IN other words ...

MAHESH: it's a procedure where we go in, typically in the femoral artery and we navigate a catheter, a small hollow plastic tube, ... the femoral artery all the way up the aorta and into typically the internal carotid artery, and then from there we have either catheters which do aspiration, think of it almost like a vacuum cleaner, or stent retrievers which are like a cage on a stick, and the idea is to grab the clot and pull the clot out of the body as opposed to, uh, breaking up the clot with medication.

NARR: Sounds pretty easy, right? And... here's the thing: he's even done this in pregnant patients.

(JINGLY MUSIC HERE OR RIGHT AFTERWARDS?)

MAHESH: We have, we've done a thrombectomy on patients that are pregnant, we've done it on patients that are postpartum, and we've also treated patients with venous, uh, stroke, venous sinus thrombosis in pregnancy.

NARR: Could it be? Have we finally found someone who is comfortable treating stroke in pregnancy? And if so, have we found a unicorn?

(ISOLATED JINGLY PART OF THE PODCAST THEME ENDS)

MAHESH: the biggest thing to know is what is the natural history, and we know that patients who come in with a large vessel occlusion, ~~so that's an occlusion of the internal carotid artery or the proximal aspect, the middle cerebral artery, without treatment have over a ninety percent~~ chance of being disabled or dead at ninety days, so it's an extremely poor prognosis without treatment, so we always weigh the risks and benefits of treatment whether it be systemic thrombolysis or thrombectomy, with those. Um, ~~now that we have highly effective ways to reperfuse endovascularly~~ in some situations we may withhold IV TPA, but certainly, uh, we tend to try to do both IV TPA and thrombectomy.

My stroke podcast script in progress

As you sit down to write, remember that at the heart of a good podcast is a good story, not just a good topic. (You should probably be thinking about this even before you conduct your interviews!) A topic is something like "stroke in pregnancy." A story is: a woman has a stroke, and later gets pregnant. How will it go? And what does she have to watch out for?

To build your story, you'll want to identify the arc, or the flow of your narrative: What's the beginning? What's the climax? How does it end? In my case, it was easy to base the "story" on the patient's own clinical history. But there are other structures that could work.

Writing your script

I tried writing my stroke podcast based on what I had envisioned the story to be – a flurry of residents saying that they really didn't know how to manage stroke in pregnancy, followed by an unfolding of the patient's own story, and then some experts telling us how it's done. I had in fact written the script without interviewing anyone at all! My co-producer laughed at me. This was certainly not how it is done in radio! How could I guarantee I would get the sound I needed?

My approach seemed logical to me- I was working off the case report I had already written. Couldn't I map out the script ahead of time? The answer is yes and no.

Unlike radio reporters, who are learning about a story as they conduct their interviews, as a health educator I already knew the major points of the story I wanted to tell. So, I could map out a fair amount of my content in advance. Once I had the outline of my story, I had a good idea of what my hand selected interview subjects would say. What could go wrong?

Well, I had a few surprises. My original patient was unreachable and I had to use a new patient. The experts did not always give the answers I expected. And to make matters more complex, the written case I had painstakingly developed had some inaccurate information – in other words, the literature and guidelines did not always match the clinical practice. In the end, I had to re-write the original written case in addition to the script.

But what stayed in? The flurry of residents saying they didn't know how to manage stroke in pregnancy, a patient's story, and some experts. I learned: don't get too attached to a format before you record, and don't be so sure that you can easily transform written content into a podcast. At the end of the process, you may have to go back and completely revise the written piece to make the two match.

Writing your script: formatting

Podcast scripts contain your narration, your sound bites and any notes about music or ambient sound you want to include in the final mix. If you can transcribe your tape, or find someone to transcribe it for you, you'll have an easier time piecing together your narration and your interviews. If not, just transcribe the portions of the sound you decide to use. This will help you write narration that flows directly into and out of your sound.

Because you'll be reading your scripts out loud, it's best to follow a specific, predictable format:

Narration is typically double-spaced and sometimes in all caps (I avoid all caps because it makes me feel like I'm shouting).

Track2:7:40 Sound clips are typically lowercase, smaller font and single spaced. To make it easier to find this sound, put the name of the file and the approximate time the sound clip appears in the recording. Or, once the sound has been cut, put the name of the sound file and the length.

When the sound bite is over, you continue your narration down below.

It's also helpful to write out symbols and numbers so you don't stumble over your words. For example, write "percent" instead of % and "dollars" instead of $. Numbers are a combination of words and numbers. For example, for 125,000, write "125 thousand" or for 1.5 write "1 point 5."[7]

Writing your script: basic tips

Start with sound

You can't rewrite the sound you have (unless you have some serious editing skills) so it's important to start with your best sound bites and build your script around them. If you begin with the text of the story, the sound can seem awkward and out of place.

I usually highlighted the portions in the transcript that addressed my learning objectives. Then, I would listen through the entire interview, letting my ear have the final say. If the audio sounded disorganized or hard to follow, I would paraphrase it in my script. On the other hand, if the expert said something that made for nice sound – an interesting analogy, for example – I would clip that quotation and paste it in my side clipboard for later, labeling it with a recognizable phrase so it would be easier to find when it came time to mix my podcast.

After I found all my sound bites, I organized them chronologically by the script, and by who said what. Then, I would read through my script while playing the sound clips aloud to see what worked and what didn't. I then copied and pasted the text of the sound bites that worked into my "final" script.

If you think this sounds like I was going around in circles, you are right. But after a while, my circling became more efficient, and editing on the fly became more second nature.

Writing your script: basic tips

Write for the ear

When you're writing your podcast, remember that your listeners are probably washing dishes, driving a car, or going for a run at the same time. Your story has to grab their attention and be clear enough that they understand it the first time around. In a newspaper article, if a sentence is unclear, you can just reread it. With audio, few people will rewind your episode to clarify what you meant.

Here's an example of how writing for audio is different from writing for print. On the day Anthony Scaramucci lost his job as the White House's communications director, this is how the New York Times reported the story:

> *John F. Kelly, President Trump's new chief of staff, firmly asserted his authority on his first day in the White House on Monday, telling aides he will impose military discipline on a free-for-all West Wing, and he underscored his intent by firing Anthony Scaramucci, the bombastic communications director, 10 days after he was hired. (NY Times 7/31/17)*

Compare that language to National Public Radio's version:

> *Just 10 days after being named White House communications director, Anthony Scaramucci is out of that job. The move comes just hours into John Kelly's tenure as the new chief of staff. (NPR News 7/31/17)*

Notice that the NPR story is in the present tense. It starts with the most pertinent information (Anthony Scaramucci is out of that job) and it's very brief. These are some of the techniques you should use as you write your script.

Writing your script: basic tips

Write in the present tense

As we already discussed, unlike a newspaper article that reports what happened, radio pieces are supposed to describe what is happening. It's like a conversation with the listener. Try to write the way you speak (and not the way you speak as a doctor, the way you speak casually!)

Think about how you'd share this information if you called your best friend on the phone. Would you say "*John F. Kelly, President Trump's new chief of staff, firmly asserted his authority on his first day in the White House on Monday by firing Anthony Scaramucci"* or would you say *"Scaramucci's out of a job"?* Of course, sometimes you can't avoid writing in the past tense. Just try to make your language as active as possible.

Be light on the commas

Don't use too many commas if you can help it. Although it might seem choppy, try to stick with short sentences that are easy to follow. The more involved your sentence is, the closer people will have to listen. As you know, it's unlikely you have your listener's full attention. Also, long sentences are difficult to read. If you're having trouble with your narration, breaking up a sentence or two might help.

Writing your script: tips from Planet Money

How to tell an "idea story" according to Chana Joffe-Walt

If you're creating a podcast for medical education, you're not just telling a story, you're telling an "idea story." Idea stories are stories that try to explain a complicated idea or answer a question. You know, questions like: "How do you treat pregnant women who have a history of stroke?"

Chana-Joffe Walt told a lot of these "idea stories" when she worked for NPR's Planet Money podcast. She explained her tips in a manifesto for Transom.org called "The Tricks of Planet Money."

Here's some of her advice about how to tell complex stories with sound:

- 'Your script should look like a map"
- "It should begin with a statement of purpose and directions of how you plan to get there."
- "You should announce clearly every time there is about to be a turn that there is about to be a turn. Even better, tell us where it will take us"
- "Use your sign-posts to keep the listeners engaged and to underline what we are learning and have learned thus far."
- "Remind us throughout the piece of the original statement of purpose."[8]

Idea stories should all start with a "statement of purpose" that tells listeners about the question you're trying to answer and how you plan to answer it. Here's an example:

> *David Kestenbaum:* **Today on the show…we want to try to answer the question 'why gold?'**
> **Why it's served as money for millennia.**
>
> *David Kestenbaum:* **We go through the entire periodic table of the elements. And try to answer that question.**

Writing your script: tips from Planet Money

Sign-posts

After your statement of purpose, you use "sign-posts" throughout your piece to remind listeners about your purpose, foreshadow where you're headed and underline twists in the story.

Here are some examples of good "sign-post" sentences:

> **Why did _____ happen? there's a back-story…**
>
> **And if you want to understand _____, just watch what happens next.**
>
> **And here is where our story takes it last and final twist.**

These three short phrases tell you where you are in the story and that it'll be worth your while to keep listening. Sign-posting can also be useful in telling listeners "here is where you should pay attention" or "this is where the lesson is." Phrases such as:

> **This is the crazy thing about _____**
>
> **I want to pause here and point out….**

If you want to learn more from Chana Jaffe-Walt, you can read her full manifesto on "The Tricks of Planet Money" at Transom.org

Writing your script: tips from Radio Lab

The methods of Radio Lab, according to Soren Wheeler

Radio Lab is another radio show that tackles complicated "idea stories." Soren Wheeler, the senior producer at Radio Lab, taught science before he entered the world of public radio. His tips for telling a good story are similar to his tips for teaching science to kids:

1. Make it real- kids like to see science actually happening
2. Make it clear- use analogies, models, representations and even "lie a little" to clarify the basics of the concepts
3. Connect what you've taught to the wider world, things they already know about
4. Model what you want them to learn in the way you act (question authority, be skeptical, curious…)
5. Motivate- give them a reason to care.

Radio Lab does this in a few ways-

1. Creating conversations-Radio Lab very rarely writes scripts. Contributors usually just talk about their story on tape until it forms a narrative that works for the piece. Of course, though, there's a lot of editing.
2. Creating a sense of intimacy- make it feel like you're sitting and talking with the interview subject, not just a voice that comes from nowhere.
3. Learn in front of people- show yourself discovering how this science works. Don't be afraid to present yourself as not knowing much. That way people who do "get it" feel smart and people who don't "get it" yet can identify with you.
4. Don't just write a story. Write a story "holding hands with an idea"- link it to something larger, a concept, a theory.

Here's Soren's central idea- when we were kids, science was an exciting discovery, very active and full of wonder. As we age, science typically becomes more about memorizing terms and following directions and it loses that excitement. But we still have the potential inside us to act like kids, to have a sense of wonder about the world. And hidden inside science is the food for unlocking all of that wonder. So, there's a lot of potential for tapping into that combination, if we do it right.[9]

Narration

My set-up for recording narration

After you've written (and re-written) the script, it's time to record your narration. It might be tempting to just turn on your recorder and quickly read through the text, but a little bit of preparation will save you time and a lot of heartbreak later on in the process. Start by reading your script out loud a few times. Are any sentences awkward to say? Do you notice that you're stumbling over the same phrases? This might mean you need to rewrite them. The way we write is very different from the way we speak. During your read through, practice the tone you want to use in the recording. Underline words that are important to emphasize. Think about places where the text is complicated and you might need to slow down. Are you ready? Now it's time to record.[10]

Narration

Find a place to record your narration that is neither noisy nor echoey

The best room to record in is small, well-insulated (this is where my love of clutter actually helps!), and lacking electrical gadgets. A closet, in other words. When I started recording, I realized for the very first time how much noise there was outside my own, clutter-filled office – foot traffic, chit-chat. This background noise was seeping into my recordings. So, my colleagues offered nice "quiet" rooms to record in. But large, vacated office spaces or empty conference rooms aren't ideal either. These large spaces produced a cavernous background sound that was distracting in the finished product.

I tried recording in my car with the engine off and windows closed, and this produced pretty good sound – but as the heat in the car rose, I talked faster and faster… by the end of the recording, I was sweating and talking a mile a minute just to end the whole thing. In the end, I decided to record narration in my office during "off hours" – weekends, nights, or early in the morning.

Check your levels and wear your headphones

Your headphones will help you pick up on any background noises that might distract from the recording. Try saying the first line of your narration a few times to adjust your levels and match the volume of your voice while you're reading.

Listen to your tape as you narrate

When I was narrating between interview sound clips, I wore my larger headphones on top of my ear buds, which I plugged into my computer. I would play the interview sound bites from the computer directly into my ear, then speak into my microphone between the clips. This allowed me to naturally adjust my voice to respond to the tone and pacing of the sound clips, making it sound more like a conversation.

Narration

Imagine you're talking to a specific person

Remember, audio is a very intimate medium. When you're recording narration, it should sound like you're having a conversation, not giving a lecture. Imagine that you're calling a good friend or a relative on the telephone. Or try pretending you're talking to a particular resident. See this person in your mind as you record your narration. Some people even draw a face on the top of their script.

Warm up your voice

If you've ever sung in a choir or acted in a play, you know that you don't go on stage without a few exercises to warm up your voice. The same is true for narration. Try a few tongue twisters or even a song to get your mouth ready to narrate. Talk to yourself in your car on the way to work, or sing in the shower if you know you'll be interviewing that day.

Record standing up

Standing up tall makes it easier to take deep breaths and project your voice with energy. If you're worried about where to put your script, set up a makeshift podium using your desk and some books. Music stands or shelves can work too.

Make your face match your voice

Of course, your listeners won't actually see you when they listen to your narration, but you'll be surprised to see how much your facial expressions can affect your voice. As you speak, move your face to match the emotion you're trying to convey. if you want to sound happy, smile; if you want to sound confused, look confused, etc. Also, don't be afraid to make hand gestures to go along with your narration. Just don't pound your hands on the table or bump into anything. This will make a distracting sound![10]

Record a few takes

If you think you might have said a sentence weirdly, or you're just not sure how you want to read it, try recording it a few times with different tones and points of emphasis. You can pick the version you like best when you're listening back later.

Editing your sound

Screen shot of my editing window

Now that you've recorded your narration, it's time to mix your sound with some kind of editing software. Every program is slightly different, so I'm not going to walk you through the specific key strokes for turning your recordings into a final piece. Most editing software come with user manuals and online tutorials to walk you through those kinds of details. However, there are some universal tips to keep in mind as you start to edit.

Editing your sound

Stay organized

It's easy to lose track of your recordings when you import them into your audio program- every sound wave looks pretty much the same. That's what it's important to label and organize your sound. Create one track for your narration, one for your interviews, and one for your music/ambient sound. Most programs will let you double click on your sound waves and rename them. So, name your narration "narration" and label your interview clips with the name of the person who is speaking and a phrase they use in that sound bite.

Use fades

Remember the slight ambient noises you heard in your headphones when you recorded your interviews? Each location has a distinct "room tone" and your podcast will sound clunky if don't account for the difference between those different tones. Make sure you use a slight fade every time you transition between your narration and an interview or two different interviews. Even better, use that room tone you recorded after each interview (you remembered to do that, didn't you?) and lay some of it under the transition between the sound bite and your narration.

The same is true if you're using music. Unless you are going for a dramatic effect, slowly bring your music up and fade it down under your narration.

Ruthlessly clip your experts' quotations

Ever notice that people say "um" a lot when they talk? Well, time to start noticing. Turns out, you can edit out some of those ums and even shorten some sentences if you want your quotes to sound tighter. Just make sure to keep track of what your expert said – so the spirit of the quotations, and your learning objectives, are captured in the final piece.

Editing your sound

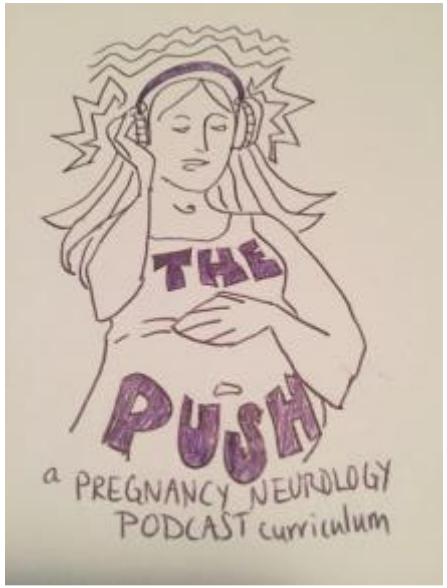
Be ready to multi-task

Generally, I had multiple computer windows open at a time – the editing software, the main script I was working from, and multiple transcripts of interviews, as well as access to music and incidental sounds.

Listen to your mix with and without headphones

When you're making precise edits, you'll want to wear your headphones to create an exact fade or cut out a small noise. But when you're closer to the final product, it's important to take a step back, take off the headphones and listen to the entire mix on a set of speakers. If you don't have actual speakers, your computer speakers will do.

The final product



Cover art for my podcast

When you're happy with the final sound mix, you'll export your editing session, transforming it into a single MP3 or Wav file. You might think your podcast sounds great, but it's a good idea to email this file around, or even hold a listening session. Ask colleagues in your field for feedback: Is this content clear? Did I miss anything? Are the facts correct? Are the right people credited for their advice? And if you are using patient stories, is my patient adequately de-identified?

I always share my podcast with everyone I interviewed to make sure they're comfortable with the final product. That's another example of how medical podcasts are different. Most podcast producers are only worried about telling a factual, interesting story for their audience. In the case of a medical podcast, you're relying on the good will of your colleagues and patients. If they're unhappy with the final product, they might feel like you violated their trust. Also, it will make working together pretty awkward. So, share your podcast around, and make tweaks to your final mix after you gather feedback.

What next?

You've shared your podcast, made some changes, and now it's perfect (or at least good enough). What happens next? It all depends on how you want to share your content. Is your podcast meant for a specific audience, such as the students at your medical school? You might want to start by posting your sound file on a website where you can include important supplementary materials.

To spread your podcast far and wide, and make it downloadable on a smart phone, you'll want to use a podcast hosting site. Some hosting sites are free (such as Podomatic and Podbean) and others are relatively inexpensive (Libsynth has a package for $5 a month). These hosting sites will store your audio and help you create the RSS feed that's used to share your podcast on ITunes and other podcast subscription services. If you're feeling ambitious, you can also write this code yourself.

Once you've found a place to host your sound and create your feed, you can submit your podcast to ITunes. Apple's "ITunes Podcast Connect" makes it easy to share your podcast. You just go to the website, paste your RSS feed URL and press the "validate" button. If your RSS feed is formatted correctly, you'll have a chance to preview your podcast description and artwork. If everything looks correct, press submit to send it along. It can take up to 10 days for ITunes to moderate and approve your podcast, so be patient! You can also submit your podcast to other aggregators, such as Stitcher and TuneIn Radio.

Resources

I didn't learn all of this information on my own! I relied on the many experts who created the websites, how to guides, and comic books that take the rest of us "behind the curtain" to see how audio stories are made. Podcasting is a relatively new pursuit, but radio producers have been sharing tips and creating open forums about audio production for decades. Here are some of those essential resources. Many of them formed the foundation for this handbook.

Transom.org
This is your first stop for learning anything about how to tell a good audio story. Jay Allison built Transom in 2001 with the goal of passing "the baton of mission and good practice in public media through tools, philosophy, and technique." Transom showcases new talent (Megan Hall got her first break on Transom), shares practical tips, publishes expert commentaries and encourages lively conversation. Jeff Towne's Tools section will teach you more than you need to know about audio technology.

PRX.org
Also a project by Jay Allison, PRX is a marketplace for audio work. You can upload up to 2 hours of audio for free or pay $50 a year for unlimited audio storage and the ability to receive royalties if radio stations buy your work. PRX also has a "Podcast Garage" in Cambridge where you can borrow equipment, rent studio space, and attend trainings on podcast production.

Radio Diaries DIY Handbook
Joe Richmond, the force behind Radio Diaries, a non-profit that helps people tell their own stories for public radio, created this simple how to guide. You can buy it online or read it for free at radiohandbook.org

Radio: An Illustrated Guide
Ira Glass of This American Life teamed up with cartoonist Jessica Abel to create this comic book about how to make a radio story. It's practical advice in a beautiful format. You can buy the comic book for $5 or download a pdf for $2 at the This American Life online store.

Resources

Interviewing Performance Artists…And Others: A Practical Guide
This is an incredible collection of interviewing advice from public radio luminaries. I have a PDF version of the guide, but all of the content is posted on HearingVoices.com.

Third Coast Festival
The Third Coast Festival is an annual event in Chicago where audio producers gather to share tips and gain inspiration, but it's more than that. Third Coast hosts events and competitions year-round. Its website also hosts an incredible collection of inventive and experimental audio stories.

StartUp
StartUp is a podcast about well, making a podcast. I know it sounds really meta, but I learned so much listening to Alex Blumberg walk through the steps of creating his own podcast company. Definitely worth a listen.

Thank you...

I couldn't have jumped into the world of podcasting without a lot of help! Thank you to Megan Hall from The MHC Group, who provided expert radio advice, and to Dr. Niharika Mehta, from Women and Infants Hospital, who provided expert obstetrical medicine advice. Thank you to all of the additional experts who were featured in my episodes: at Women and Infants Hospital: Dr. Kenneth Chen, Dr. Jane Sharp, and Dr. Erika Werner, at Rhode Island Hospital: Dr. Karen Furie, Dr. Elizabeth Nestor, Dr. Mahesh Jayaraman, Dr. Shadi Yaghi, Dr. Petra Klinge, Dr. Alex Mohler, Dr. Carl Saab and Dr. Gina Deck; at Butler Hospital: Dr. Steve Salloway; at The Miriam Hospital: Dr. Lucy Rathier; at Boston Medical Center: Dr. Tina Yarrington. Thank you to Dr. Danielle Goldfarb for her help with the stroke in pregnancy case! Thank you to the Brown-affiliated residents in neurology, ob/gyn, family medicine, emergency medicine and internal medicine – I appreciate your feedback and your support! Thank you to all of the patients who will go unnamed to protect their privacy. Thank you to Tom Van Buskirk, who composed our beautiful theme song based on his baby's fetal heartbeat. Thanks to Lauren Black and Katrina Roi for production assistance, and to Dan Bobkoff, who taught me a lot in the NYU crash course in podcasting. And special thanks to Bob Lovinger in the Lifespan Development Office, Larry Warner and the Rhode Island Foundation for making this podcast possible.

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